Dissemination and Adoption of Milkfish Aquaculture Technology in the Philippines

BFAR-UPV-SEAFDEC-WorldFish Center
1st Semi-Annual Report
August 2004 to January 2005

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(August 2004 – January 2005)

A. BASIC INFORMATION

1. Project Title: Dissemination and Adoption of Milkfish Aquaculture Technology in the Philippines

2. Proponent:
Dr. Mahfuzzudin Ahmed
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WorldFish Center, Penang, Malaysia
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3. Implementing Agencies

3.1 Lead Agency: WorldFish Center

Dr. Yolanda T. Garcia (WorldFish Center Consultant)
Associate Professor
Department of Economics, UP Los Banos

Ms. Catherine T. Aragon
Research Associate, WorldFish Center-Philippines

3.2 Collaborating Agencies:

Bureau of Fisheries and Aquatic Resources (BFAR)

Central Office:
Mr. Nelson Lopez (Team Leader)
Division Chief
Inland Fisheries and Aquaculture Division (IFAD), BFAR

National Integrated Fisheries Technology Development Center
Mr. Westly R. Rosario (Project Manager)
Chief, NIFTDC, BFAR

University of the Philippines Visayas (UPV)

Dr. Rodel Subade (Study leader)
Associate Professor, Division of Social Sciences (Economics)

Southeast Asian Fisheries Development Center – Aquaculture Department (SEAFDEC-AQD)

Mr. Wilfredo Yap (Study leader)
OIC Head, Manila Office

4. Project Duration

a. Date project started: July 2004
b. Expected date of completion: July 2007

5. Period Covered by this Report:[1]

Component 1 (SEAFDEC-AQD)	- December 1, 2004 to January 31, 2005
Component 2 (UPV)	- October 16, 2004 to January 31, 2005
Component 3 (WFC-Philippines)	- August 1, 2004 to January 31, 2005
Component 4 (NIFTDC-BFAR)	- August 1, 2004 to January 31, 2005

6. Project Location: (Pilot sites)

a. Barangay Malacapas, Dasol, Pangasinan
b. Barangay Dulao, Aringay, La Union

7. Project Funding

7.1 Amount Approved for the Year	- 3,507,500.00 PHP
7.2 Actual Released Budget	- 3,507,500.00 PHP
7.3 Balance for the Year	- None
7.4 Actual Expenses	- 2,629,330.44 PHP [2]
7.5 Unspent budget	- 878,169.56 PHP

B. TECHNICAL DESCRIPTION

1. SCOPE AND OBJECTIVES OF THE STUDY

The study focuses on the current structure of the milkfish industry by examining the development and changes in the production and processing technologies, and product demand, markets and institutions over the past decade. In particular it looks into the policy structure, the role of research and technology, and identification of parameters/ variables that has enhanced and/or hindered technology adoption by the small-holder operators, e.g., farmers, traders and processors.

Hence, the general objective of the study is to analyze the production, market and policy structures of the milkfish industry in the Philippines in order to identify the constraints and opportunities for the future growth of the industry with emphasis on the adoption and impact of technological development using case studies in hatchery and grow-out production and post production systems that can be transferred or replicated in other parts of the Philippines. The specific objectives of the study are presented in the table below:

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[1] The four components of the project have different start-up dates due to the delays in the preparation and signing of the respective MOAs and budget releases.

[2] See respective financial reports, i.e., WorldFish Center, NIFTDC-BFAR, UPV and SEAFDEC-AQD

Specific objectives	Institution(s) involved	% Objective attained
1. Documentation of the evolution of the milkfish industry in the Philippines, including recent trends in policies, institutions, technology and trade.	Component 1 (SEAFDEC-AQD) Component 2 (UPV)	10% 50%
2. Identify the policies, institutional and socioeconomic factors that has helped or hindered the adoption and uptake of various technologies and growth of the milkfish industry in the Philippines.	Component 2 (UPV)	50%
3. Examine the production, market (supply-demand requirement in domestic and international markets), institutional, macroeconomic factors affecting the performance of the milkfish industry in the country.	Component 2 (UPV)	50%
4. Assess the role of research and technology transfer in the development of the industry in the Philippines.	Component 1 (SEAFDEC)	10%
5. Develop profiles of production and post-harvest technologies for milkfish, and examine their social and economic viabilities and environmental sustainability.	Component 1 (SEAFDEC)	10%
6. Formulate an industry development plan road map through prioritizing production and post-harvest technologies for adoption by the poor and smallholder operators through pilot-scale dissemination of selected technologies.	Component 1 (SEAFDEC) Component 3 (WorldFish Center) Component 4 (NIFTDC-BFAR)	10% 30% 15%

2. METHODOLOGY

This project has four components, namely:

Component 1 - Technology Review and Screening;
Component 2 - Policy and Socioeconomic Review and Identification of Constraints;
Component 3 - Overall Framework and Baseline Information; and
Component 4 - Pilot Testing and Dissemination of Technology.

Data and information for the study required review of secondary data including published studies and statistics. Key informant interviews of the milkfish industry players and focused group discussions with various stakeholders, e.g., producers, processors and traders were also undertaken. Prior to the pilot-scale dissemination of milkfish technologies for production and processing, the project conducted a baseline survey in the identified project sites to gather socio-economic and demographic information regarding the status of milkfish farmers/operators relative to other livelihood sectors in the area. The baseline survey also aims to present benchmark indicators by which the impact of the project's technology intervention can be compared and measured at the end of the project. The specific activities that were undertaken in each project component are described in detail below:

Project Component I. Technology Review and Screening

The Southeast Asian Fisheries Development Center–Aquaculture Department (SEAFDEC-AQD) was commissioned to review and screen available technologies for seed production, grow-out and processing of milkfish in the Philippines. The main objective of this component is to compare and analyze the available technologies for milkfish culture and processing in the country in order to identify the constraints and opportunities for the future growth of the industry. This will be done by documenting the adoption and impact of technological development using case studies in hatchery/nursery, grow-out production systems, post-harvest processing and value-adding in the pilot sites that can be transferred or replicated in other parts of the Philippines.

Specifically, the study calls for the collection, organization, and analysis of baseline information on available technology in milkfish culture and processing. This entails review of published materials as well as field surveys to validate and update secondary findings. Visits will be made to milkfish hatcheries, nurseries, brackishwater ponds, fishpens and fish cages in order to obtain bio-economic data through interviews with operators and/or technicians. The findings will be compiled into technical reports formatted in such a way that each technology profile can be readily converted into manual form for dissemination

Project Component II. Policy and Socioeconomic Review and Identification of Constraints

The Social Science (Economics) Division of the University of the Philippines Visayas (UPV) was tasked to do the following:

a. document the evolution of the milkfish industry in the Philippines, with emphasis on recent trends in policies, institutions, technology and trade;
b. identify the policies, institutional and socio-economic factors that have helped the adoption and uptake of various technologies and growth of the milkfish industry in the country; and
c. examine the production, markets (supply-demand requirement in domestic and international markets), institutional and macroeconomic factors affecting the performance of the milkfish industry in the country.

To accomplish these tasks, key informant interviews and focus group discussions were conducted. The municipal agricultural officer (MAO), municipal planning and development officers as well as the Sangguniang Bayan (SB) members who chair the SB committee on agriculture and fisheries in the pilot and control sites of the study were interviewed. Focus group discussions of the fishpen and fishpond operators from the pilot and control sites were also conducted. Similarly, secondary data were collected on local and national policies related to milkfish aquaculture, fry production and processing.

Project Component III. Overall Research Framework and Baseline Information

The WorldFish Center is in-charge of providing the overall research framework for the project and serves as its secretariat. At the same time, the conduct of the baseline survey was assigned to the WorldFish Center team (composed of a research associate and a project consultant), which is based at the Philippine office of the Center. The baseline survey aims to assess the relative importance of the fisheries sector, especially the milkfish industry in the study sites relative to other economic sectors in the area, i.e., agriculture, manufacturing and services. Also, the baseline survey will provide benchmark information for comparison of socioeconomic indicators, which will allow the quantification of the impacts of technology interventions in the pilot sites. To account for the exogenous growth that may take place in the project sites brought about by economic progress other than the milkfish technology interventions, separate control areas were identified and included in the survey. A post-intervention survey will be conducted on the third year of the project to assess the impacts of the technology interventions.

Aside from the baseline survey, a separate survey for the project's cooperators (after they have been identified by Component 4) will be undertaken to examine the production efficiency of commercial milkfish hatcheries/nurseries, grow-out facilities and processing outfits; and to study the feasibility of producing milkfish for export by the small-holder operators.

Project Component IV. Pilot Testing and Dissemination of Technology

The core of the project's activities is focused around Component 4 which is being implemented by the National Integrated Fisheries Technology Development Center (NIFTDC) under the Bureau of Aquatic Resources (BFAR) located in Bonuan-Binloc, Dagupan. Technologies currently being developed in the Center and those available from other related projects are being prioritized for pilot-scale transfer to two selected municipalities within the milkfish growing region of Region 1, namely Dasol (Pangasinan) and Aringay (La Union). This is done through site visits and interview of prospective cooperators which will be selected from a list of fishpond/fishpen/fishcage operators and fish processors in the area. Poorer producers and processors will be targeted for technical assistance and training support by the project.

Technology intervention will be done through a) awareness building; b) training and farm visits; c) technical support; d) institutional support; and e) monitoring and record keeping of piloted technologies. On-site seminars and trainings will be conducted by NIFTDC for prospective cooperators/ beneficiaries and key leaders in the community in order to disseminate the selected technologies for hatchery, nursery, grow-out and processing of milkfish that will be piloted by the Center. At the same time, educational tours to various processing establishments, hatchery and grow-out ponds/pens/cages will be arranged to enhance awareness among farmer operators.

Technical and institutional support will be extended by NIFTDC to adopters of piloted technologies. Milkfish farmers and processors will be federated into an umbrella organization to enable them to avail of existing credit programs by various financial institutions. Project cooperators will likewise be assisted in farm record keeping for better monitoring of their progress and constraints in technology adoption. At the end of the project, the effects of the technology interventions in the efficiency and livelihood of the adopters will be measured by conducting an impact assessment survey.

3. HIGHLIGHTS OF RESULTS

Please see attached appendices for the summary of results by component)

Appendix 1. Summary of Results for Component 1
Appendix 2. Summary of Results for Component 2
Appendix 3. Summary of Results for Component 3
Appendix 4. Summary of Results for Component 4

C. PROJECT MANAGEMENT

(Please see attached matrix of accomplishments, constraints met and actions taken by respective components)

D. FINANCIAL STATUS REPORT

(Please see attached overall financial report of the whole project and individual financial reports by respective components)

MONITORING/ACCOMPLISHMENT REPORT
For the 2nd SEM, CY 2004-2005

Project Title: Dissemination and Adoption of Milkfish Aquaculture Technology in the Philippines
Project Leader: Dr. Mahfuzzudin Ahmed
Lead Agency: WorldFish Center
Network: BFAR, UP Visayas, SEAFDEC

Activities	Accomplishments		% Completion	Problem/s Encountered	Action/s Taken	Recommend-ations
	Target	Actual				
PROJECT COMPONENT I **Technology Review and Screening**						
Collection and organization of literature and baseline information on available technology on milkfish culture and processing	Nov. 2004	▪ Partial compilation of available literature on milkfish aquaculture ▪ Prepared/ completed a format for reporting the available technology ▪ SEAFDEC-AQD team conducted a field visit in Bulacan, Bulacan to find out existing milkfish nursery practices in the area ▪ SEAFDEC-AQD team conducted field visit in the pilot sites to find out existing status and practices in milkfish culture and processing in the two areas	10%	Delay in the implementation of activities because of the delay in the remittance of funds due to some technical problems in the signing of the MOA.	Revision of the MOA from SEAFDEC and WorldFish Center to SEAFDEC and BFAR.	

Activities	Accomplishments		% Completion	Problem/s Encountered	Action/s Taken	Recommend-ations
	Target	Actual				
PROJECT COMPONENT II **Policy and Socioeconomic Review and Identification of Constraints** • Review of policies, institutions, markets and socio-economic factors affecting the milkfish industry ▪ Data collection on national policies, local policies and municipal ordinances for fisheries aquaculture	Oct '04-Jan '05	▪ Collected and compiled local and national policies **National policies**, namely: FAO 117, 119, 125, 129, 135, 173, 125-1, 125-2, 197, 214, 221 LLDA MC 2004-02, #4 LLDA SO# 614 DTI Export advisory RA 8550 RA 8435 IRR of RA 8550 **Local policies**, namely: MFOs, CLUP and other related ordinances in the study sites	50%	Some documents on local policies were not readily available	Requested RA at NIFTDC to gather additional documents which were not previously collected.	
▪ Assessment of the current use of public lands under FLA (sub-leasing practices)	Oct '04-Jan '05	▪ Conducted KIs and FGDs and secondary data collection to assess the current use of public lands under FLA (sub-leasing practices)	30%	Very few informants are aware about fishpond/pen sub-leasing		Additional key informant interviews; reference to and use of results from baseline survey of Component 3

Activities	Accomplishments		% Completion	Problem/s Encountered	Action/s Taken	Recommendations
	Target	Actual				
▪ Evaluation of the compliance and enforcement of national laws and regulations	Oct '04-Jan '05	▪ Gathered data of FAOs, and other related policies FAO 117, 119, 125, 129, 135, 173, 125-1, 125-2, 197, 214, 221 LLDA MC 2004-02, #4 LLDA SO# 614 DTI Export advisory RA 8550 RA 8435 IRR of RA 8550	50%			
▪ Assessment and analysis of supply and demand of fry and marketable size bangus based on secondary data available	Oct '04-Jan '05	▪ Some of the data were already collected; analysis of data collected is on-going	50%	There were inconsistencies in the data figures from different data sources.		Need to address figure inconsistencies from different sources by notifying the said agencies. Perhaps another study/ research can be done in unifying & synchronizing data collections from the field for fisheries statistics.
▪ Assessment of critical inputs like feeds, fertilizers, pesticides and prohibited drugs	Oct '04-Jan '05	▪ Some of the data were already collected; analysis of data collected is on-going	50%	There were inconsistencies in the data figures from different data sources.		Need to address figure inconsistencies from different sources by notifying the said agencies

Activities	Accomplishments		% Completion	Problem/s Encountered	Action/s Taken	Recommend-ations
	Target	Actual				
PROJECT COMPONENT III **Overall Research Framework and Baseline Information**						
• Conduct baseline studies in the project pilot sites and control sites ▪ Selection of target and control sites in La Union and Western Pangasinan was based on established criteria, ocular visit and consultation with Municipal Agricultural Officer	Sept-Nov '04	▪ The following areas were chosen as the target and control sites a) La Union – Brgy. Dulao, Aringay (pilot site) and Brgy. Raois, Sto. Tomas (control site) b) Western Pangasinan – Brgy. Malacapas, Dasol (pilot site) and Brgy. Nayom, Infanta (control site)	100%			
▪ Establishment of benchmark information through focused group discussions, key informant interview of barangay officials and data from municipal profiles	Sept-Oct '04	▪ Compiled data and presented brief socio-economic profile of the pilot sites during the Awareness Seminar conducted by NIFTDC last January 11 and 13	100%	Some of the pilot barangays do not have a barangay profile		
▪ Conduct of training of enumerators on data collection for the baseline survey	Sept-Oct '04	▪ 12 Research Assistants/Technicians were trained on how to fill-up the baseline survey questionnaire last Sept. 30-Oct. 1	100%			

Activities	Accomplishments		% Completion	Problem/s Encountered	Actions Taken	Recommendations
	Target	Actual				
▪ Conduct of formal baseline surveys in the two pilot sites and two control sites o Preparation of sampling frame o Design of survey instrument o Pre-testing of questionnaire o Training of enumerators o Conduct of field survey	Nov-Dec '04	▪ Conduct of baseline surveys in selected sites - Aringay - 116 sample respondents -Sto. Tomas– 94 sample respondents - Dasol – 85 sample respondents - Infanta – 81 sample respondents Note: Cooperators survey yet to be undertaken in the pilot sites	80%	▪ The sampling frame of the survey used the total population of the respective sites. However, fishpond owners in the Pangasinan sites are mostly "outsiders" hence there was no milkfish operator that was interviewed in the control site and only one was interviewed in the pilot site. ▪ Milkfish producers in the La Union control site are operating fishponds and not fish pens, which is different from the pilot site.		
▪ Editing of questionnaires and processing of data	Dec '04-March'05	▪ Database of baseline survey has not yet been completed and analysed since the survey was conducted only recently Data encoding and data entry are on-going. Please see **Appendix 3** for preliminary results.	10%	▪ Need more computers and manpower for data encoding	NIFTDC to fast track purchase of another computer	NIFTDC provided 1 computer and assigned 2 RAs to help in encoding

Activities	Accomplishments		% Completion	Problem/s Encountered	Action/s Taken	Remarks/ Recommend-ations
	Target	Actual				
PROJECT COMPONENT IV **Pilot Testing and Dissemination of Technology**				Delay in the implementation of activities because of the delay in the remittance of funds due to changes in the MOA between WorldFish Center and BFAR.	Requested WorldFish Center to initially release P100,000 to be able to start activities. Followed up approval of changes in MOA.	
• Identification and prioritization of technologies for dissemination and adoption by smallholder farmers and poorer operators.	Jan-June '05					
▪ Organize core group and training specialists for the project	Dec '04	5 core group members identified 8-member team of Training specialists 2 Staff members on field	100%			
▪ Site visits were conducted by the BFAR-NIFTDC bangus team to identify technically feasible technologies	Dec '04	Identified technologies for dissemination: **Aringay :** Fry hatchery production, Fry to fingerling production, Grow-out culture in fishpens, Bangus Processing **Dasol :** Fry to fingerling production, Grow-out culture in fishpens, Bangus Processing	100%	Lack of available vehicle in the conduct of the survey, site visits, seminars and educational tour.	BFAR–NIFTDC vehicles were made available. Private jeepneys were also hired when the BFAR-NIFTDC vehicle was not available. Submitted needed documents to BFAR-CO purchase new vehicle	Documents for invitation to bid are for approval. Constant follow-must be done.
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Activities	Accomplishments		% Completion	Problem/s Encountered	Action/s Taken	Remarks/ Recommend-ations
	Target	Actual				
▪ Identification of sites for water quality monitoring	Jan '05	▪ Conducted: E. coli analysis (river seawater and deepwell), nutrient analysis (NH3, NO4, PO4) for river and seawater and; analysis of DO, pH, salinity, chlorophyll-a, phaeopigment, TDC and suspended solids	100%	Lack references/ books which would be used for the identification of benthos in the project and control sites.	Referred to Mr. Nelson Lopez.	Purchase books needed in the analysis
▪ Conduct awareness seminar in the pilot sites	Jan '05	▪ Participants Aringay – 34 participants Dasol – 58 participants Participants were oriented on the mandates of BFAR and the objectives of the project. An overview of the milkfish industry and the different milkfish technologies were presented. Representatives from Landbank of the Philippines and Quedancor were invited to present their financing programs for fishery projects.	100%			
▪ Conduct an educational tour for prospective cooperators from the pilot sites	Jan '05	▪ Prospective cooperators from Dulao, Aringay, La Union and Malacapas, Pangasinan were toured to BFAR- NIFTDC, processing establishments in San Fabian and Dagupan and to fishponds (nursery, grow-out) in Bonuan Binloc, Dagupan City.	100%			

Activities	Accomplishments		% Completion	Problem/s Encountered	Action/s Taken	Recommen-dations
	Target	Actual				
▪ Preparation of information materials and training modules/materials	Dec '04	▪ Information materials on: Commercial Hatchery Production of Milkfish Fry, Fishpond Management, Principles of Cage Operation and Management, Fish Processing (bottled sardines, smoked bangus), Bangus Deboning were prepared	50%			
▪ Construction of smoke drums	Sept '04	▪ Constructed smoke drum house which can be used during trainings on smoked milkfish or "tinapa" making. Drums will be distributed on-loan to selected core cooperators.	100%			
▪ Selection of cooperators who will attend trainings on: - Hatchery production of fry - Nursery of hatchery-bred fry to fingerlings - Rearing of fingerlings to grow-out - Product development	Jan-Jun '05	Obtained list of interested people. The list is yet to be finalized.	50%			

Appendix 1

Appendix 1: Summary of Results (Component 1)
Technology Review and Screening

Study Leader: Wilfredo G. Yap
OIC Head, SEAFDEC-AQD Manila Office
17 Times St., QC

Project Staff:

1. Antonio C. Villaluz, Milkfish Culture Specialist
2. Ruel V. Eguia, Nursery and Pen Culture Specialist
3. Mary Nia Santos, Research Assistant
4. Gracia Garcia, Research Assistant

Project duration under review: December 1, 2004 to January 31, 2005

Project Funding:

a. Amount approved for the Year: 350,000.00 PHP
b. Amount Released: 300,000.00 PHP
c. Balance for the Year: 50,000 PHP
d. Actual Expenses: 1,550.95[3]
e. Unspent Budget: 298,439.05 PHP

Highlights of Activities/Results:

As of January 31, 2005, a milkfish culture specialist, milkfish pen culture specialist and a full time technical assistant has been identified and recruited. A partial compilation has been made on available literature on milkfish culture. A format for reporting the available technology has been completed. The SEAFDEC AQD team has also conducted field survey to find out existing milkfish nursery practices in Bulacan, Bulacan, which is considered the center of such industry in the Philippines. Key informant surveys and focused group discussions were also conducted in the target areas, namely, Bgy. Malacapas in Dasol, Pangasinan and in Bgy. Dulao, Aringay, La Union in order to find out existing status and practices in milkfish culture and processing in these two areas. Results of the activities undertaken are presented in the following annexes:

a. Field survey of existing practices (Annex A)
b. Format for Reporting Technology Profiles (Annex B)
c. Literature Scanning (Annex C)

Problems encountered and Action taken:
Delayed remittance of funds.

Attachments:
No financial report (since only disbursement so far is the pre-deducted bank charges)

[3] Covers only bank charges during remittance

ANNEX A
HIGHLIGHTS OF FINDINGS MADE DURING THE FIELD SURVEYS ON EXISTING PRACTICES

Background

Among the three aspects in milkfish culture, namely, fry production in a hatchery, fingerling production in nursery and grow-out, that of the nursery aspect is the least documented in the literature. It is for this reason that there was a need to visit the commercial nursery operators in Bulacan, Bulacan, which is considered the center of milkfish fingerling industry in the Philippines. Through such visit the study team hoped to document industry practice and trends and find out what may be applicable to project's target areas in Pangasinan and La Union.

The field surveys in Pangasinan and La Union on the other hand were conducted in order to obtain the technological baseline in the target areas. Only by knowing the existing practices, would the project be able to determine whether or not there is any need at all to introduce new technology, and if any intervention is found necessary, what type of technology may be appropriate to introduce.

A.1 Milkfish Nursery Practices in Bulacan

Bulacan, Bulacan is the major source of milkfish fingerlings for grow-out ponds in Central Luzon and SouthernTagalog regions, the fishpens in Laguna de Bay, the freshwater fish cages in Taal Lake and the marine cages in Pangasinan and Zambales. The area has a long history for fingerling production, which dates back probably to as long as milkfish has been cultured in Central Luzon. The fingerling production area used to include Navotas and Malabon (which before was within the province of Rizal but is now part of Metro Manila) but because of urbanization the industry is largely confined to the Bulacan area which includes Obando. But even in Obando urbanization has crept in and many erstwhile milkfish ponds have been reclaimed for subdivision.

The milkfish pond practice has not changed much over the years. The basic practice can be outlined as follows:

1. Drying of ponds till the pond bottom cracks.
2. Application of chicken manure at the rate of seven (7) *casko* per four hectares (One *casko* is equivalent to 41 sacks. One sack is about 20 to 25 kg). *Casko* actually refers to the hull of the shallow-draft wooden boat used for general transport including fry and fingerlings.
3. Letting in of brackishwater from the tidal river up to a depth of 10 to 15 cm. At this stage pesticide may be applied to eliminate extraneous organisms.
4. After the lab-lab has bloomed water in the pond is flushed out and new water is allowed in to a depth of 30 cm. Inorganic fertilizer in the form of urea or ammonium phosphate (16-20) maybe applied at the rate of one sack per hectare or

less depending on the judgement of the caretaker. The ponds are now ready for stocking.

5. After the milkfish fry has been stocked, water is gradually increased up to a maximum of 50 cm. Inorganic fertilizer may be applied as a dressing during this stage.
6. Feeding with commercial fry mash cut with rice bran to reduce the cost maybe resorted to during the cold months when natural food does not grow well.
7. The fingerlings are harvested after 30 days.
8. These are either packed in plastic bags if destined for the sea cages or transferred to pituya for transport to the fishpens in Laguna de Bay.

The nursery farmers have completely stopped from using the banned agricultural pesticides such as Thiodan, Endrin and Brestan. Instead they have shifted to a cheaper and more widely available alternative, which is even more effective and has a wider spectrum, namely Sodium cyanide (NaCN). Although considered an illegal substance for fishing, this is widely available as an industrial chemical.

One of the most significant trend, which has developed is the consolidation of small ponds and farms into larger units. Before milkfish nursery farms were within 3 to 5 hectares in size. Each farm used to be subdivided into small ponds of 500 up to 1,000 sq meters. The typical practice was to use a pair of ponds for each stocking with one pond remaining empty and exclusively prepared for lab-lab growing. When the lab-lab in one pond is becoming thin, the partition dike between the pair of ponds is merely breached to allow the fingerlings to spread. This practice is still done now but the individual farms can range from five to 10 hectares while each operator may have consolidated several small nursery farms into one big nursery farm of 100 hectares or more.

A.2 The Milkfish Industry in Malacapas, Dasol, Pangasinan

The milkfish industry in Malacapas consists totally of brackishwater fishponds. The municipal government has completely banned the installation of fish cages and fishpens in the entire municipality of Dasol. There was one attempt to put up a fishpen in the tidal river of Malacapas, which serves both as fishpondsand salt bed. But this was ordered removed by the barangays chairman. Both the Mayor and the Municipal Agriculturist believe that fishpens and fish cages will do more harm than good due to the fishkills, which happened in Bolinao. They are also afraid that the organic pollution from fish cages and fish pens may affect the quality of the salt produced in the area. Salt making through solar evaporation is considered a major industry in Malacapas and alternates with milkfish production during the dry season.

Except for one large farm measuring some 250 ha that is owned by one family, the milkfish farms in Malacapas are small with size ranging from one to three hectares. There are a few fishponds measuring five to seven hectares and even 12 to 22 hectares, but these are exceptional cases. A total of 1,000 ha of brackishwater fishpond has been mentioned but it was not clear whether this is for the whole municipality of Dasol or only

for barangay Malacapas. This figure will be subject to verification with municipal records.

The practice in Malacapas can be characterized only as traditional. Most of the operators practice straight culture wherein the fingerlings are stocked in one pond until harvest. Modular system is not a common practice. Those who can afford to buy fingerlings for stocking can do two growing cycles in one year. While those who can afford to buy only milkfish fry and have to grow their own fingerlings can do only one cycle. Most of the milkfish farms turn to solar salt production during the dry season. Salt-making apparently earns more than milkfish growing. Furthermore the fish farmers observe that the milkfish do not grow so well during the dry season.

Milkfish fry are caught in Dasol and there are also a few small-scale nursery operators in the locality. With the usual stocking density of 2,000 to 3,000 fingerlings per hectare the local supply of fry and fingerlings is often enough for local needs. Should the local supply be short, fingerlings maybe obtained from other nearby municipalities within Pangasinan. Local growers therefore has no experience using milkfish fry from hatcheries.

The usual pond culture in Malacapas is as follows:

1. Pond preparation consisting of drying until large portion of the pond bottom is completely dry.
2. Most operators apply chemical pesticide at this stage to remove the unwanted organisms especially in the low lying areas, which cannot be dried. A few operators apply pesticide only after the chicken manure is applied
3. Application of chicken manure is at the rate of 50 to 70 sacks per ha.
4. Letting in of water to cover the entire pond bottom. Because the pond bottom is uneven the depth of water is not uniform and can be deeper in some parts of the pond.
5. Flushing of pond after the natural food (lumut or lab-lab) has bloomed.
6. After 15 days when natural food has bloomed the depth is increased to the maximum (may be as low as 30 to 60 cm only)
7. Urea is applied at the rate of one sack per ha or 16-20 at the rate of 2 sacks per ha may be applied as a dressing.
8. Even if the natural food has not yet been totally consumed, many operators use supplemental feeds in the form of commercial feed pellets.
9. Milkfish is harvested upon reaching the size of 4 to 5 pcs/kg and brought to the landing center (*consignacion*) for marketing.

There is no milkfish processing activity whatsoever in Malacapas but the ladies in the barangay are all willing to undergo training and devote either part or all of their time to milkfish processing in order to augment family income. Towards this end the need to identify an area to put up a central processing facility was pointed out. The identified area should be close to the road, has adequate water supply and should have electricity. The barangay chairman promised to identify such site. One of the residents offered the use of his 300 square meters roadside property adjacent to the barangay center to accommodate the central processing facility.

A.3 The Milkfish Industry in Dulao, Aringay, La Union

There is a flourishing milkfish industry in Barangay Dulao and in the whole municipality of Aringay in general. The production base consists of both brackishwater ponds and fishpens. In Barangay Dulao alone the milkfish landings from aquaculture ranges from one to three tons a day, and total landing in 2004 was estimated at 400 tons. The milkfish production area in Dulao is unique because the whole area used to consist totally of brackishwater ponds ranging in size from one to three hectares. During the big earthquake in 1990, the whole area sank and the whole area became a lagoon covering 540 ha making all the fishponds unusable. The pond operators were forced to convert the fishponds into fishpens.

Because of their common origin as fishponds that are adjacent to each other, the fishpens as they now stand are built also adjacent to each other with hardly any space in between since each operator merely erected the pens along their respective boundaries. What used to be the tidal creek where all the fishponds drew their water from has been left clear for navigation.

The earthquake proved to be a blessing. From a stocking of 2,000 to 3,000 per ha in the traditional fishponds, the fishpens can now be stocked at much higher rates with commensurate increase in the production. However, new problems also cropped up. One immediate problem is working capital. Nets for the pens cost money. Furthermore the shift to a fishpen mode of production means they can no longer start with milkfish fry but has to buy pre-grown fingerlings from private nursery operators. Not only that the stocking has increased ten-fold but feeding using commercial feed is now a must. Most of the pond operators have to resort to finding financiers for their operation who are often out-of-towners. Of the 370 individual pond owners in the area, only 15 operators were able to finance their own operation. The typical sharing of the net operating income between the operator and the financier is 30:70 in favor of the financier.

The other problem that cropped up in the area is technical in nature. The proximity of the fishpens to each other means poor water circulation and very limited access to new water even with the incoming tide. Oxygen depletion became a common occurrence especially during the early hours before sunrise. Rising to the challenge the fishpen operators installed engine-driven propellers in their respective fishpens to improve circulation in their pens. This crude aerating device is operated whenever the fish are observed to be surfacing for lack of oxygen and has found to be effective.

The poor circulation has been exacerbated by the seasonal formation of a sand bar at the river mouth. During the northeast monsoon, a sand bar forms and restricts the entry of new tidal water. This normally starts on the month of November. Every April when the wind shifts, the sandbar has to be removed. The municipal government uses a bulldozer to remove the obstruction. A public works engineer has proposed a more permanent solution to this problem. This will consist of rip-rapping the sides of the river mouth and the construction of at least six groins strategically positioned to deflect the movement of the sand away from the river mouth.

The technology involved in the Dulao fishpens cannot be made simpler. The fishpens are regularly stocked and the fish fed ad libitum until harvest. Most of the fishpens are equipped with a demand feeder. The fishpen operators themselves fabricate these feeders. A floating fine-mesh net barrier is installed below the feeder encircling a space of approximately 3 to 5 meters in diameter so that the floating feed pellets do not get scattered in all directions or even escaped from the net pen. Typical stocking density is 20,000 fingerlings (with size of 7.5 to 10 cm) per pen during the dry season and 30,000 during the rainy season. Each pen encloses an area of about 2,500 sq meters. There is no net change during the culture period except if smaller size fingerlings are used for stocking in which case a finer mesh net enclosure may be used at the start. The fingerlings are sourced both from local nursery operators and from other parts of La Union and as far as Dagupan. Some fishpen operators have had experience using fingerlings from a commercial hatchery.

The milkfish are harvested after 4 months if 3-4 pcs per kg is desired. To harvest 2-3 pcs per kg, an additional month is needed. All the fish are landed at the central fish landing area operated by the Dulao Lagoon Fishpen and Fishpond Operators Association to which all the operators are members. The Association serves as the central market for all the milkfish produce. The fish are sold to traveling traders at a mark-up of one peso per kilogram regardless of size and unit price. The traders are given 15 days to pay for the fish they procure. Since the annual volume is estimated at 400 to 500 tons, the Association, which was established in 2001, would have accumulated a substantial amount of cash by now. However their system of 15 day delayed payment was abused and many of the traders failed to pay for their procurement. As a result the Association was not able to pay all the growers in full and now has an obligation of some PHP800,000. Their collectibles from the absconding traders amounted to PHP1.3 Million. This matter has been brought to the local court for collection.

All the traders who failed to settle their obligation has been blacklisted. The present policy is to collect the payment for each consignment before the fish can be loaded to their respective vehicles by the traders. In addition to the Association, the Aringay Aquaculture Producers Multi Purpose Cooperative, Inc was formed and was approved by the Cooperative Development Agency in 2002. Unlike the Association, which covered only Barangay Dulao, the cooperative covers the entire municipality of Aringay. At present, the Coop only has 28 members. Another barangay, which has substantial milkfish production from fishpens, is Rosario. The fishpens are set in Rosario River, which feeds into the Dulao lagoon. Some of the fishpen operators in Dulao also have fishpens in Rosario.

To date, there is no milkfish processing industry in Aringay. BFAR Region I had conducted training on milkfish deboning in the barangay, with 37 participants of which four were males. No one however had practiced what they learned from the training due to lack of proper equipment and capital. However one lady who has previously worked in a milkfish-processing establishment in Dagupan, debones milkfish for a fee. She also processes milkfish into boneless marinated "daing" on order by traders.

ANNEX B
PROPOSED FORMAT FOR REPORTING DIFFERENT MILKFISH CULTURE AND PROCESSING TECHNOLOGIES

Reporting Approach

The various technologies covering all phases of milkfish culture from seed production and fingerling production, to grow-out and processing will be reported in a format which will lend itself readily to popularization. Thus the report shall be modeled using a cookbook format. Certain aspects in the production process that need more detailed background materials shall be provided with annexes.

TECHNOLOGY 1: MILKFISH FRY PRODUCTION

A. Overview of product and technologies

A.1 Tank System

Site Requirements
- Location
- Water Quality

Facilities Required
- Seawater Supply System
- Freshwater Supply
- Aeration System
- Larval Rearing Tanks
- Natural Food Tanks
- Equipment and Tools
- Staff Quarters

Personnel Required

Inputs

Financial Aspects

Procedure
- Preparations
- Natural Food Culture
- Larval Rearing
- Water Management
- Feeds and Feeding
- Harvest, Packing and Transport

A.2 Pond System

Site Requirements
- Location
- Water Quality

Facilities Required
- Water Supply System
- Culture Ponds
- Equipment and Tools
- Staff Quarters

Personnel Required

Inputs

Financial Aspects

Procedure
- Preparations
- Natural Food Culture
- Larval Rearing
- Water Management
- Feeds and Feeding
- Harvest, Packing and Transport

B. Comparison between the two systems

TECHNOLOGY 2: MILKFISH FINGERLING PRODUCTION

A. Overview of product and technologies

A.1 Brackishwater Pond System

Site Requirements
- Location
- Water Quality

Facilities Required
- Culture Ponds
- Equipment and Tools
- Staff Quarters

Personnel Required

Inputs

Financial Aspects

Procedure
- Pond Preparation
- Natural Food Culture
- Rearing of Fry to Fingerlings
- Water Management
- Supplemental Feeding
- Stunting
- Harvest, Packing and Transport

A.2 Freshwater Cage System

Site Requirements
- Location
- Water Quality

Facilities Required
- Net Cages
- Equipment and Tools Required
- Staff Quarters

Personnel Required

Inputs

Financial Aspects

Procedure
- Cage Preparations
- Rearing of Fry to Fingerlings
- Harvest, Packing and Transport

B. Comparison between the two systems

TECHNOLOGY 3: MILKFISH GROW-OUT

A. Overview of Product and Technologies

A.1 Modular System

Site Requirements

- Location
- Climate
- Water Quality

Facilities Required

- Culture Ponds
- Equipment and Tools
- Staff Quarters

Personnel Required
Inputs
Financial Aspects
Procedure

- Pond Preparation
- Natural Food Culture
- Stocking and Stock Management
- Water Management
- Supplemental Feeding
- Harvesting and Post-Harvest Handling

A.2 Straight Culture System

Site Requirements

- Location
- Climate
- Water Quality

Facilities Required

- Culture Ponds
- Equipment and Tools
- Staff Quarters

Personnel Required
Inputs
Financial Aspects
Procedure

- Pond Preparation
- Natural Food Culture
- Stocking and rearing of fingerlings to size
- Water Management
- Supplemental Feeding
- Harvesting and Post-Harvest Handling

TECHNOLOGY 3: MILKFISH GROW-OUT (Continued)

A.3 Deep-water Plankton System

Site Requirements

- Location
- Climate
- Water Quality

Facilities Required

- Culture Ponds
- Equipment and Tools Required
- Staff Quarters

Personnel Required
Inputs
Financial Aspects
Procedure

- Pond Preparation
- Natural Food Culture
- Stocking and Rearing of Fingerlings to Table Size
- Water Management
- Harvesting and Post-Harvest Handling

A.4 Pen Culture

Site Requirements

- Location
- Climate
- Water Quality

Facilities Required

- Net Pens
- Equipment and Tools Required
- Staff Quarters

Personnel Required
Inputs
Financial Aspects
Procedure

- Pre-stocking Preparation
- Stocking of Net Pens and Rearing of Fingerlings to Table Size
- Feeds and Feed Management
- Harvesting and Post-harvest Handling

A.5 Cage Culture

Site Requirements

- Location
- Climate
- Water Quality

Facilities Required

- Net Cages
- Equipment and Tools Required
- Staff Quarters

Personnel Required
Inputs
Financial Aspects

Procedure

- Stocking and Rearing of Fingerlings to Table size
- Feeds and Feed Mnagement
- Harvesting and Post-Harvest Handling

B. Comparison of the five systems

TECHNOLOGY 4: PROCESSING OF MILKFISH

A. Introduction

Raw Material Characterization
Nutrient Content
Sensory Attributes

A.1 Traditional Processing

Drying

- Daing na bangus (split-salted fish)

Fermentation

- Burong bangus (fermented milkfish with cooked rice)

Smoking

- Smoked drawn milkfish
- Smoked soft-boned milkfish
- Deboned smoked milkfish

A.2 Non-traditional Processing

Bottling/Canning

- -Bottled bangus, French style
- -Canned bangus in oil
- -Canned bangus, Salmon style
- -Canned bangus, Sardine style
- -Canned bangus relleno
- -Canned paksiw na bangus
- -Canned smoked bangus in oil
- -Canned bangos escabeche
- -Canned curried bangus

TECHNOLOGY 4: PROCESSING OF MILKFISH (Continued)

Freezing

- -Boneless milkfish

Value-added Processing

- Deboning
- Pickling/Marinating
- Marinated milkfish
- Kippered milkfish
- Roll mop

Surimi (minced fish)

- Fish balls
- Sticks (fish fingers)
- Fish kikiam
- Bangus Longganisa/ Fish sausage
- Fish Nuggets
- Fish burger steak/Patties
- Milkfish Shanghai
- Milkfish embutido

Other Fishery Products and By-products

- Bangus chicharon
- Milkfish polvoron

B. Sanitary Protocols

Good Manufacturing Practices (GMPs)

Plant construction

Personnel hygiene and sanitation

Standard Sanitary Operating Procedures (SSOPs)

C. Overview of Hazard Analysis Critical Control Point (HACCP)

ANNEX C
COMPILED LIST OF LITERATURE ON MILKFISH CULTURE AS OF JANUARY 31, 2005

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Appendix 2

Appendix 2: Summary of Results (Component 2)
Policy and Socio-Economic Review

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Project Staff:

1. Gay Defiesta, Assistant Professor, Division of Social Sciences (Economics), UPV
2. Brian Ventura, Instructor, Division of Social Sciences (Economics), UPV
3. Joseph Raymund Bautista, Research Assistant

Project duration under review: October 16, 2004 to January 31, 2005

Project Funding:

a. Amount approved for the Year: 350,000.00 PHP
b. Amount Released: 300,000.00 PHP
c. Balance for the Year: 50,000 PHP
d. Actual Expenses: 131,607.71 PHP[4]
e. Unspent Budget: 168,290.79 PHP

Highlights of Activities/Results:

The following activities were undertaken within the period covered in the review:

a. Key Informant Interviews with:
   - Municipal planning & development officers of the study sites
   - SB members of the study sites (Chairs of the SB committee on agriculture)
   - MAOs of the study sites
   - Mr. Nelson Lopez of IFAD – BFAR
b. Focus Group Discussions
   - 3 – 5 fishpond & fishpen operators each from Aringay & Sto. Tomas, La Union and from Dasol and Infanta, Pangasinan
c. Library and Internet Research/ Data Gathering
   - SEAFDEC - AQD Library
   - UPV Main Library
   - UPV CFOS Library
   - UPLB Main Library
   - UPLB CEM Library
   - Documents about the bangus industry of Mr. Nelson Lopez
   - Regional milkfish data from BFAR Region 6 office

[4] Financial statement to follow.

A. Preliminary Results from Secondary Sources (See attached figures and tables)

- The Philippines had led the world aquaculture production of milkfish along with Indonesia, which overtook us in 1995, and Taiwan. (Table 1 and Figure 1)

- Across regions, Western Visayas (Region VI) has consistently led in aquaculture production except for early 2000s when Central Luzon (Region III) became the dominant producer. Region I showed its vast potentials in terms of hectarage and production in 2000s placing itself to third biggest regional producer. (Table 2 and Figure 2)

- By production environment, the brackish water ponds produced 85% of the country's total milkfish output. (Table 3 and Figure 3)

- A huge deficit in fry supply has been estimated by both DA (1995) and BFAR (2003), ranging from 1.5 to 2 billion fry. The method(s) and details of these estimates need to be examined, however. Bagarinao (1998) believes that fry shortage may just be exaggerated or over-estimated. (Tables 4 & 5 and Figures 4 & 5)

- Milkfish exports have been mainly of frozen type, which accounted for 60% of total milkfish exports in 2001, i.e. 345MT of the total 577MT. Since 1983, milkfish exports has declined, though there have been fluctuations. (Tables 6 & 7 and Figures 6 & 7)

- The main market of milkfish exports has been the U.S.A., where a big market of Filipino immigrants is believed to be the buyers. (Tables 8-11 and Figures 8-11)

B. Preliminary Results from FGDs and KIs

- Based from the Pangasinan and La Union study sites, there are several modes of production by type of enclosures used, i.e., fishpens, fishponds and fish cages. In Dasol, salt making alternates with milkfish culture in the dry season to supplement family income.

- There are several fishponds under FLAs and private ownership, which have not been utilized since the ponds submerged underwater during the 1990 earthquake, which destroyed most of the fishponds in Aringay. Hence, fishpond owners were forced to convert the fishpond to fishpens in order to continue their milkfish production.

- The presence of fish farmers' association in the case of Aringay, gave them more market power such that they were able to solicit higher prices for their milkfish harvests. This can be a good strategy to help poorer fish farmers.

- Not all municipalities in the study sites have passed the needed Municipal fishery ordinance. This is an urgent matter which the respective LGU has to deal with in order to truly assist fish farmers. Among LGU's, there seems to be a lack of technical manpower and equipment for the monitoring of the environmental quality of fishponds as regards to their environmental indicators.

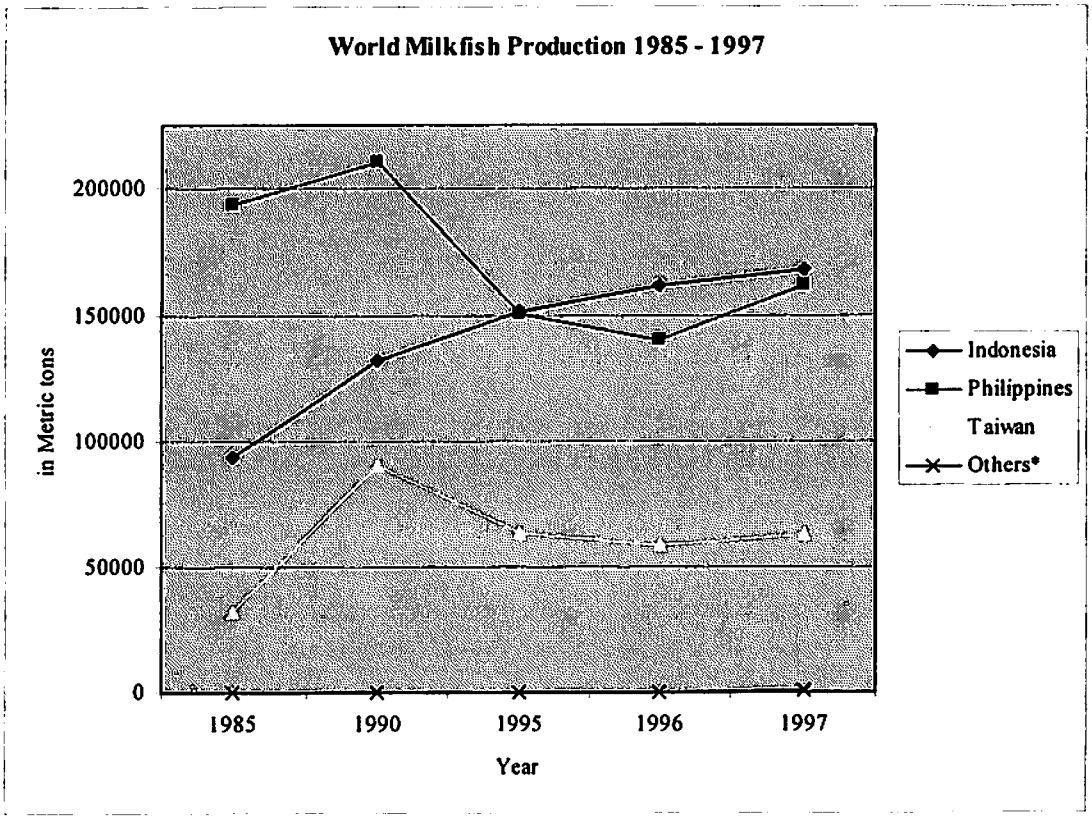
TABLES AND FIGURES

A. Philippine Milkfish Production

Table 1: World Milkfish Production 1985 - 1997 (metric tons)

Year	Total	Indonesia	Philippines	Taiwan	Others*
1985	318957	93508	193743	31677	29
1990	434113	132432	210872	90716	93
1995	365444	151256	150858	63254	76
1996	360806	162127	140150	58453	76
1997	392520	167900	161426	62143	1051

* Cook Islands, Guam, Kiribati, Micronesia, Singapore
Source: FAO 1998



* Cook Islands, Guam, Kiribati, Micronesia, Singapore
Source: FAO 1998

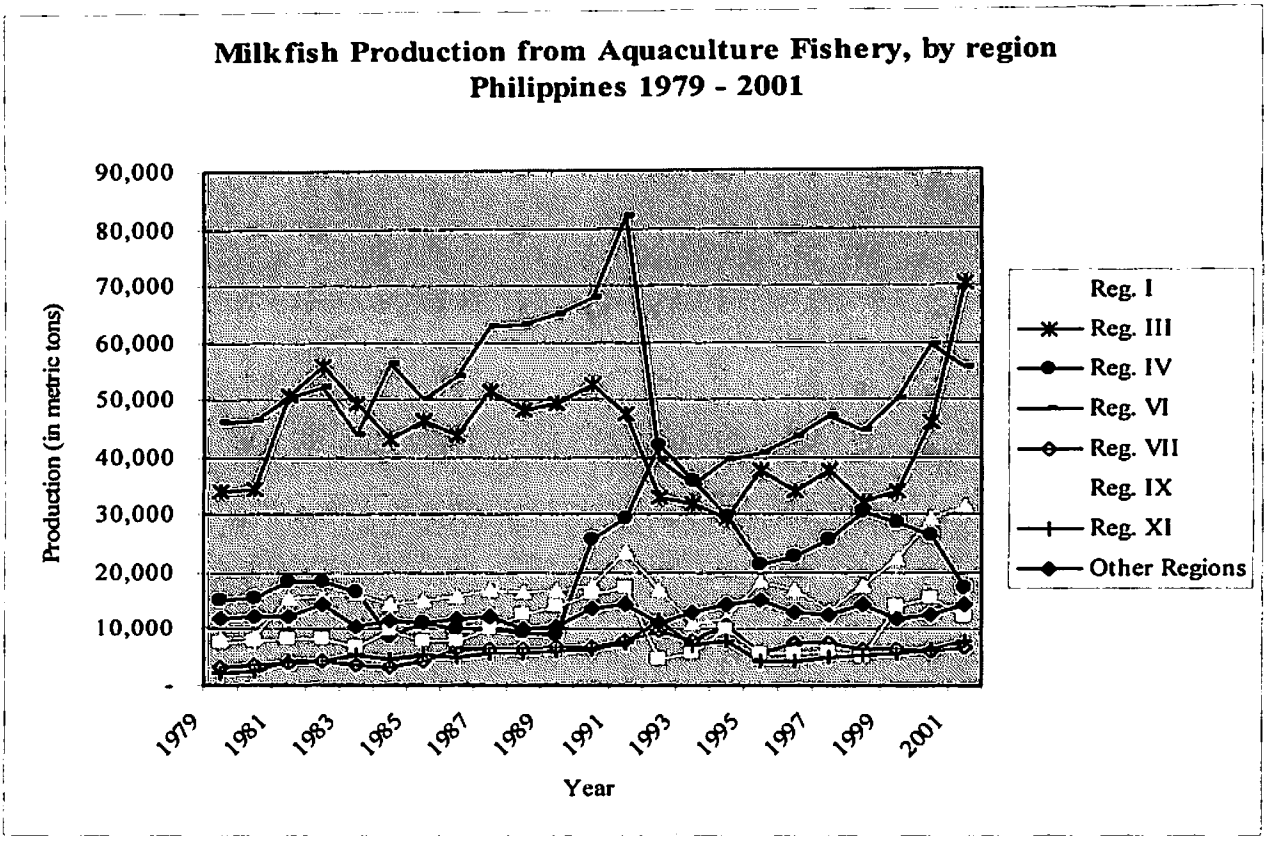
Figure 1: World Milkfish Production 1985 - 1997 (metric tons)

Table 2. Milkfish Production from aquaculture fishery, by region, Philippines 1979-2001 (in metric tons)

Year	Phil.	Reg. I	Reg. III	Reg. IV	Reg. VI	Reg. VII	Reg. IX	Reg. XI	Other regions
1979	137,813	8,433	33,988	15,150	45,986	3,356	7,723	2,313	12,057
1980	171,775	8,724	34,572	15,494	46,283	3,471	7,911	2,366	12,463
1981	225,026	15,522	50,754	18,367	50,612	4,085	8,351	4,262	12,477
1982	239,745	16,131	56,048	18,357	52,375	4,362	8,351	4,262	14,364
1983	238,559	16,211	49,452	16,594	43,853	3,649	7,013	5,343	10,397
1984	237,675	14,678	43,222	8,567	56,302	3,441	9,683	4,851	11,588
1985	193,650	15,197	46,420	11,177	50,132	4,438	7,867	5,376	11,336
1986	179,505	15,900	44,051	10,159	54,028	6,565	7,923	4,922	11,868
1987	197,527	17,032	51,633	10,167	62,723	6,565	10,300	5,726	12,475
1988	187,877	16,744	48,118	9,312	63,296	6,389	12,747	5,835	10,264
1989	192,896	16,995	49,477	9,062	64,959	6,771	14,254	6,012	10,403
1990	210,882	17,820	52,759	25,646	68,022	6,897	16,198	6,412	13,733
1991	234,123	23,569	47,402	29,473	82,104	8,123	17,273	7,792	14,655
1992	171,116	17,029	32,928	41,973	39,704	9,709	4,749	11,502	11,303
1993	148,965	11,195	31,953	35,760	35,184	7,906	5,737	7,317	13,041
1994	156,331	11,875	29,247	29,845	39,648	10,774	10,304	7,866	14,681
1995	151,116	18,536	37,571	21,564	40,755	5,705	5,907	4,208	15,093
1996	150,229	17,106	34,143	22,803	43,460	7,597	5,705	4,479	13,145
1997	158,472	13,542	37,583	25,654	47,007	7,479	6,131	5,085	12,702
1998	162,458	17,750	32,121	30,467	44,497	6,378	5,042	5,586	14,335
1999	180,771	22,471	34,245	28,772	49,970	6,635	14,098	5,828	11,804
2000	209,994	29,371	46,030	26,533	59,562	6,309	15,526	6,541	12,620
2001	225,337	31,746	70,445	17,482	55,490	6,920	12,322	8,164	14,392
Average	189,645	17,112	43,224	20,799	51,998	6,240	9,614	5,741	12,661

* data from ARMM and CARAGA (prior to its creation) are included in Regions X and XI and IX and XII, respectively. Data for 1979-1989 also includes the total production in freshwater fishpen although their regional distributions are not available.

Source: BAS



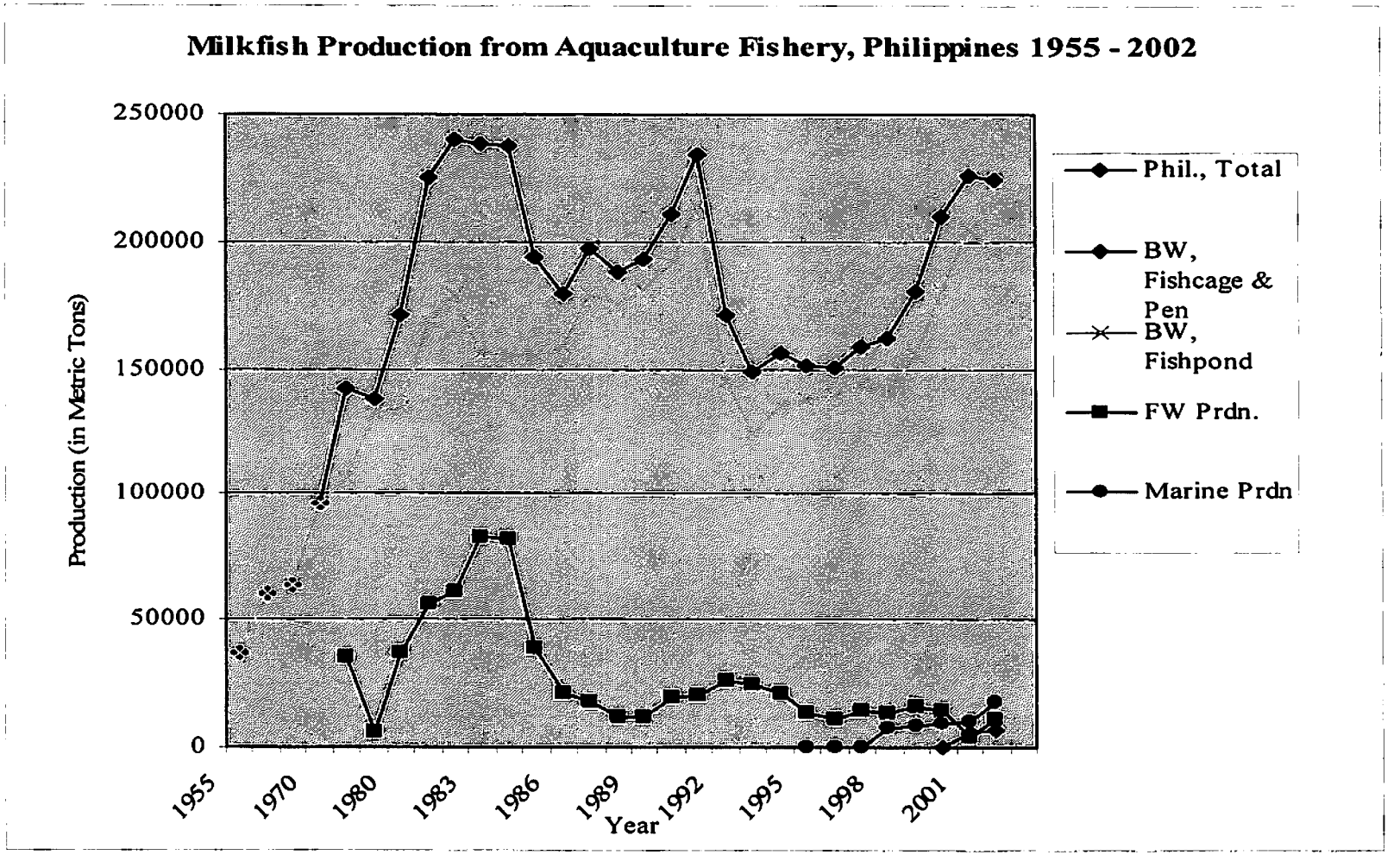
Source: BAS

Figure 2. Milkfish Production from aquaculture fishery, by region, Philippines 1979-2001 (in metric tons)

Table 3. Milkfish Production from aquaculture fishery, Philippines 1955-2002 (in metric tons)

Year	Philippines TOTAL	Brackishwater fishcage & fishpen	Brackishwater fishpond	Freshwater Production	Marine Production
1955	36,734		36,734		
1960	60,119		60,119		
1965	63,198		63,198		
1970	96,461		96,461		
1975	142,000		106,461	35,000	
1979	137,813		132,262	5,551	
1980	171,775		134,591	37,184	
1981	225,026		168,727	56,299	
1982	239,745		178,679	61,066	
1983	238,559		155,995	82,564	
1984	237,675		155,709	81,966	
1985	193,650		155,344	38,306	
1986	179,505		158,621	20,884	
1987	197,527		179,791	17,736	
1988	187,877		175,935	11,942	
1989	192,896		181,197	11,699	
1990	210,882		191,878	19,004	
1991	234,123		213,674	20,449	
1992	171,116		145,554	25,562	
1993	148,965		124,510	24,455	
1994	156,331		135,682	20,649	
1995	151,116		137,796	13,154	166
1996	150,229		139,372	10,779	78
1997	158,472		144,076	14,175	221
1998	162,458		141,131	13,782	7,545
1999	180,771	240	155,593	16,246	8,692
2000	209,994	5,668	180,931	14,523	8,872
2001	225,337	6,732	204,862	3,802	9,941
2002	224,336		195,887	11,137	17,312
Average	189,645	2,107	160,994	12,218	5,074

Source: BAS



Source: BAS

Figure 3. Milkfish Production from aquaculture fishery, Philippines 1955-2002 (in metric tons)

Table 4. Fry Requirement per Region as of January, 2003 (in 10,000 fry)

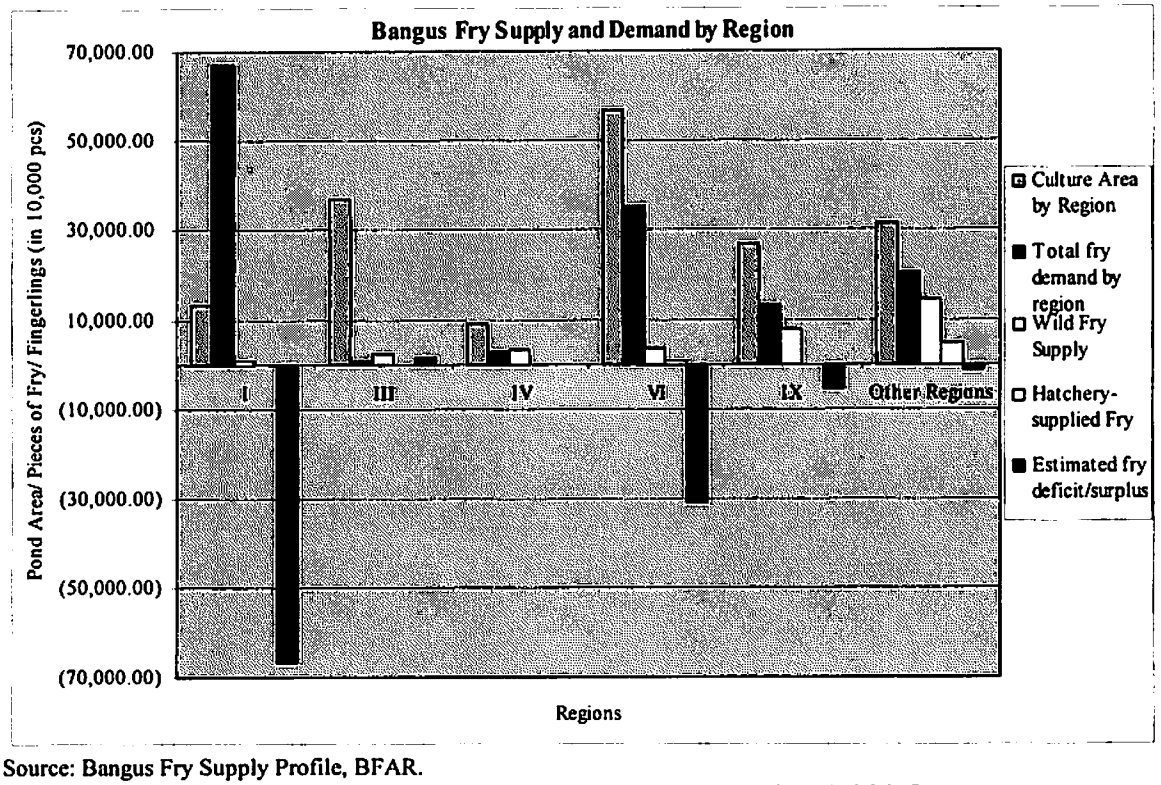
Region	Culture Area by Region (Hectares)	Total fry demand by region	Wild Fry Supply	Hatchery-supplied Fry	Estimated fry deficit/surplus
I	13,362.70	67,240.94	679.97	-	(66,560.97)
III	36,489.00	1,005.41	2,700.00	-	1,694.59
IV	9,113.38*	3,052.79	3,136.00	-	83.21
VI	56,573.66	35,092.92	3,547.16	900.00	(30,645.77)
IX	26,520.07	13,520.44	8,112.27	-	(5,408.18)
Other Regions	31,453.12* ^	20,583.64	14,443.50	5,000.00	(1,140.14)
Grand Total	173,511.93	240,032.09	32,618.89	5,900.00	(201,513.20)

Legend:

* - with cages

^ - with fish pens

Source: Bangus Fry Supply Profile, BFAR.



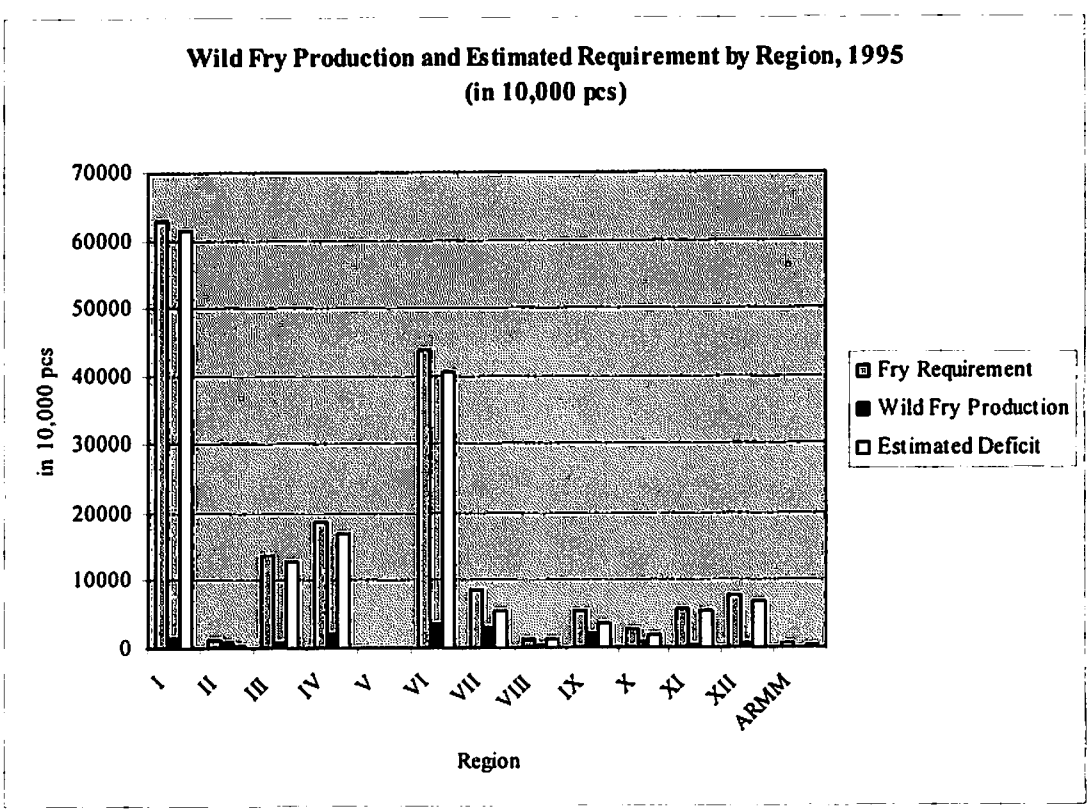
Source: Bangus Fry Supply Profile, BFAR.

Figure 4. Fry Requirement per Region as of January, 2003 (in 10,000 fry)

Table 5. Wild Fry Production and Estimated Requirement by Region, 1995 (in 10,000 pcs)

Region	Wild fry production	Fry Requirement	Estimated Deficit
I	1500	62976	61476
II	900	1247.774	347.7742
III	900	13782.6	12882.6
IV	1977.1	18900	16922.9
V	10	15.303	5.303
VI	3528.8172	43924.68	40395.86
VII	3070.3648	8500	5429.635
VIII	200	1320	1120
IX	2000	5449.527	3449.527
X	900	2700	1800
XI	360	5700	5340
XII	600	7600	7000
ARMM	120	500	380
TOTAL	16,066	172,616	156,550

Source: DA-RFU in Aqua Farm News 1995



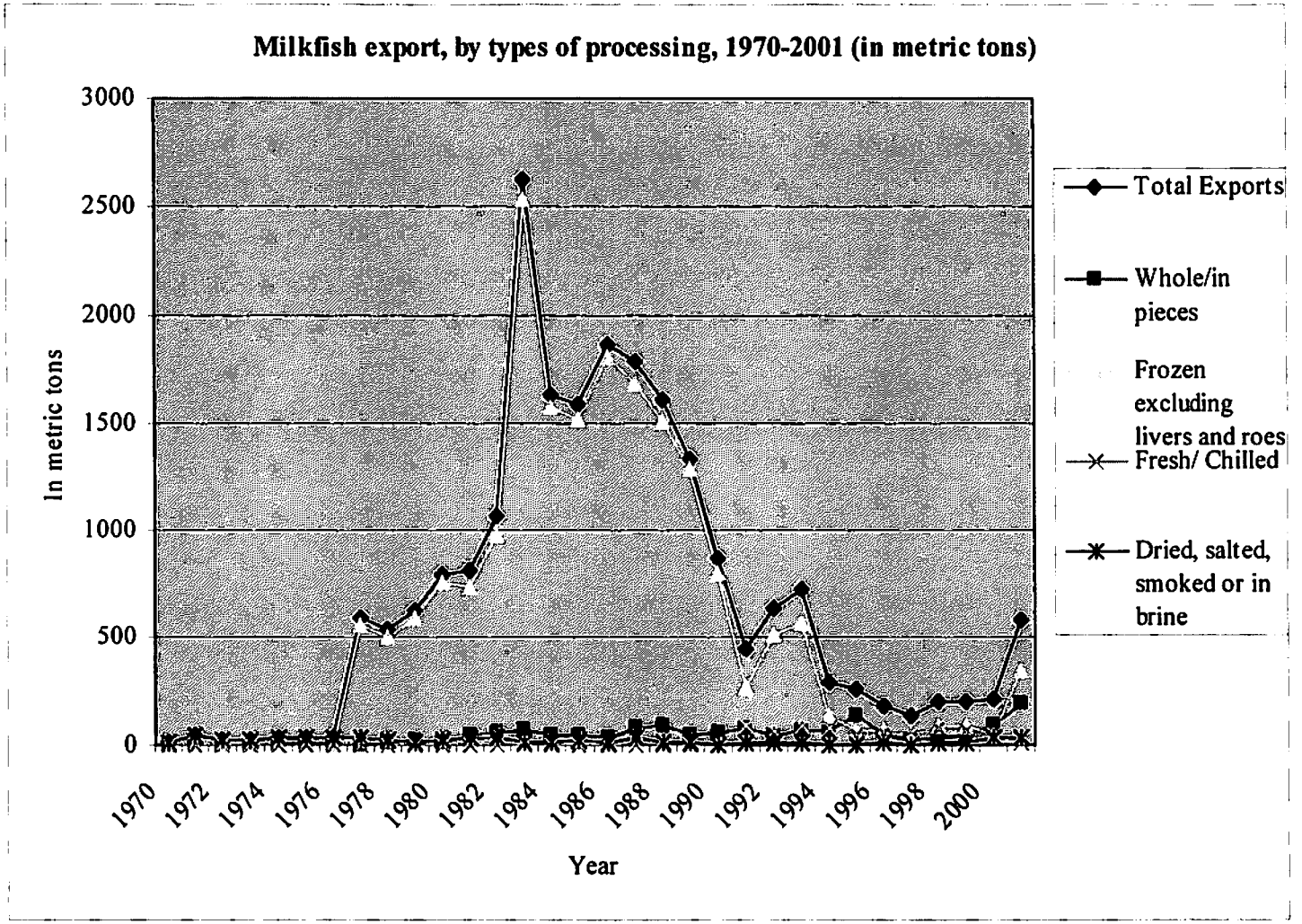
Source: DA-RFU in Aqua Farm News 1995

Figure 5. Wild Fry Production and Estimated Requirement by Region, 1995

Table 6. Milkfish export, by types of processing, 1970-2001 (in metric tons)

Year	Total Exports	Whole/in pieces	Frozen excluding livers and roes	Fresh/ Chilled	Dried, salted, smoked or in brine
1970	11.787	2.818	-	-	8.969
1971	46.852	5.358	-	-	41.494
1972	26.362	2.884	-	-	23.478
1973	23.864	5.139	-	-	18.725
1974	36.557	-	-	-	36.557
1975	38.793	7.302	-	-	31.491
1976	30.908	2.113	-	-	28.795
1977	586.579	1.324	555.547	-	29.708
1978	535.057	10.628	497.502	-	26.927
1979	622.98	20.006	593.513	-	9.461
1980	793.239	12.433	757.684	-	23.122
1981	812.209	43.558	732.905	-	35.746
1982	1071.703	55.327	982.73	-	33.646
1983	2617.974	67.027	2537.027	-	13.92
1984	1630.26	40.633	1575.199	-	14.428
1985	1586.655	46.76	1522.261	-	17.634
1986	1863.899	37.042	1810.284	-	16.573
1987	1794.282	74.121	1689.348	-	30.813
1988	1613.405	90.366	1511.631	-	11.408
1989	1335.925	41.802	1287.362	-	6.761
1990	867.718	59.214	805.177	-	3.327
1991	445.417	75.519	271.925	85.356	12.617
1992	637.462	47.65	516.222	65.409	8.181
1993	716.859	63.311	562.763	84.84	5.945
1994	289.435	68.449	137.249	79.4	4.337
1995	253.04	136.646	65.565	48.142	2.687
1996	172.443	41.979	66.572	55.325	8.567
1997	133.264	22.075	39.173	70.383	1.633
1998	204.551	30.701	86.334	76.102	11.414
1999	203.565	38.924	87.101	61.321	16.219
2000	209.898	87.326	48.126	41.803	32.643
2001	577.142	190.018	345.054	13.182	28.888

Source: Foreign Trade Statistics of the Philippines, National Statistics Office, several years

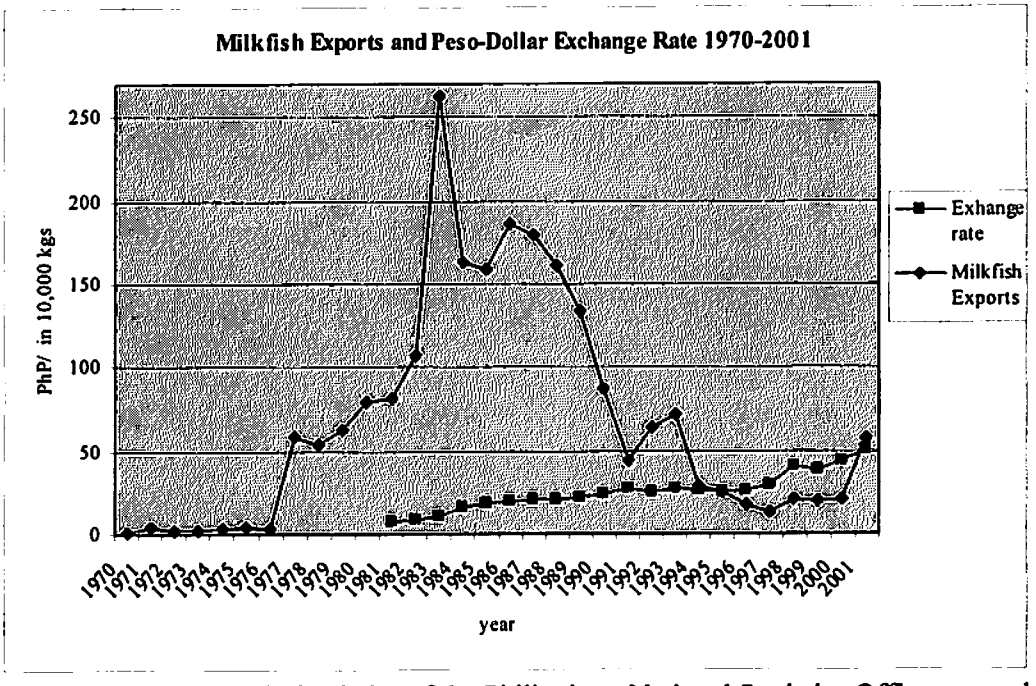


Source: Foreign Trade Statistics of the Philippines, National Statistics Office, several years
Figure 6. Milkfish export, by types of processing, 1970-2001 (in metric tons)

Table 7. Milkfish Exports and Peso-Dollar Exchange Rate 1970-2001

Year	Total Exports (in 10,000 kgs)	PhP – US Dollar Exchange Rate	Year	Total Exports (in 10,000 kgs)	PhP – US Dollar Exchange Rate
1970	1.1787		1986	186.3899	20.3857
1971	4.6852		1987	179.4282	20.5677
1972	2.6362		1988	161.3405	21.0948
1973	2.3864		1989	133.5925	21.7367
1974	3.6557		1990	86.7718	24.3105
1975	3.8793		1991	44.5417	27.4786
1976	3.0908		1992	63.7462	25.5125
1977	58.6579		1993	71.6859	27.1199
1978	53.5057		1994	28.9435	26.4172
1979	62.298		1995	25.304	25.7144
1980	79.3239		1996	17.2443	26.2157
1981	81.2209	7.8996	1997	13.3264	29.4707
1982	107.1703	8.5400	1998	20.4551	40.8931
1983	261.7974	11.1127	1999	20.3565	39.0890
1984	163.026	16.6987	2000	20.9898	44.1938
1985	158.6655	18.6074	2001	57.7142	50.9927

Source: Foreign Trade Statistics of the Philippines, National Statistics Office, several years, BSP Website



Source: Foreign Trade Statistics of the Philippines, National Statistics Office, several years, BSP Website

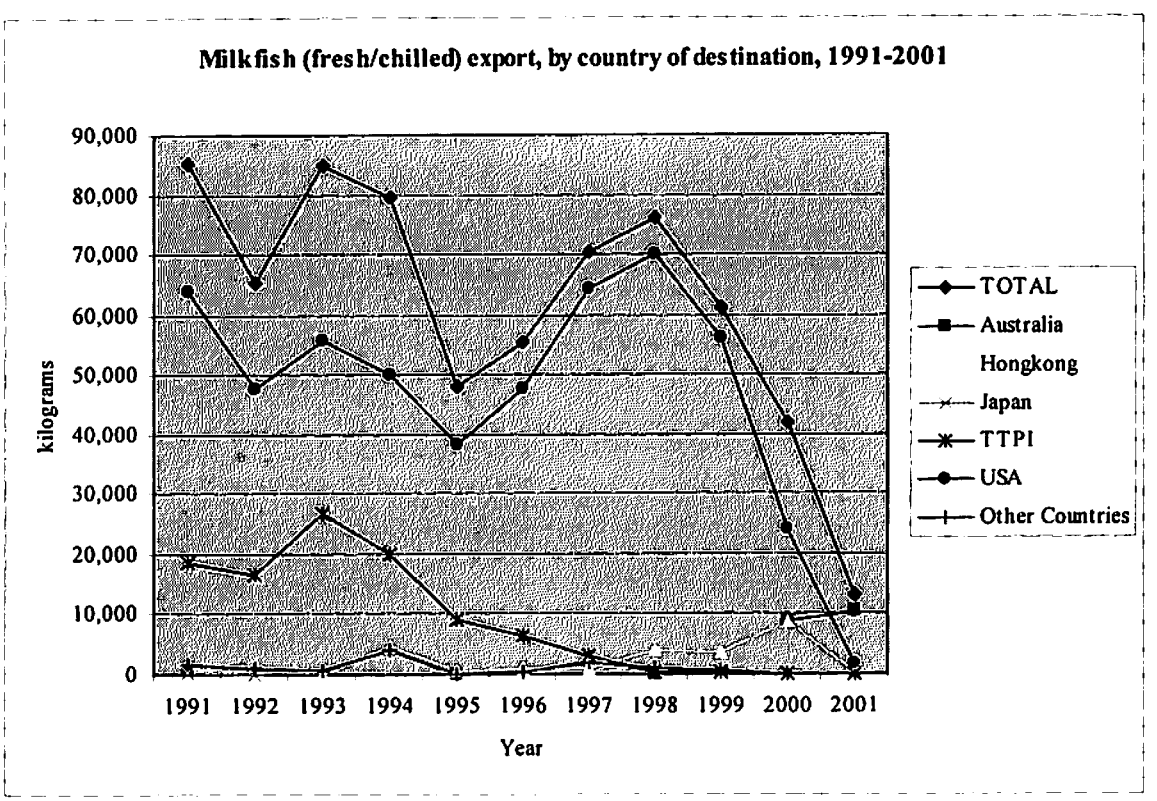
Figure 7. Milkfish Exports and Peso-Dollar Exchange Rate 1970-2001

Table 8. Milkfish (fresh/chilled) export, by country of destination, 1991-2001 (in net kilograms)

Year	TOTAL	Australia	Hongkong	Japan	TTPI	USA	Other Countries*
1991	85,356	700		486	18,676	63,910	1,584
1992	65,409			92	16,626	47,562	1,129
1993	84,840		100	1,474	26,657	55,776	833
1994	79,400		4,800	651	19,804	50,045	4,100
1995	48,142	110	567		9,147	38,282	36
1996	55,325		908		6,540	47,616	261
1997	70,383		1,181		2,958	64,221	2,023
1998	76,102	160	4,200		505	70,129	1,108
1999	61,321		3,790	300	301	56,330	600
2000	41,803	8,958	8,706		55	24,054	30
2001	13,182	10,500	422		75	1,597	88

*includes Bahrain, Brunei, Egypt, Korea, Palau, Singapore, St. Helena, Switzerland,Taiwan, UK

Source: Foreign Trade Statistics of the Philippines, National Statistics Office, several years



Source: Foreign Trade Statistics of the Philippines, National Statistics Office,

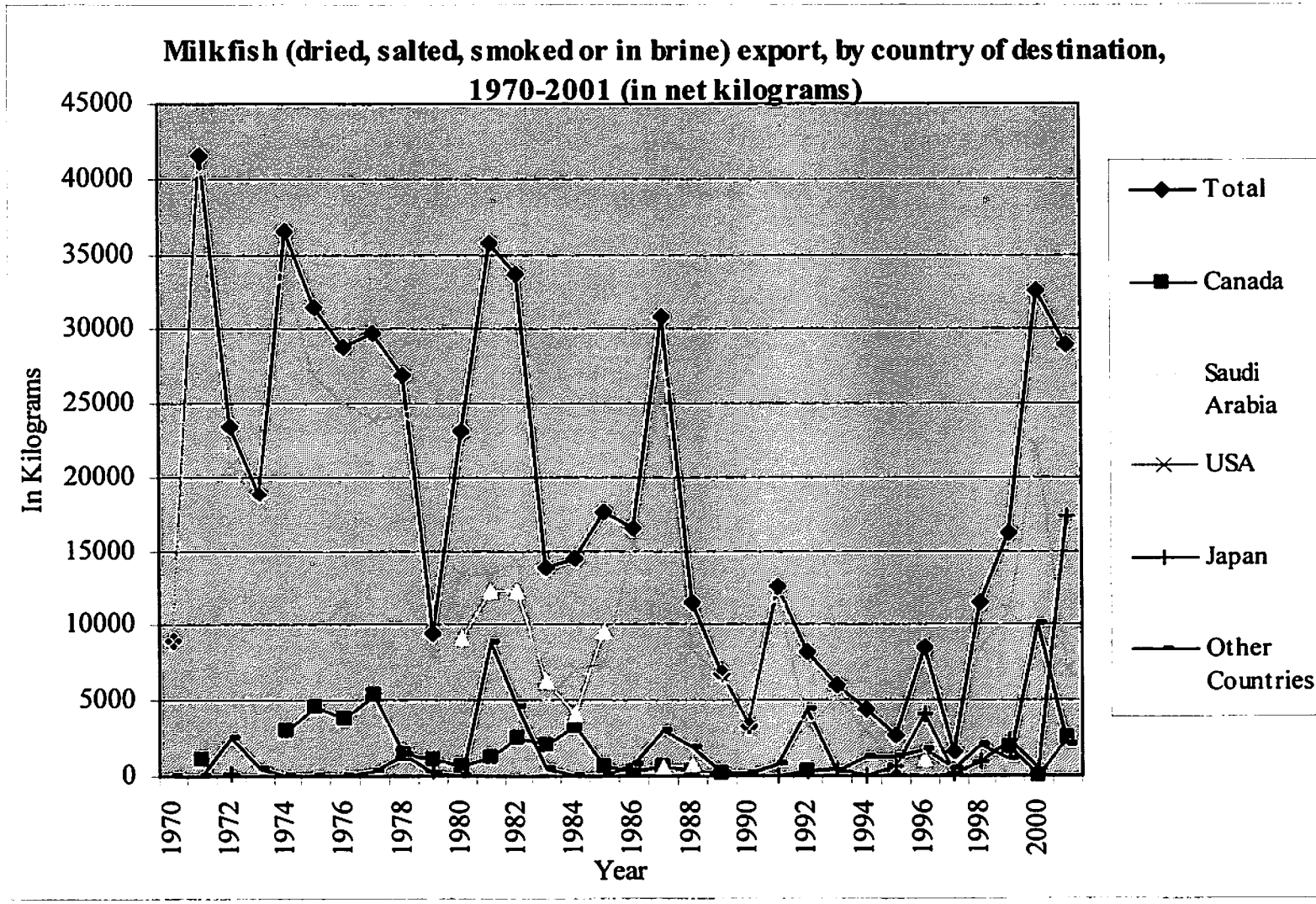
Figure 8. Milkfish (fresh/chilled) export, by country of destination, 1991-2001 (in net kilograms)

Table 9. Milkfish (dried, salted, smoked or in brine) export, by country of destination, 1970-2001 (in net kilograms)

Year	Total	Canada	Japan	Saudi Arabia	USA	Other Countries*
1970	8969				8969	0
1971	41494	1092			40402	0
1972	23478		215		20780	2483
1973	18725				18317	408
1974	36557	2969			33588	0
1975	31491	4543			26930	18
1976	28795	3761			24967	67
1977	29708	5419			23991	298
1978	26927	1340			24223	1364
1979	9461	1125	250		7996	90
1980	23122	656		9048	13418	0
1981	35746	1203		12276	13394	8873
1982	33646	2453		12213	14357	4623
1983	13920	1971		6313	5193	443
1984	14428	3282		4038	7108	0
1985	17634	695		9535	7364	40
1986	16573	379			15471	723
1987	30813	689		680	26491	2953
1988	11408	326		816	8333	1933
1989	6761	157			6387	217
1990	3327				3145	182
1991	12617		54		11833	730
1992	8181	272	287		3247	4375
1993	5945		394		5248	303
1994	4337		27		3053	1257
1995	2687	250	600		603	1234
1996	8567		4148	1134	1577	1708
1997	1633		181		1004	448
1998	11414		998		8444	1972
1999	16219	1854	2307		10931	1127
2000	32643	65	500		21952	10126
2001	28888	2460	17278		7053	2097

*Includes APS, Australia, Bahrain, Belgium, Brunei, Denmark, China, France, Germany, Hongkong, Kuwait, Nauru, Netherlands, New Guinea, New Zealand, Norway, Oman, Palau, Qatar, Sabah, Singapore, Switzerland, TTPI, UAE, and UK & NI

Source: Foreign Trade Statistics of the Philippines, National Statistics Office, several years

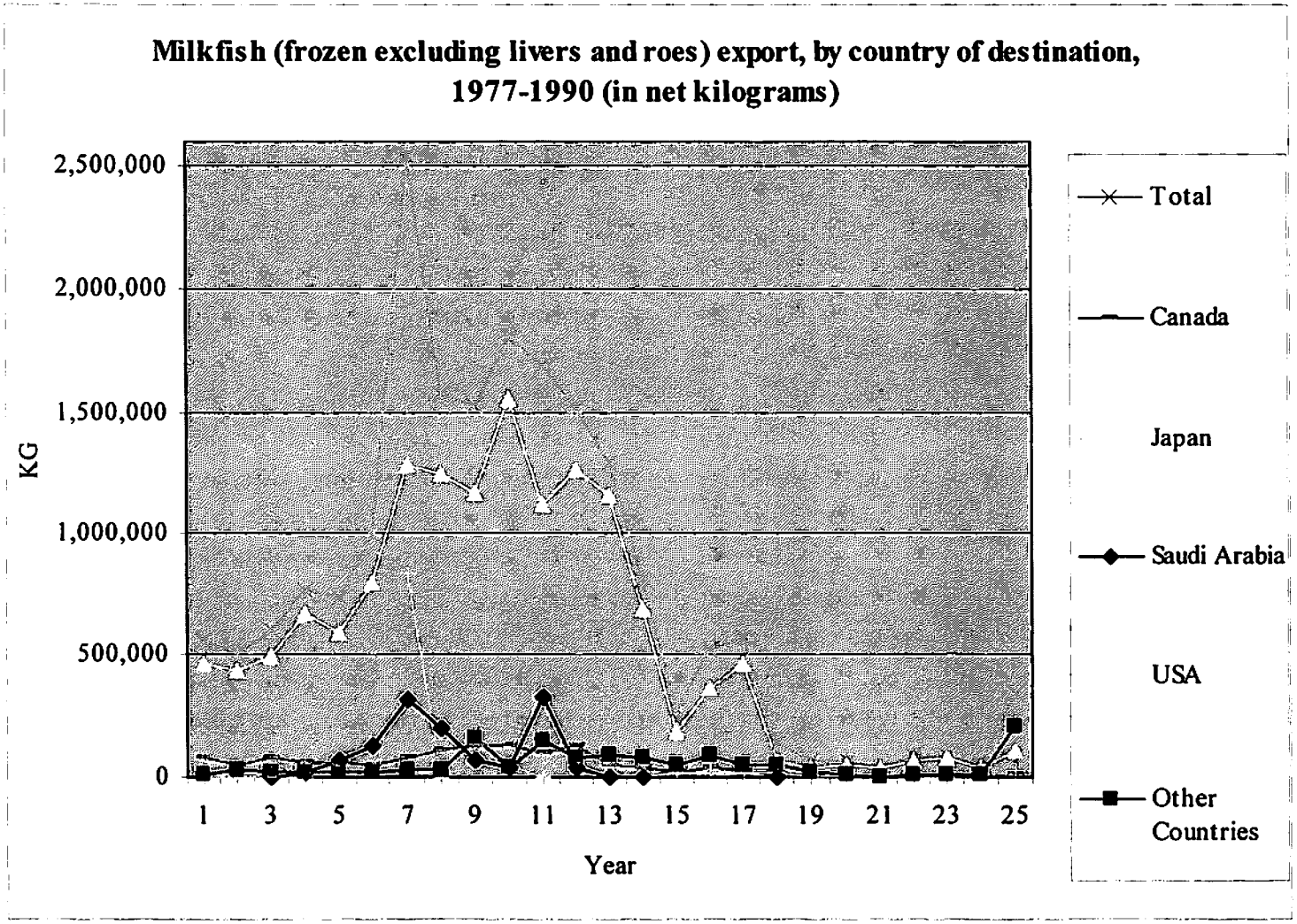


Source: Foreign Trade Statistics of the Philippines, National Statistics Office, several years
Figure 9. Milkfish (dried, salted, smoked or in brine) export, by country of destination, 1970-2001 (in net kilograms)

Table 10. Milkfish (frozen excluding livers and roes) export, by other country of destination, 1977-2001 (in net kilograms)

Year	Total	Canada	Saudi Arabia	USA	Other Countries
1977	555,547	80,740		461,903	12,854
1978	497,502	44,209		425,932	27,241
1979	593,513	80,380	4,000	491,842	16,641
1980	757,684	54,194	20,847	662,999	19,144
1981	732,905	56,945	68,253	584,017	23,690
1982	982,730	52,131	124,479	786,925	19,195
1983	2,537,027	81,080	314,371	1,280,445	34,093
1984	1,575,199	108,829	195,030	1,240,999	27,075
1985	1,522,261	124,645	69,774	1,167,081	160,761
1986	1,810,284	129,385	36,210	1,555,489	39,801
1987	1,689,348	95,389	323,165	1,117,628	149,836
1988	1,511,631	125,523	43,467	1,264,323	78,318
1989	1,287,362	44,947	3,800	1,155,338	83,277
1990	805,177	36,167	2,000	684,848	80,462
1991	271,925	24,239		182,593	44,406
1992	516,222	37,496		366,354	91,347
1993	562,763	30,556		460,552	48,574
1994	137,249	2,885	576	67,071	45,202
1995	65,565	2,213		39,112	20,430
1996	66,572	1,270		49,752	7,536
1997	39,173	1,144		36,903	1,126
1998	86,334	1,270		72,731	11,933
1999	87,101	2,867		73,825	9,079
2000	48,126	1,996		39,502	6,628
2001	345,054	6,484		111,512	202,125

*Includes APS, Australia, Bahrain, Belgium, BPI, Brunei, China, Denmark, Germany, Greece, Hongkong, Iraq, Israel, Japan, Kuwait, Macau, Nauru, Netherlands, New Guinea, New Zealand, Norway, Oman, Palau, Singapore, Switzerland, Taiwan, TTPI, UK, and USSR
Source: Foreign Trade Statistics of the Philippines, National Statistics Office, several years

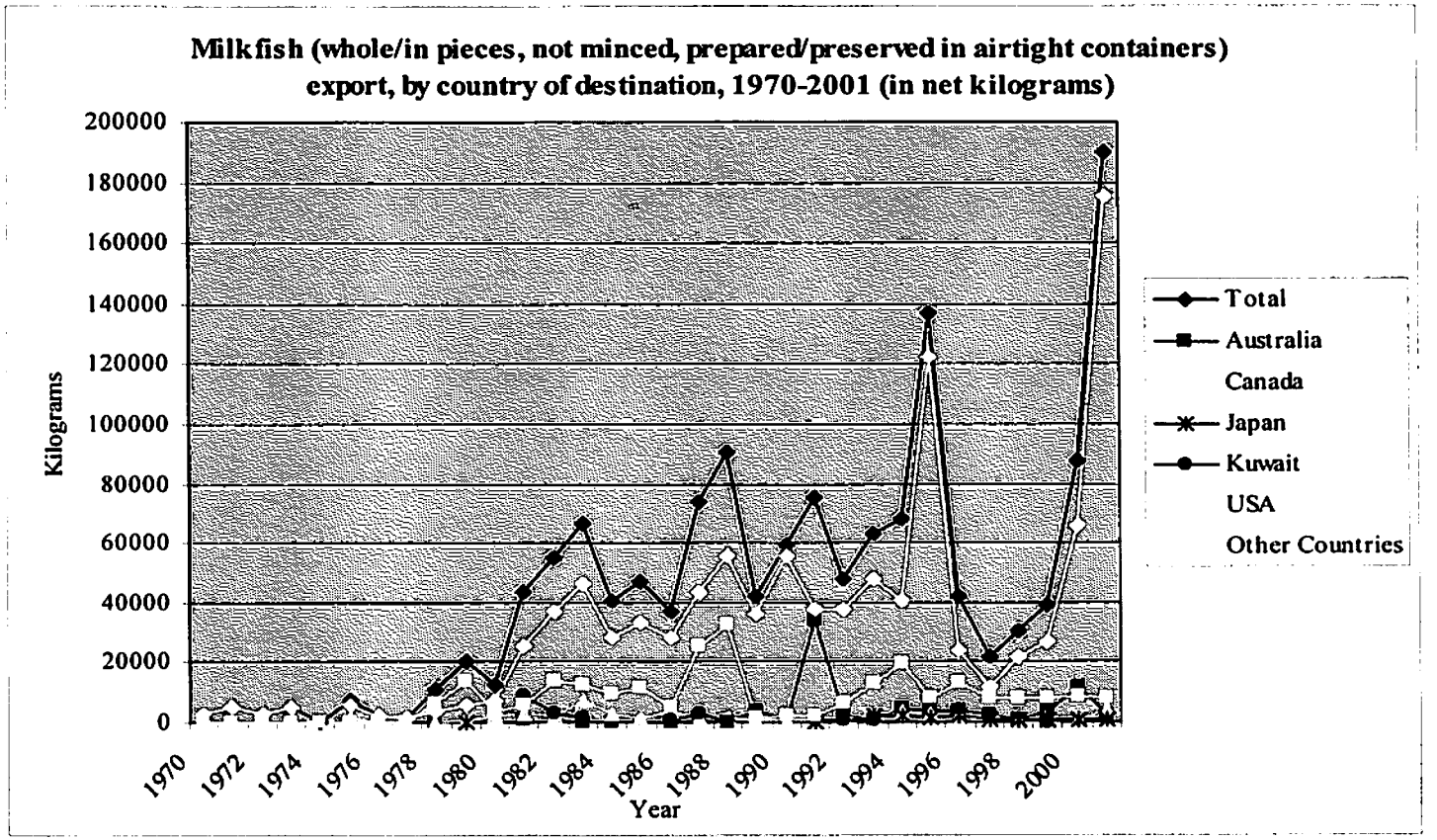


Source: Foreign Trade Statistics of the Philippines, National Statistics Office, several years
Figure 10. Milkfish (frozen excluding livers and roes) export, by country of destination, 1977-2001 (in net kilograms)

Table 11. Milkfish (whole/in pieces, not minced, prepared/preserved in airtight containers) export, by country of destination, 1970-2001 (in net kilograms)

Year	Total	Australia	Canada	Kuwait	USA	Other Countries
1970	2818				2818	0
1971	5358				5358	0
1972	2884				2884	0
1973	5139		123		5016	0
1974	0					0
1975	7302		1172		6130	0
1976	2113		287		1826	0
1977	1324				1324	0
1978	10628	304	36		3968	6320
1979	20006		817		5595	13594
1980	12433		1832		7210	3391
1981	43558	544	3176	8828	25377	5633
1982	55327		1992	2566	37159	13610
1983	67027	38	7001	1685	46161	12142
1984	40633	11	3021		28136	9465
1985	46760		1735		33339	11686
1986	37042	29	3280	864	28080	4789
1987	74121	689	1689	2891	43453	25399
1988	90366	233	1662	240	55835	32396
1989	41802	3549	565		36263	1425
1990	59214	808	634		55435	2337
1991	75519	33884	699	533	38016	2387
1992	47650	2066	181	710	37960	6733
1993	63311	927	680	796	47594	13314
1994	68449	4215	3646		40661	19927
1995	136646	3372	2742		122750	7782
1996	41979	3565	1238		23772	13404
1997	22075	2189			11784	8102
1998	30701	957	253		21572	7919
1999	38924	3728	286	129	27106	7675
2000	87326	11908	747		65811	8860
2001	190018	2398	4020		175595	8005

* Includes APS, Austria, Bahrain, Belgium, Bosnia, BPI, Brunei, China, Czechoslovakia, Denmark, Germany, Greece, Hongkong, Indonesia, Iraq, Israel, Italy, Japan, Jordan, Korea, Lebanon, Macau, Malaysia, Micronesia, Nauru, Netherlands, New Guinea, New Zealand, Norway, Oman, Palau, PNG, Qatar, Saudi Arabia, Singapore, Spain, Sweden, Switzerland, Taiwan, TTPI, UAE, and UK
Source: Foreign Trade Statistics of the Philippines, National Statistics Office, several years



Source: Foreign Trade Statistics of the Philippines, National Statistics Office, several years

Figure 11. Milkfish (whole/in pieces, not minced, prepared/preserved in airtight co ntainers) export, by country of destination, 1970-2001 (in net kilograms)

C. National Policies Related to Milkfish Aquaculture

Name	Date of issue	Title/ particulars
FAO 117	28 Jul 1975	Rules and regulations governing the operation of processing plants for fish and fishery/ aquatic products & prescribing/ requiring standards, quality control & inspection of processed fish & fishery/ aquatic products
FAO 119		Guideline in the imporation of milkfish fry, Chanos Chanos
FAO 125	1979	Rules and regulations governing the conversion of the ordinary fishpond permits & ten (10)- year fishpond lease agreements into twenty-five (25) year fishpond lease agreements & other related matters
FAO 129	16 July 1980	Ban on taking/ catching, selling, possessing, transporting sabalo (full-grown Bangus/ milkfish)
FAO 135	23 Dec 1981	Rules and regulations governing the importation of fish & fishery aquatic products
FAO 173	5 Feb 1991	Banning the exportation of Bangus fingerlings (Hatirin)
FAO 125-1	1991	Amending Sections 5 & 6 of FAO # 125, Series of 1979
FAO 125-2		Amending Sections 5 & 6 of FAO # 125, Series of 1979
FAO 197	23 Feb 2000	Rules and regulations governing the leas of public lands for fishpond development
FAO 214		Code of Practice for aquaculture
FAO 221	2003	Further regulating the importation of live fish & Fishery/ aquatic products under FAO # 135, Series of 1981 to include microorganism & biomolecules
LLDA MC 2004-02	12 Apr 2004	Policy Guidelines for Fishpen Registration in Laguna de Bay
LLDA MC #4	20 Sept 2002	Policy Guidelines for fishcage operation in the Laguna de Bay
SO# 614	2003	Creation of a Bangus Council of the Phil.

C. National Policies Related to Milkfish Aquaculture (continued)

DTI Export advisory	28 Aug 2003	New Food safety Measures required by the U.S. bioterrorism Act of 2002
RA 8550	1998	Fisheries Code of 1998
RA 7160	1991	Local Government Code of 1991
RA 8435		AFMA
PD 704	16 May 1975	Fisheries Decree of 1975
Act 4003 of 1932		Have provisions regarding the granting concessions for the fry gathering grounds (Bagarinao. "Ecology..")
National Bangus Breeding Program (Bagarinao. "Ecology..")		A government program that aims to produce milkfish broodstocks to produce quality hatchery-bred fry for the local farms at low cost.
Milkfish Broodstock Development Program		A government program that privatizes the milkfish broodstocks from the NBBP
PhilBangus Program		A government program that aims to produce quality milkfish eggs for the local hatcheries as well as quality hatchery-bred fry for the local farms at low cost.
Ginintuang Masaganang Ani		Details the present roadmap for the milkfish
IRR for RA 8550	8 May 1998	Implementing rules and regulations of RA 8550
IRR for RA 8435		Implementing rules and regulations of RA 8435

Appendix 3

Appendix 3: Summary of Results (Component 3)
Baseline Survey

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Project duration under review: August 1, 2004 to January 31, 2005

Project Funding:

a. Amount approved for the Year: 1,225,000.00 PHP
b. Amount Released: 1,225,000.00 PHP
c. Balance for the Year: None
d. Actual Expenses: 661,520.93 PHP[5]
e. Unspent Budget: 563,479.07 PHP

Highlights of Activities/Results:

A. Selection of the Pilot and Control Sites

A municipality in La Union and in Western Pangasinan, respectively were selected as project sites for technology interventions of the project, i.e. for milkfish production and post-harvest processing. Similarly, one municipality in each of these provinces were also selected which serve as control sites. This sampling design for the baseline survey will facilitate the impact analysis by employing the "with and without technology intervention" analysis. The baseline survey in these sites was conducted for comparison of their socioeconomic indicators. The criteria used for selection of the communities includes the following: a) the two locations (Pilot and Control) should have similar coast line; b) poor coastal community belonging to 3rd-6th class municipality; c) existence of infrastructure to support technology adoption; d) few intervention from government and private sectors; e) people are receptive to adoption of technologies; and f) good peace and order situation. In consultation with the Office of the Provincial Agriculturist in the above-mentioned provinces, the identified communities in La Union

[5] See attached financial statement

were Aringay (pilot site) and Sto. Tomas (control site) while Dasol (pilot site) and Infanta (control site) were chosen for Western Pangasinan. In choosing the most suitable barangay in these municipalities, the municipal agricultural officer was consulted and the criteria for site selection used were as follows: (a) the barangay which has the most number of smallholder milkfish operators; (b) relatively poor barangay (class C or D); (c) barangay with receptive/cooperative officials and (d) good peace and order in the locality.

B. Establishment of Benchmark Information in the Selected Project Sites

Benchmark or baseline information in the selected sites were obtained through focused group discussions and key informant interviews of barangay officials and fishpond/fish pen operators. Secondary information about the municipality was obtained from the Municipal Agriculturist Office. Additional information was obtained from the respective barangay officials.

C. Conduct of the Baseline Survey

c.1 Sample Selection

A complete list of names of household heads in each of the identified barangays was obtained to serve as sampling frames for the selection of respondents for the baseline survey. These lists were obtained from the barangay office in the selected sites. The respondents for the survey were selected using a random sampling technique

c.2 Formulation and Pre-testing of the Benchmark Survey Questionnaire

The baseline household questionnaire contained relevant indicators pertaining to technical, economic, and social change that will serve as basis for on-going and ex-post evaluations. Thus, a baseline household questionnaire[6] was prepared in this study to gather data on the pre-implementation socio-economic profile of the sample household heads in the sites and their household members (e.g. membership in organizations, household size, educational attainment, sex, age, health status, and income by sources, non-land fix assets; health and sanitation practices of households); farm characteristics (e.g., number of operated parcels, farm size, land tenure, sharing arrangements, soil type, source of water/irrigation, land utilization); crop production costs; yield and annual production of crops; information on livestock raising (e.g., inventory, production, labor utilization); information on capture fishing (duration of lean and peak months, type of fishing gear used, species caught; volume of fish caught); fishpen/fishpond characteristics (e.g., no. of ponds/pens operated, fish pen/fishpon size, tenure status, sharing arrangement, stocking density, quality of water, source of water, number of croppings per year; pond/pen use); fishpen/pond production costs; yield and annual production of fish; methods of product disposal (crops, livestock, fish caught, fish harvested from pens/pond); marketing practices (e.g. mode of sale; market outlets; mode of transport, etc.); constraints of adoption of fish culture; perceptions related to milkfish aquaculture;

[6] see attached survey questionnaire

awareness of policies pertaining to fish aquaculture; information on household consumption, expenditure and indebtedness; and recent changes in rural economy.

The design of the baseline questionnaire was simple so that the form could be easily accomplished within a reasonable time. Most of the questions were pre-coded for ease in the direct transfer of data to any computer medium. The questionnaire was pre-tested in Aringay, La Union before it was finalized and implemented.

c.3 Training of Enumerators

To ensure collection of reliable data, the survey team composed of Research Assistants and field technicians from the NIFDTC with enough background in Fisheries were trained by the WorldFish Center Project Consultant and Research Associate in the use of the baseline questionnaire. The questionnaire was then thoroughly discussed to the enumerators to make sure they will have a common interpretation of the socio-economic and production variables to be gathered. Role-playing activities were conducted to allow the enumerators to get a feel of how to interview respondents and familiarize themselves with the questionnaire.

c.4 Conduct of the Field Survey

Once the survey team was adept in using the questionnaires, the field survey was undertaken in the two pilot sites and two control sites. Another survey will be conducted for the project cooperators (those who will adopt the technology that will be piloted by the project) as soon as they are identified by BFAR.

c.5 Editing of Questionnaires

The questionnaires were edited by the survey team prior to data processing. Each questionnaire was checked for completeness.

c.6 Editing of Questionnaires Date Entry and Validation

Transferring the data intro electronic files have been started and data validation will be undertaken to ensure the quality of the data sets generated prior to statistical analysis.

D. Barangay Profiles of Project Sites

d.1 Barangay Dulao, Aringay and Barangay Raois, Sto. Tomas (La Union)

Item	Dulao, Aringay	Raois, Sto. Tomas
Climate	Distinct wet and dry season Dry season - Nov. to April Wet Season - May to Oct.	Distinct wet and dry season Dry season - Nov. to April Wet Season - May to Oct.
Land Area	3.296 km^2	198.66 has.
Hydrological Resouce	Aringay River	
Major Fishing Ground	Lingayen Gulf	Lingayen Gulf
Total Population	3,302	1,026
No. of Households	578	189
Major sources of livelihood	Municipal fishing, farming, fish trapping	Fishing, oyster farming, fish vending
No. of Fishpen/fishpond operators	81 (most operate fish pens)	approx. 19 fishpond owner-operators and 57 fishpond caretakers (most operate fishponds)
Production of Milkfish	Mostly for grow-out	Mostly for grow-out
Culture method	Semi-intensive and intensive pen culture	
Typical sharing arrangement between fishpond operators and caretakers	70:30 or 75:25	90:10 or 85:15
Fishery Association/Cooperative	Dulao Lagoon Fishpen and Fishpond Operators Association; Dulao Fisherfolk Association; Aringay Aquaculture Producers Multipurpose Cooperative	Raois Fish Vendors Association

d.2 Barangay Malacapas, Dasol and Barangay Nayom, Infanta (Western Pangasinan)

Item	Malacapas, Dasol	Nayom, Infanta
Climate	Distinct wet and dry season Dry season - Nov. to April Wet Season - May to Oct.	Distinct wet and dry season Dry season - Nov. to April Wet Season - May to Oct.
Land Area		278.91 has.
Total land area covered by fishponds	approx. 132 has.	71.71 has.
Hydrological Resouce		Nayom River, Pisasaan River, Kalag creek
Total Population	989	1,447
No. of Households	168	328
Major sources of livelihood	Farming, municipal fishing, fish trapping	Farming, mango production/spraying, fishing
No. of Fishpen/fishpond operators	29	23
FLA holders	6 FLA holders (area for FLA totals to 32.086 ha.)	
Production of Milkfish	Grow-out	Grow-out
Average Cropping	2x/year (There are some who convert their fishponds to saltbeds in the dry season)	
Ave. stocking density	3,000/ha	
Fishery Association/Cooperative	No existing cooperative	
Support Facility for Fishing	Fish Landing Center	
Bangus processors in the barangay	None	None

E. Benchmark Information Gathered from FGDs, KIs and Secondary Data Collection

As mentioned previously the municipality of Dasol is the pilot site in Western Pangasinan, while the control site is Infanta. On the other hand, the pilot site in La Union is the municipality of Aringay while the control site is Sto.Tomas. Aringay and Santo Tomas have a similar coastline which is Lingayen Gulf. Meanwhile, Dasol and Infanta have a similar coastline which is China Sea. Based on established criteria, the Research Team consulted the Municipal Agricultural Officer (MAO) in each of the sites to get their opinion on which specific coastal barangays would be the most suitable location to conduct the baseline survey. Brgy. Dulao was selected in Aringay while Brgy. Raois was

chosen for the town of Sto. Tomas. The barangay chosen in Dasol was Brgy. Malacapas, while it was Brgy. Nayom for Infanta.

Benchmark information through focused group discussions (FGD), key informant interview of barangay officials and secondary data collection from municipal profiles were undertaken in the project sites. Below is a summary of the information obtained.

e.1 Barangay Dulao, Aringay (La Union Pilot Site)

Based on interviews of key officials, it was found that many of the residents in Brgy. Dulao derive their income from municipal fishing (using gill net, see Annex 1), fish pen operation (as operators/financers or as caretakers of fish pen, see Annex 2), fishing trapping (use of fish trap locally called "bukatot", see Appendix 3) and rice farming. Through key informant interviews, it was also revealed that rice is a regular crop grown in the village specifically in the Sitios of Cocoville and Sedras. Non-farm income of the residents commonly comes from labor work as tricycle driver, security guard and construction worker.

There are approximately 81 active fish pen and fishpond operators in Brgy. Dulao. Most of them operate fish pens. Before 1990, a number of the residents were operating fishponds. However, due to subsidence or "ground sinking" as a result of the July 16, 1990 earthquake in Luzon, the fishponds were greatly affected and caused the people to convert their ponds to fish pens. However, others considered this a blessing in disguise since now they are able to stock more fingerlings with the construction of fish pens. Most of the fish pen/ fish pond operators culture fish for grow-out. An estimated 30 people operate a nursery for own fingerlings in the area. The culture methods practiced by fish pen operators are semi-intensive and intensive culture. The common sharing arrangement between milkfish pen financers and caretakers in Brgy. Dulao is 70:30 or 65:35 with 30-35% of the net income (i.e., gross sales of milkfish minus cost of feeds and cost of fingerlings and rent of fish pen, if applicable) going to the caretakers. Many of the fish pen operators interviewed in the FGD asserted that lack of capital was a major problem. They usually obtain feeds via credit from feed suppliers. They pay the suppliers after their harvest with a surcharge of P30 per bag (e.g., cost of feeds is P535/bag, but become P565/bag after harvest). Other problems in fish pen operation raised during the FGD were: a) turbidity of water (degraded water quality in Dulao Lagoon), b) siltation/sedimentation of fish pens due to forest denudation and coastal construction, c) lack of water during dry season, d) heterogenous supply of fingerlings, e) and high cost of feeds. The FGD also revealed that the milkfish producers in Brgy. Dulao sourced their fry/ fingerlings from Indonesia, Taiwan and Saranggani.

There are three existing associations/cooperatives in Dulao, namely: Dulao Lagoon Fishpen and Fishpond Operators Association; Dulao Fisherfolk Association; and Aringay Aquaculture Producers Multipurpose Cooperative, Inc. Some of the residents are thinking of setting up a new cooperative for milkfish processors which they would like to name as Aringay's Best Multi-Purpose Cooperative.

Barangay Dulao has a central fish landing area which is aptly called "consignacion". Consignacion is operated mainly by the Dulao Lagoon Fishpen and Fishpond Operators Association which has more than 100 members consisting of 81 active fishpond/fish pen operators and 40 fish vendors. The produce is mainly sold to the fish vendor member of the association. The average daily volume of fish sold in consignacion is 2 tons. Traders from outside the barangay like San Fernando, Bacnotan and Naguilian are also welcome to buy from the consignacion but only up to 20 kilograms. In consignacion, the fish are sold at a mark-up of one peso per kilogram regardless of size and unit price. This serves as a service fee for fish sorting. Fifty percent of the fee goes to the association's fund while the remaining 50% is used to pay for the 7 hired workers of the association (two people who sort the fish, two people who weigh the fish, one person who lists down the transactions, one treasurer, and one person who loads the fish for transport). Fifty percent of the service fee is equally divided to pay for each of the worker's services.

Bangus processing is not common in Dulao. Only a few residents of Brgy. Dulao are engaged in processing boneless bangus. Production of boneless bangus is by order only.

e.2. Barangay Raois, Santo Tomas (La Union Control Site)

According to the Raois' Barangay Profile, the major sources of livelihood of the residents are fishing, oyster farming and fish vending. According to the barangay captain 45% of the residents are fishermen. Meanwhile, about 30% are fishpond caretakers, 10% are fishpond operator-owners and about 5% are oyster farmers. Based on KIs, it was found that a number of people in the area were now working abroad as a seaman.

Many residents of Raois get their income from operating fishponds (see Annex 4). Milkfish production is commonly operated in fishponds in Brgy. Raois instead of pens. There are approximately 19 fishpond owner-operators and 57 fishpond caretakers in Brgy. Raois. Most of the them culture fish for grow-out. The sharing arrangement between milkfish pond financers and caretakers in the area is lower compared to that in Brgy. Dulao. Commonly, caretakers only get 10-15% of the net income. However, the sharing arrangement from their sale of other fish (not milkfish) and shrimp caught in the milkfish pond is 50:50. Many people in the area also get additional income from oyster farming (using car tires and bamboo as artificial oyster beds). Similar to the FGD conducted in Brgy. Dulao, the fishpond operators emphasized that lack of capital (some of the fishponds are even idle due to lack of capital) is their major problem. Another constraint they raised was poor water quality.

Most of the fishpond operators sell their milkfish to the Raois Fish Vendors Association. The fishpond operators do not incur any transportation cost in selling their fish since the vendors themselves pick-up the milkfish from the fishpond. Currently, the Raois Fish Vendors Association has 14 members.

e.3 Barangay Malacapas , Dasol (Western Pangasinan Pilot Site)

Based on KIs, an estimated 71% of the residents are farmers, 25% are fishermen and 2% are caretakers/owner of fishponds. Rice farming is the primary source of income by many residents (see Annex 5). There is only one cropping season in Malacapas since farmers have no irrigation system. Another primary source of income in the area is fishing. Common gears used are gillnets and pushnets. Skylab and "salambao" are also populat fish traps in the area. The barangay has a fish landing center where local fishermen market their produce (Annex 6).

There are about 29 fishponds operated in the area. The average cropping for milkfish is 2 times per year. However, there are some operators who convert their fishponds to saltbeds in the dry season (see Annex 7). Based on secondary information, the average stocking density in ponds is 3,000/ha. Some of the fishponds in the barangay are covered by the Fishpond Lease Agreement (FLA). The land area in Brgy. Malacapas covered by FLA totals to 32.086 ha or 24% of the total fishpond area. As of 2004, there are 6 FLA holders. Based on KIs, it was found that most of the fishponds operate grow-out culture. So far, there are no bangus processors in the area and no cooperative has been formed in the site. Among the problems raised by the operators during the FGD were: a) lack of capital, b) presence of "kakayat" in fishponds which compete with milkfish for natural algae, and c) shortage of fry.

e.4 Barangay Nayom, Infanta (Western Pangasinan Control Site)

The major income resources in Brgy. Nayom are rice, coconut, bangus fry, tilapia and prawn fry. Many residents in the barangay are engaged in mango production/spraying (see Annex 8). About 92% of the inhabitants own mango trees in their backyard. Rice farming is also a major source of income by many residents (see Annex 9). Farmers only have one cropping season since they have no irrigation system. Approximately 71% of the residents are farmers, 24% are fishermen and 2% fishpond owners/caretakers.

There are 23 fishpond owners in Brgy. Nayom. Based on FGD conducted, the modular system is practiced in the area. Some residents are engaged in wild bangus fry trading. Among the problems raised by the operators were: a) lack of capital and b) shortage of fry.

F. Preliminary Results of the Survey

The survey in La Union was conducted from November 8 to 20 while that of Western Pangasinan was conducted from November 29 to December 8. A total of 376 respondents were interviewed from all the 4 barangays (Table 1) of which 116 respondents were from Dulao and 94 respondents from Raois. On the other hand, 85 respondents were interviewed in Brgy. Malacapas, while 81 respondents were interviewed in Brgy. Nayom.

Table 1 . Number of respondents by location, 2004.

Location	No. of households	% to Total No. of Households	No. of Respondents
La Union			
Dulao, Aringay	578	20	116
Raois, Sto. Tomas	189	50	94
Western Pangasinan			
Malacapas, Dasol	168	50	85
Nayom, Infanta	328	25	81
Total	1263	30	376

Database of the baseline survey has not yet been completed and analysed since the survey was conducted only recently. Data encoding and data entry are on-going. However, data on main occupation of the respondents were processed to look at the sources of income of the respondents.

Also, basic information on fish pen and fishpond operators were processed to obtain preliminary background/profile of their operation. As mentioned earlier, the sampling frame used for the survey was the total household population in the barangay. Respondents were selected using random sampling technique. Of the 116 respondents interviewed in Brgy. Dulao, 15 were fishpen/ fishpond owners or operators (Table 2). On the other hand, 12 fishpen/ fishpond owners or operators were interviewed in Brgy. Sto. Tomas. Among the sample respondents interviewed in Brgy. Nayom, there was no milkfish operator. Meanwhile, only one milkfish operators was interviewed in Brgy. Malacapas. This information surfaced only during data processing. It was found that most of the fishpond owners in these sites were not part of the sampling frame used since they were not residents of the barangay but operate fishpond within the barangay. It was also found that most of the actual residents who owned a fishponds particularly in Brgy. Malacapas were not included in the list of households given by the barangay secretary. The list, unfortunately, missed out some of the residents and therefore was not reliable. Because of this, the profile of the fishpond owners/operators that are discussed below is only for Brgys. Dulao and Raois.

Figure 1. Distribution of primary occupation of household heads by site, 376 sample respondents, 2004.

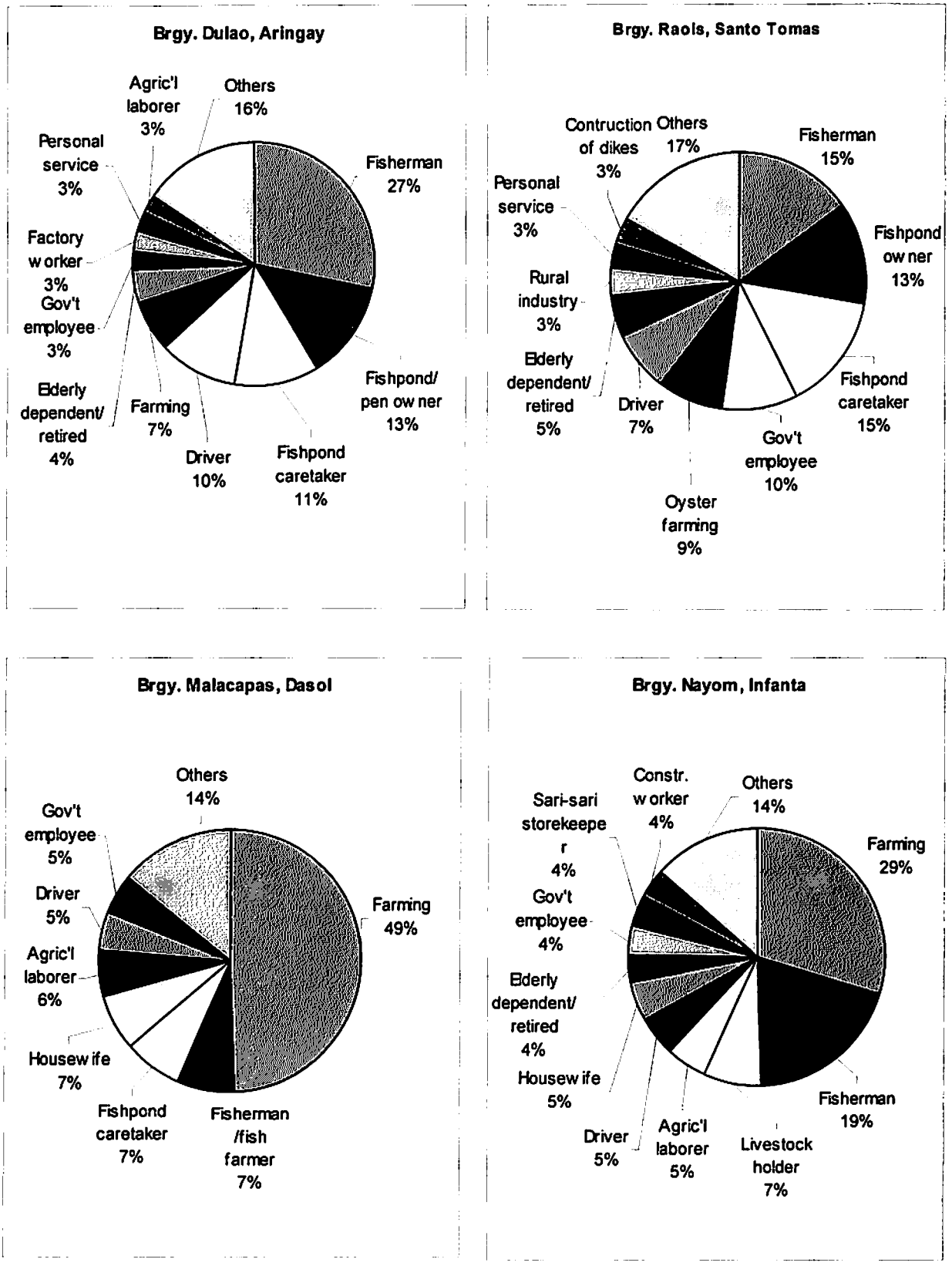


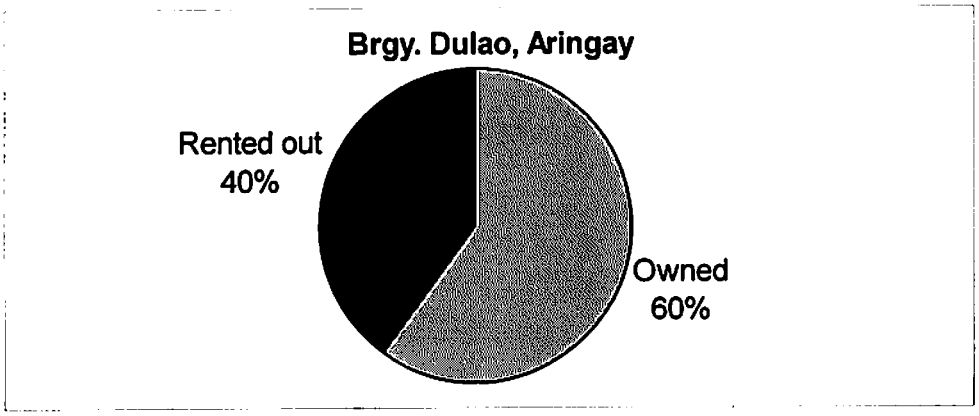
Table 2. Number of fishpen/pond operators interviewed by location, 2004.

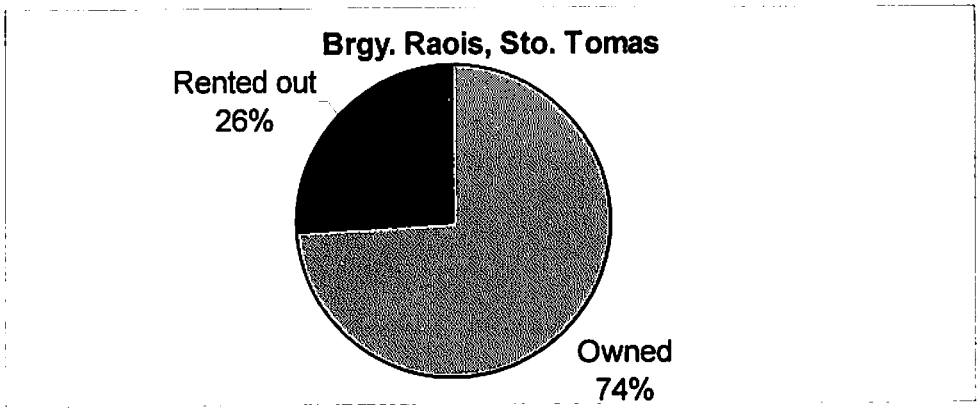
Location	No. of fishpen/pond operators interviewed
Brgy. Dulao, Aringay	15
Brgy., Sto. Tomas	12
Brgy. Malacapas, Dasol	1
Brgy. Nayom, Infanta	0

Milkfish Operation in La Union Pilot and Control Sites (based on survey respondents)

- Based on the survey, majority of the milkfish pens and ponds in Brgys. Dulao and Raois are owned by the operators. This was reported by 60% and 74% of the milkfish farmer respondents in Brgy. Dulao and Raois, respectively. It should be noted that a higher proportion of the pens/ponds in Dulao are just being rented out by the operator (Figure 2).

Figure 2. Tenure status of ponds/pens operated by location, 27 sample respondents, 2004.





- Most of the milkfish producers (80%) interviewed in Aringay were operating **fish pens for grow-out production**. (Table 3)

- Most of the milkfish producers (83.3%) interviewed in Sto. Tomas were operating **fishponds**. About 33.3% of the milkfish producers practiced straight culture wherein the fingerlings are stocked in one pond until harvest. Another 33.3% practiced the modular system. (Table 3)

Table 3. Type of pond/pen operated by location, 27 sample respondents, 2004.

Operation	Aringay		Sto. Tomas	
	No.	%	No.	%
Pond				
Traditional pond system(Grow-out only)	1	6.7	4	33.3
Nursery			2	16.7
Modular system			4	33.3
Pen				
Grow-out only	12	80.0	1	8.3
Both pen and pond				
Nursery pond and grow-out pen	2	13.3		
Grow-out pen and pond			1	8.3
Total	15	100.0	12	100.0

- In Brgy. Dulao, the average stocking per pen of the **fishpen operators** was 11,125 pcs per pen. The average area of the fishpens was 2,295 square meter. The average survival rate was 77%. About 79% are practicing intensive culture method. (Table 4)

- In Brgy. Raois, the **fishpond operators** stocked their pond at an average of 4,083 pcs per pond. The average area of the fishponds was 13,683 square meters. The average stocking density of the ponds was 0.3 pcs per square meter. Average survival rate was 89%. (Table 4)

- In Brgy. Raois, about 55% of the 11 people who operate a fishpond do not use pesticides. The 6 fishpond operators who do use pesticide apply organic pesticide specifically teaseed.

Table 4. Basic information on ponds/pen by location, 2004.

Item	Dulao, Aringay (fishpens)	Raois, Sto. Tomas (fishponds)
Ave. stocking (pcs per pen/pond)	11,125	4,083
Ave. Area (m^2)	2,295	13,683
Ave. stocking density (pcs/m^2)	5	0.3
Survival rate (for grow-out ponds/pen only)	77%	89%

- Most of the fishpen operator-respondents (71.4%) in Brgy. Dulao operate only one fishpen. Likewise, most of the fishpond operator-respondents in Brgy. Raois also operate only one fishpond. (Table 5)

Table 5. Number of pens/ponds operated by site, 2004.

No. of pens/ponds operated	Dulao, Aringay (fishpens)		Raois, Sto. Tomas (fishponds)	
	No.	%	No.	%
1	10	71.4	6	54.5
2	2	14.3	2	18.2
3			2	18.2
4			1	9.1
6	1	7.1		
8	1	7.1		
Total	14	100.0	11	100.0

- Majority of the milkfish farmers (41%) in Brgy. Dulao directly purchase from a private hatchery for fry/fingerling supply. About 29% of the milkfish farmers sourced their fry/fingerling from vendors who sell fry/fingerling collected from rivers/open waters. For the milkfish farmers in Bry. Raois, this type of vendors is their major source of fry/fingerling supply. This was reported by 54% of the milkfish operators in Brgy. Raois. (Figure3).

- The most common problem cited by the respondents in the La Union project sites was lack of capital (25.6% and 29.2% in Brgys. Dulao and Raois, respectively). Extreme turbidity of water and lack of water in the dry season was the second most common constraint faced by milkfish farmers in Brgy. Dulao as reported by 14% of the respondents. In Brgy. Raois, the second most common problem in milkfish production was risk of theft which was mentioned by 16.7% of respondents in the area. (Table 6)

Figure 3. Percentage distribution of source of fry/fingerling supply by location, 27 sample respondents. 2004.

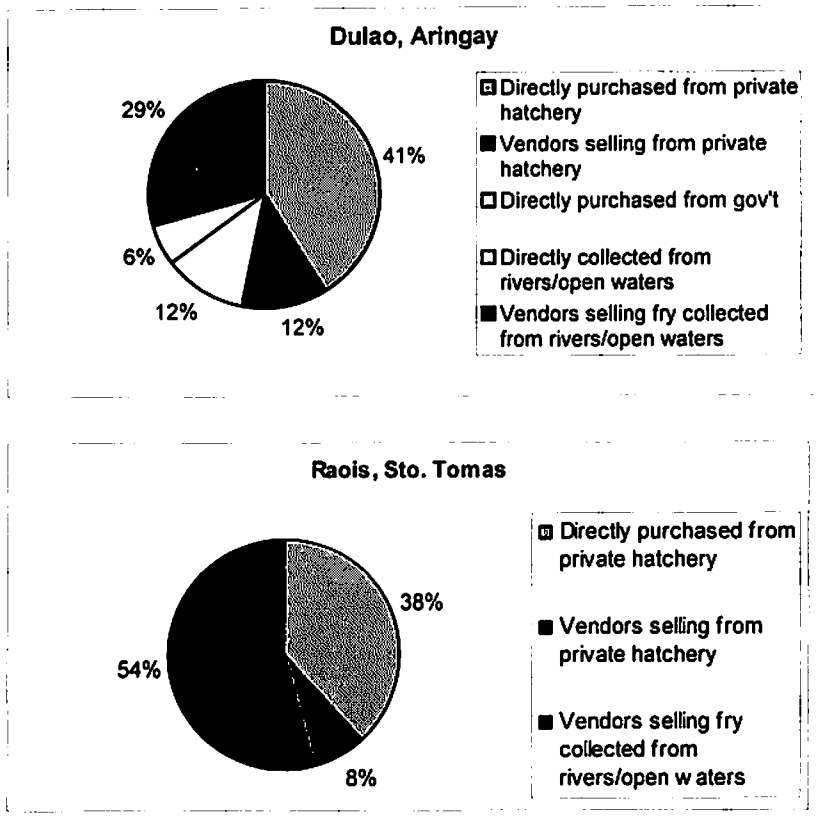
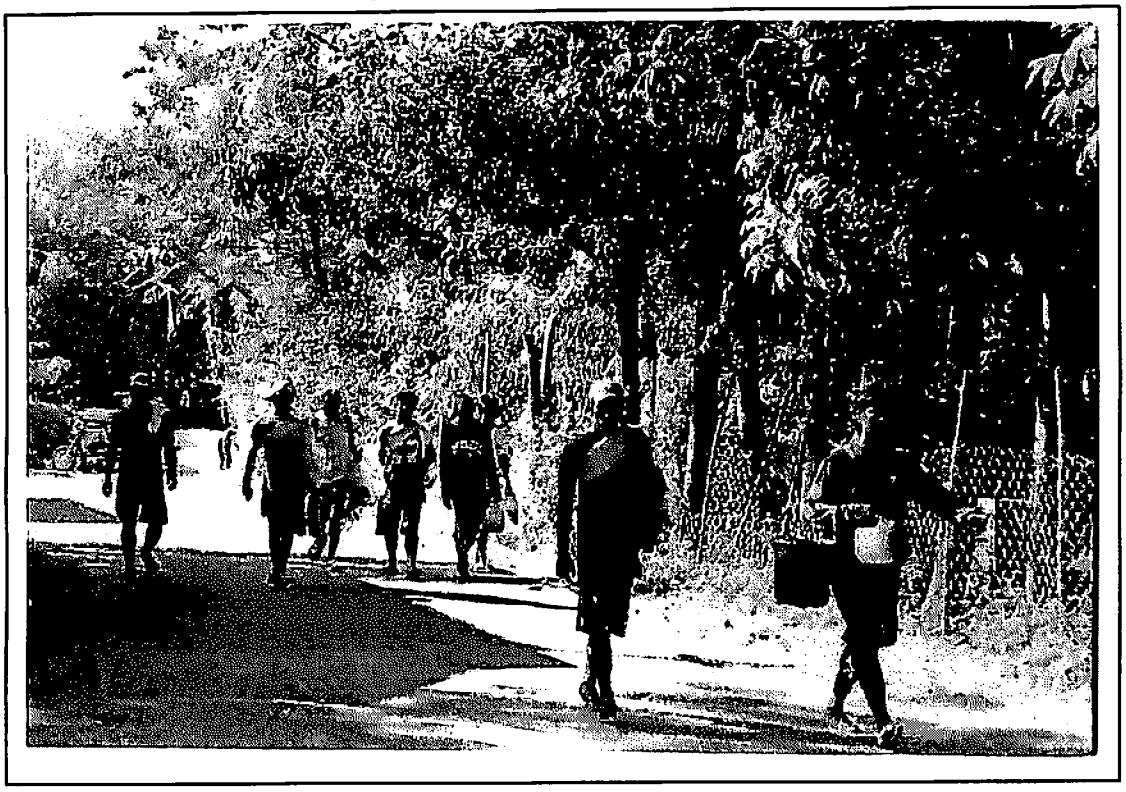


Table 6. Problems encountered in milkfish production, 27 sample respondents, 2004.

PROBLEMS	Dulao, Aringay		Raois, Sto. Tomas		Both sites	
	No. [a]	%	No. [a]	%	No. [a]	%
Lack of capital	11	25.6	7	29.2	18	26.9
Extreme turbidity of water	6	14.0	3	12.5	9	13.4
Lack of water in the dry season	6	14.0	1	4.2	7	10.4
Risk of theft	5	11.6	4	16.7	9	13.4
Inadequate supply of fingerlings	3	7.0	1	4.2	4	6.0
Heterogenous supply of fingerlings	2	4.7	1	4.2	3	4.5
Low dissolved oxygen	2	4.7	0	0.0	2	3.0
Fry eaten by birds	2	4.7	0	0.0	2	3.0
Poor quality of fingerlings	1	2.3	1	4.2	2	3.0
River mouth was closed due to eroded sand	1	2.3	0	0.0	1	1.5
Weak bamboo structures	1	2.3	0	0.0	1	1.5
Lack of technical knowledge	1	2.3	0	0.0	1	1.5
Too much salinity of water	1	2.3	0	0.0	1	1.5
Diseases	1	2.3	2	8.3	3	4.5
Floods	0	0.0	3	12.5	3	4.5
Lack of technical knowledge	0	0.0	1	4.2	1	1.5
Total	43	100.0	24	100.0	67	100.0

[a] More than the total number of respondents due to multiple responses

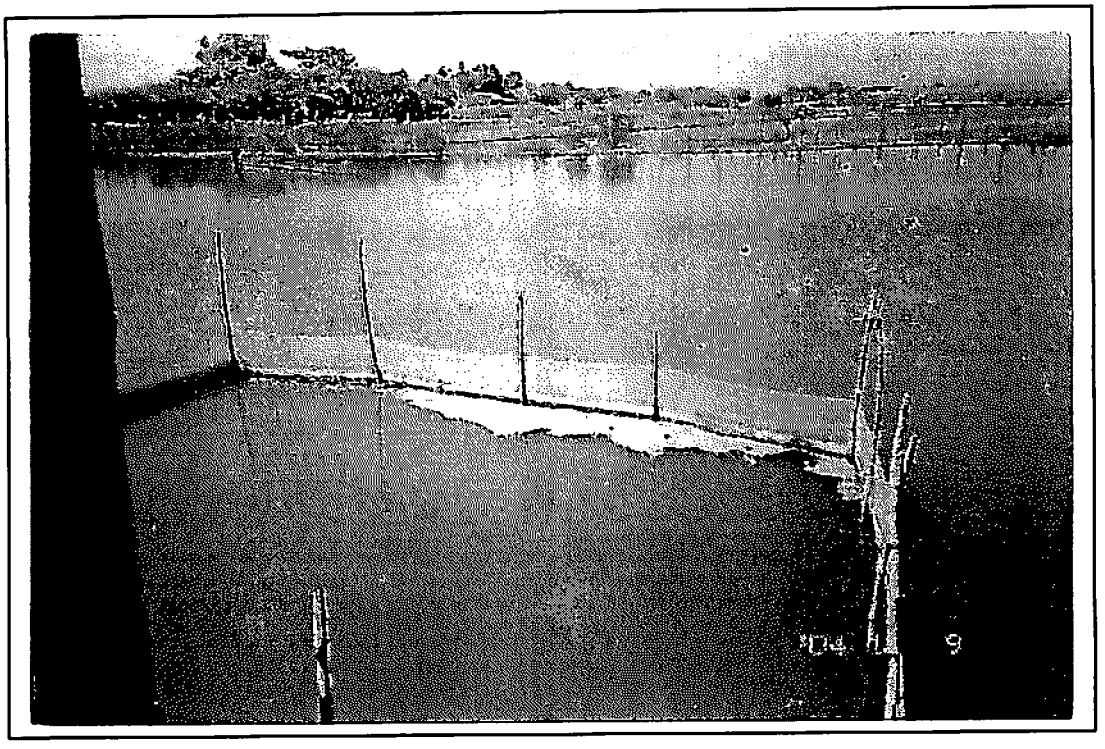
Annex 1. Pictures of municipal fishermen in Brgy. Dulao, Aringay, La Union.



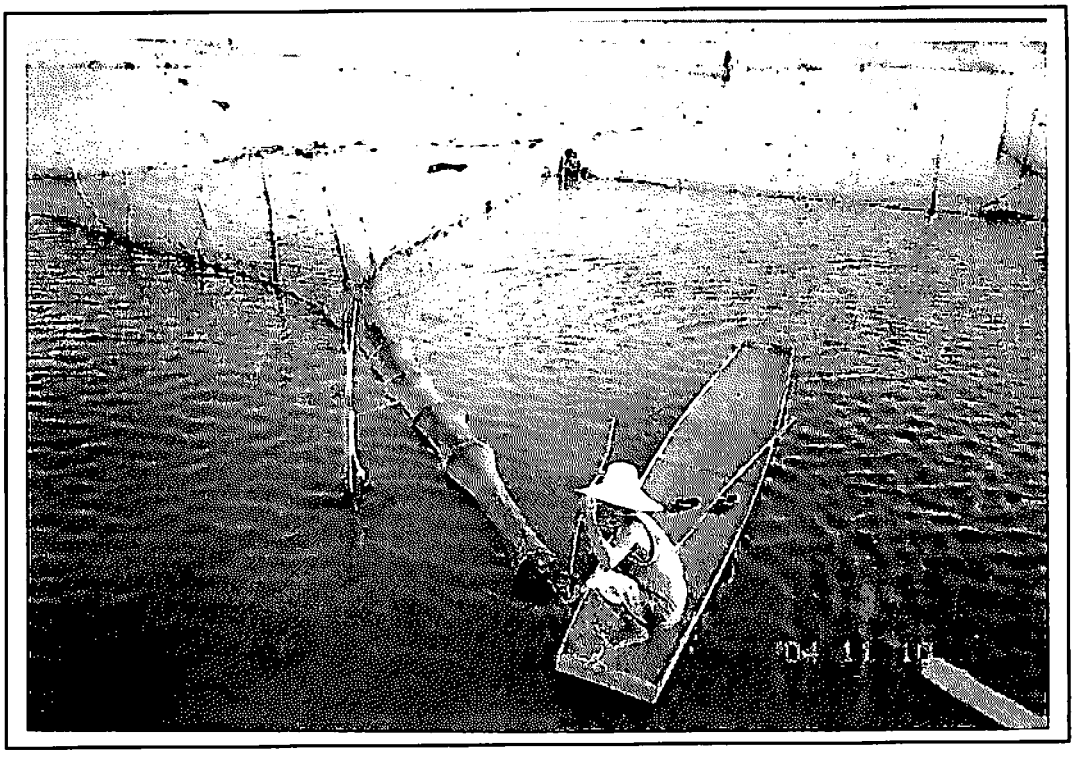
Group of municipal fisherman on their way home from fishing

Municipal fisherman making a gillnet

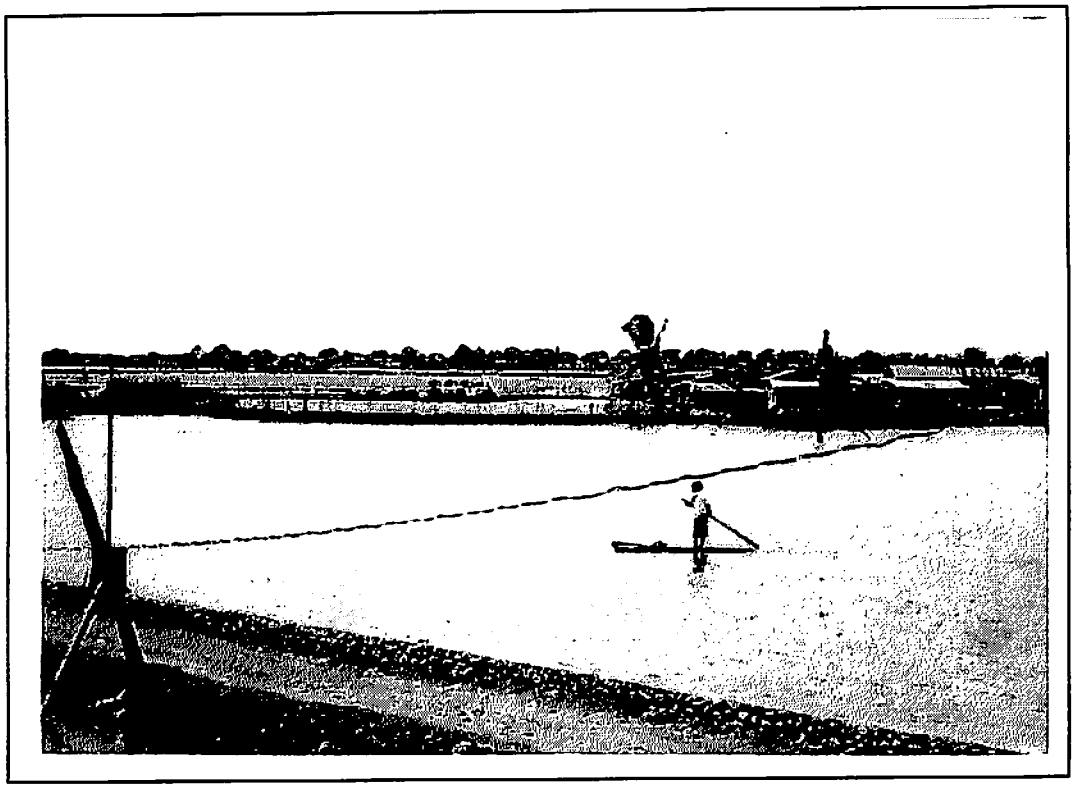
Annex 2. Picture of fishpen in Brgy. Dulao, Aringay, La Union.



Annex 3. Pictures of fish trip ("bukatot") in Brgy. Dulao, Aringay, La Union.

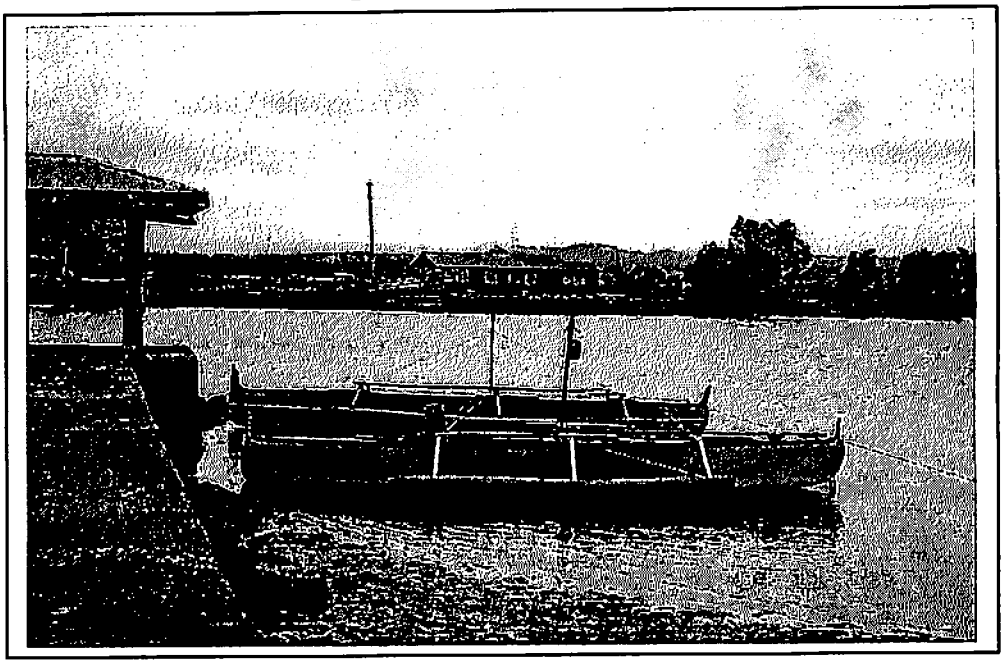


Annex 4. Pictures milkfish ponds in Brgy. Raois, Sto. Tomas, La Union.

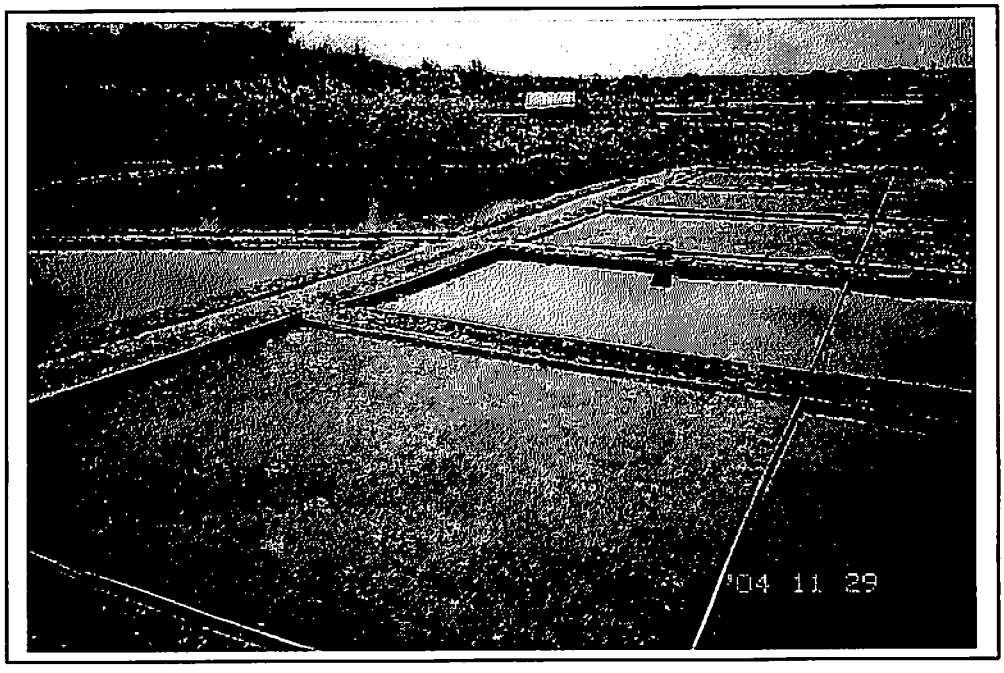


Annex. 5. Picture of rice farm during the dry season in Brgy. Malacapas, Dasol, Western Pangasinan

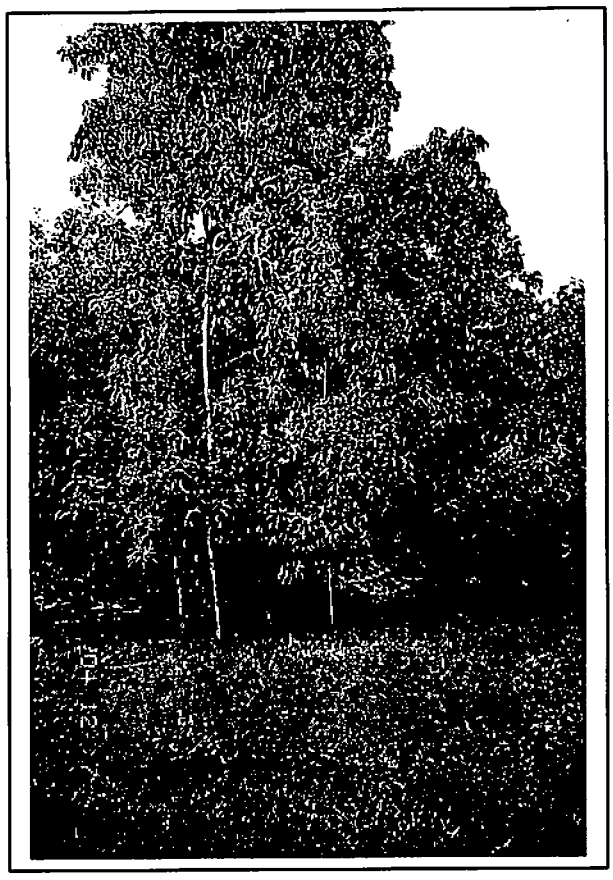
Annex. 6. Picture of fish landing center in Brgy. Malacapas, Dasol, Western Pangasinan.



Annex. 7. Picture of fishpond converted in saltbeds during the dry season in Brgy. Malacapas, Dasol, Western Pangasinan.



Annex. 8. Picture of mango tree which is a good source of income in Brgy. Nayom, Infanta, Western Pangasinan.



Annex 7. Picture of typical rice farm during the dry season in Brgy. Nayom, Infanta, Western Pangasinan.

Appendix 4

Appendix 4: Summary of Results (Component 4)
Pilot Testing and Dissemination of Technology

Study Leader: Mr. Westly R. Rosario
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Project Staff:

1. Ms. Cordelia Nipales, Senior Agriculturist, NIFTDC-BFAR
2. Ms. Jocelyn Jovellanos, Research Assistant, NIFTDC-BFAR
3. Henry Enriquez, Research Assistant, NIFTDC-BFAR

Project duration under review: August 1, 2004 to January 31, 2005

Project Funding:

a. Amount approved for the Year: 1,025,000 PHP
b. Amount Released: 1,025,000 PHP
c. Balance for the Year: None
d. Actual Expenses: 143,500 PHP[3]
e. Unspent Budget: 881,500 PHP

Highlights of Activities/Results:

A. Assisted Worldfish team in conducting site selection for project and control sites.
Selected project sites are:
1. Barangay Dulao, Aringay, La Union and
1. Brgy. Malacapas, Dasol, Pangasinan.

Control sites are:
1. Barangay Raois, Sto. Tomas, La Union and
2. Barangay Nayom, Infanta, Pangasinan

B. Organized core group and training specialists for the project.
Core group Members : Westly Rosario (Chairman), Cordelia Nepales, Jose Gamboa III, Editha Roxas, Regie Regpala,
Training specialist team : Westly Rosario (Chairman), Cordelia Nepales, Jose Gamboa III, Editha Roxas, Regie Regpala, Evelyn Dangla, Robert Bravo, Dennis Mateo.
Staff on Field : Henry Enriquez and Jocelyn Jovellanos

[3] See attached financial statement.

C. Conducted site visits to project sites in Dulao, Aringay, La Union on December 8, 2004 and Malacapas, Dasol, Pangasinan in December 9, 2004 for the identification of possible areas for hatchery and processing facilities and field office. The technical staff of BFAR-NIFTDC were able to identify the following technologies to be disseminated:

Aringay :

a. Fry hatchery production
b. Fry to fingerling production
c. Grow-out culture in fishpens
d. Bangus Processing

Dasol :

a. Fry to fingerling production
b. Grow-out culture in fishpens
c. Bangus Processing

D. Conducted Awareness Seminars in Brgy. Dulao, Aringay, La Union on Jan. 18, 2005 and Brgy. Malacapas, Dasol, Pangasinan on January 20, 2005. The seminar was attended by 34 participants in Aringay and 58 participants in Dasol, Pangasinan. The participants were oriented on the mandates of BFAR and the objectives of the Worldfish project. An overview of the milkfish industry and the different milkfish technologies e.g. hatchery, nursery, grow-out and processing were also discussed. Representatives from Landbank of the Philippines and Quedancor likewise gave a lecture on their financing programs for fishery projects.

E. Highlights of the issues, concerns and observations brought out during the seminar includes the following :

E. 1 Brgy. Dulao, Aringay, La Union

a. Lack of supply of milkfish fry for stocking. Milkfish fry usually comes from the wild or from Alcantara Farm, Sarranggani province or from Indonesia. However, mortality is high due to 1) stress from long distance travel and 2) high number of fry when packed (about 13,000 fry per bag).

b. Heterogeneous size of fingerlings in ponds especially when milkfish fry is sourced from the wild.
c. Farmers believe that wild fry is better than hatchery bred fry. However, Mr. Rosario explained that results of an experiment conducted between wild fry and hatchery bred fry do not have significant difference in growth performance. There was however, a significantly higher survival rate among fry coming from shorter distance sources.
d. Occurrence of fish kills in pens especially during summer months when there is minimal exchange of water in the river.
e. Poor quality of water in fishpen area due to poor water exchange from sea and Dulao lagoon. Dredging was done at the mouth of Dulao lagoon but sands easily build-up due to typhoons.
f. Fishpens are not properly zone and fish traps "bokatot" filled the navigational path of the river.

E.2 Observations in Brgy. Dulao, Aringay, La Union

a. Participants' interest in the project is high because most of them are engaged in milkfish production. There are four active organizations namely; Dulao Lagoon Fishpen/Fishpond Operators Assn., Dulao Fisherfolk Assn (for capture fishing); Aringay Aquaculture Producers Cooperative (grow-out culture); and Aringay's Best Multi-Purpose Cooperative (for Processors).
a. The project is highly supported by Barangay Officials and have agreed to allow BFAR to put-up its field office beside the consignacion bldg.

E.3 Brgy. Malacapas, Dasol, Pangasinan

a. Lack of supply of milkfish fry from the wild.
b. There is notion that wild fry is better than hatchery bred-fry.

E.4 Observations in Brgy. Malacapas, Dasol, Pangasinan

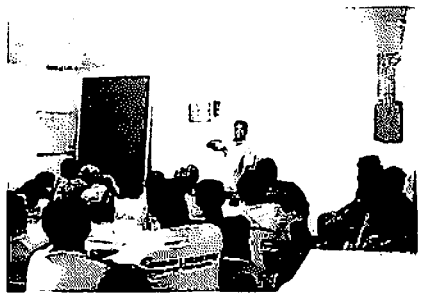
a. The participants were interested in bangus processing since most of them are housewives.

F. Conducted Educational Tour on January 18, 2005 and January 20, 2005 for prospective cooperators from Aringay, La Union and Dasol, Pangasinan respectively.

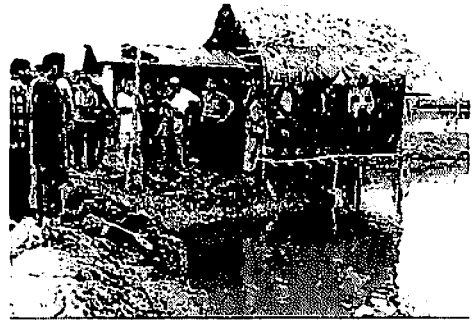
F.1 Participants from Dulao, Aringay, La Union were toured to processing establishments in Anjo's Farm in San Fabian, Pangasinan. They were able to observe Hazard Analysis on Critical Control Point (HACCP) method of producing bangus products from cleaning to packaging and storing. They were presented with milkfish products like deboned tinapa flakes and deboned marinated bangus for export.

F.2 Prospective cooperators from Aringay and Dasol were toured to a small processing establishments of St. John Multi-Purpose Cooperative Incorporated

in Dagupan City. The participants observed how the milkfish products were processed and packed. They were also presented with the different processed bangus products like Bangus lumpia, bangus embotido, boneless bangus, chicharon bangus and others.



Participants were also given an overview of the BFAR-NIFTDC and tour its facilities especially its bangus hatchery facilities. They were also able to visit the fishponds (nursery, grow-out) in Bonuan Binloc, Dagupan City.



G. Conducted the following environmental monitoring of rivers, deepwells and fishponds in the project and control sites.
   1. E. coli analysis (river seawater and deepwell)
   2. Nutrients analysis (NH3, NO4, PO4) for river and seawater
   3. Analysis of DO, pH, salinity, chlorophyll-a, phaeopigment, TDC and suspended solids

Results of analysis for Brgy. Dulao, Aringay,Brgy. Sto. Tomas, La Union and Brgy. Malacapas, Dasol, Pangasinan are found in annexes A and B. Samples collected in Brgy. Nayom is still being analyzed.

H. Prepared the following information technology materials:
   1. Commercial Hatchery Production of Milkfish Fry
   2. Fishpond Management
   3. Principles of Cage Operation and Management
   4. Fish Processing (bottled sardines, smoked bangus)
   5. Bangus Deboning

These information materials will be distributed to the project beneficiaries during trainings.

I. Constructed smoke drum house which can be use during trainings on smoked bangus or "tinapa" making. "Tinapa" making is a processing technology which the project beneficiaries can adopt. Drums will be distributed on-loan to selected core beneficiaries

J. Other Accomplishments

1. Assisted in the conduct of the inception workshop of the project ("Dissemination and Adoption of the Milkfish Aquaculture Technology in the Philippines") which was held in NIFTDC, Bonuan-Binloc, Dagupan City last July 12-13, 2004. The workshop was attended by 34 participants from BFAR, Worldfish, DA-BAR, UPV, PCAMRD, SEAFDEC, LGU officials and representatives from the NGOs and the private sector.

2. Assisted Dr. Yolanda Garcia and Ms. Catherine Aragon, Consultant and Research Associate of the Worldfish Center, respectively in the conduct of baseline survey in the project and control sites (Component 3). Ten enumerators from BFAR-NIFTDC interviewed 376 respondents from the study areas, i.e., 116 in Aringay, 94 in Sto. Tomas, 85 in Dasol and 81 in Infanta.

3. Coordinated with the LGU officials in the four study areas (Aringay and Sto. Tomas in La Union; and Dasol and Infanta in Pangasinan) in relation to the visit of Dr. Rod Subade and team for the gathering information on the policy and socio-economic review (Component 2) aspect of the project. People contacted were Mayors, Municipal Agriculturists, SB Chairmen on Agriculture and Fisheries, and Barangay officials of the concerned project and control sites.

4. Coordinated and assisted the SEAFDEC-AQD team and Mr. Nelson Lopez in their site visits for the techno-screening component of the project (Component 1).

Annex A.1
Fish Health and Microbiology Laboratory Report

Samples	:	River water; Deepwell
Sources	:	Bgry. Dulao, Aringay, La Union
Analysis Performed	:	Total and Fecal Coliform Most Probable Number (MPN)
Date Collected	:	6 January, 2005
Date Analyzed	:	7 January, 2005

RESULTS OF WATER ANALYSIS

Source / Site	Total Coliform (MPN/100 ml H_2O)	Fecal Coliform (MPN/100 ml H_2O)
River water : Alaska Berlin, Aringay, La Union	780	780
River water: Canada, Aringay, La Union	Negative	Negative
River water: Hawaii, Aringay, La Union	Negative	Negative
River water: Dulao Centro, Aringay, La Union	1,300	1,300
River water: Sto. Rosario West, Aringay, La Union	Negative	Negative
Deepwell: Dulao Multi Purpose Coop., Aringay, La Union	Negative	Negative

REMARKS:

Samples of deepwell water is negative for Total and Fecal Coliform and passed the standard value of zero Total and Fecal Coliform MPN for the bacteriological quality for drinking water (Philippine National Standards for Drinking Water, 1993).

All river water samples have a Total Coliform Most Probable Number below the maximum acceptable limit of 5,000 for class C type of water. Fishery Water for the propagation and growth of fish and other aquatic resources- DENR Admin: Order no. 34, Series of 1990 (Subject: Revised Water Usage and classification / Water Quality Criteria Amending Section Nos. 68 and 69, Chapter III of the 1978 NPCC Rules and Regulations).

Annex A.2
Fish Health and Microbiology Laboratory Report

Samples	:	River water; NAWASA
Sources	:	Raois, Sto. Tomas, La Union
Analysis Performed	:	Total and Fecal Coliform Most Probable Number (MPN)
Date Collected	:	12 January, 2005
Date Analyzed	:	13 January, 2005

RESULTS OF WATER ANALYSIS

Sample	Sources / Site	Total Coliform (MPN/100 ml H_2O)	Fecal Coliform (MPN/100 ml H_2O)
NAWASA	Raois Multi Purpose, Sto. Tomas, La Union	23	23
River water #1	Raois, Sto. Tomas, La Union	≥1,100	≥1,100
River water #2	Raois, Sto. Tomas, La Union	≥1,100	≥1,100
River water #3	Raois, Sto. Tomas, La Union	1,100	1,100
River water #4	Raois, Sto. Tomas, La Union	1,100	1,100
River water #5	Raois, Sto. Tomas, La Union	1,100	1,100

REMARKS:

Water sample for drinking contain Total and Fecal Coliform of 23 grams per 100 ml. of water, and did not passed the standard value of zero Total and Fecal Coliform MPN for the bacteriological quality for drinking water (Phil. National Standards for Drinking Water, 1993)

All river water samples have a Total Coliform Most Probable Number below the maximum acceptable limit of 5,000 for class type of water. Fishery Water for the propagation and growth of fish and other aquatic resources - DENR Administrative Order no. 34, Series of 1990 (Subject: Revised Water Usage and classification / Water Quality Criteria Amending Section Nos. 68 and 69, Chapter III of the 1978 NPCC Rules and Regulations).

Annex A.3
Fish Health and Microbiology
Laboratory Report

Samples	:	River water; deepwell
Sources	:	Brgy. Malacapas, Dasol, Pangasinan
Analysis Performed	:	Total and Fecal Coliform Most Probable Number (MPN)
Date Collected	:	19 January, 2005
Date Analyzed	:	20 January, 2005

RESULTS OF WATER ANALYSIS

Sample	Source / Site	Total Coliform (MPN/100 ml H_2O)	Fecal Coliform (MPN/100 ml H_2O)
River water Station # 1	Malacapas, Dasol, Pangasinan	20	20
River water Station # 2	Malacapas, Dasol, Pangasinan	14	14
River water Station # 3	Malacapas, Dasol Pangasinan	7.8	7.8
River water Station # 4	Malacapas, Dasol ,Pangasinan	7.8	7.8
River water Station # 5	Malacapas, Dasol, Pangasinan	negative	negative
Deep well # 1 (near chapel)	Malacapas, Dasol, Pangasinan	negative	negative
Deep well # 2	Malacapas, Dasol, Pangasinan	negative	negative

REMARKS:

Samples of deepwell water is negative for Total and Fecal Coliform and passed the standard value of zero Total and Fecal Coliform MPN for the bacteriological quality for drinking water (Philippine National Standards for Drinking Water, 1993).

All river water samples have a Total Coliform level below the maximum acceptable limit of 5,000 for class C type of water - Fishery Water for the propagation and growth of fish and other aquatic resources - DENR Administrative Order no. 34, Series of 1990 (Subject: Revised Water Usage and Classification / Water Quality Criteria Amending Section Nos. 68 and 69, Chapter III of the 1978 NPCC Rules and Regulations).

Annex A.4
Fish Health and Microbiology Laboratory Report

Samples : River water; deepwell
Sources : Brgy. Nayom, Infanta, Pangasinan
Analysis Performed : Total and Fecal Coliform Most Probable Number (MPN)
Date Collected : 26 January, 2005
Date Analyzed : 27 January, 2005

RESULTS OF WATER ANALYSIS

Sample	Source / Site	Total Coliform (MPN/100 ml H_2O)	Fecal Coliform (MPN/100 ml H_2O)
Deepwell # 1	Barangay Hall, Brgy. Nayom, Infanta, Pangasinan	9.1	9.1
Deepwell # 2	Barangay Hall, Brgy. Nayom, Infanta, Pangasinan	23	23
Deepwell # 3	Barangay Hall, Brgy. Nayom, Infanta, Pangasinan	Negative	Negative
River water # 1	Barangay Hall, Brgy. Nayom, Infanta, Pangasinan	≥1,100	≥1,100
River water # 2	Barangay Hall, Brgy. Nayom, Infanta, Pangasinan	240	240
River water # 3	Barangay Hall, Brgy. Nayom, Infanta, Pangasinan	≥1,100	≥1,100
River water # 4	Barangay Hall, Brgy. Nayom, Infanta, Pangasinan	93	93
River water # 5	Barangay Hall, Brgy. Nayom, Infanta, Pangasinan	≥1,100	≥1,100

REMARKS:

Deepwell water no. 3 passed the standard values of zero Coliform. Deepwell numbers 1 and 2 contain Total and fecal Coliform bacteria and did not passed the standard value of zero Total and Fecal Coliform MPN for the bacteriological quality for drinking water (Philippine National Standards for Drinking Water, 1993).

All river water samples have a Total and Fecal Coliform Most Probable Number below the maximum acceptable limit of 5,000 for Class C type of water; i.e. Fishery water for the propagation and growth of fish and other aquatic resources – DENR Administrative Order no. 34. Series of 1990 (Subject: Revised Water Usage and classification/Water Quality Criteria Amending Section Nos. 68 and 69, Chapter 3 of the 1978 NPCC Rules and Regulations).

Annex B
Soil and Water Quality Monitoring

Sampling Area: Brgy. Sto. Rosario West,
Brgy. Dulao, Brgy. Alaska, Aringay, La Union
Sampling Date: January 6, 2005

Site	Water Parameters										Soil Parameter	
	pH	Salinity (ppt)	Temp. (°C)	DO (ppm)	TSS (mg/L)	TDS (mg/L)	Chlo-a (ug/L)	NH_3 (ppm)	NO_3^- (ppm)	PO_4^{-3} (ppm)	pH	H_2S
S1	7.4	34.4	29.2	5.2	71.47	34.0	79.86	0	0.04	0.45	7.28	.00089
S2	7.5	29.6	29.6	11.2	66.78	29.8	93.37	.01	.030	0.55	7.53	.00112
S3	7.5	22.3	22.3	9.6	45.00	23.1	31.11	.04	.030	0.66	7.67	.00020
S4	8.2	33.0	33.0	14.6	70.38	32.9	80.55	0	.030	0.51	7.14	.00066
S5	7.7	36.0	32.6	10.3	58.6	35.5	4.55	0	.030	0.48	7.44	.00010

Sampling Area: Raois Cove, Sto. Tomas La Union
Sampling Date: January 12, 2005

Site	Water Parameters										Soil Parameter	
	pH	Salinity (ppt)	Temp. (°C)	DO (ppm)	TSS (mg/L)	TDS (mg/L)	Chlo-a (ug/L)	NH_3 (ppm)	NO_3^- (ppm)	PO_4^{-3} (ppm)	pH	H_2S
S1	7.5	33.70	26.5	10.7	11.3	33.4	9.1	0	0.01	0.05	7.33	.00006
S2	7.5	34.60	26.1	9.5	14.9	34.2	7.67	0	0.02	0.05	7.20	.00025
S3	7.5	34.70	26.4	9.6	12.3	34.2	5.53	0	0.01	0.05	7.46	.00002
S4	7.6	35.10	26.2	9.0	16.9	34.6	5.36	0	0.02	0.05	7.57	.00002
S5	7.8	35.40	26.6	9.3	14.9	34.8	2.74	0	0.01	0.04	7.70	0

Sampling Area: Raois Cove, Sto. Tomas La Union
Sampling Date: January 19, 2005

Site	Water Parameters										Soil Parameter	
	pH	Salinity (ppt)	Temp. (°C)	DO (ppm)	TSS (mg/L)	TDS (mg/L)	Chlo-a (ug/L)	NH_3 (ppm)	NO_3^- (ppm)	PO_4^{-3} (ppm)	pH	H_2S
S1	7.4	33.7	26.5	10.7	11.3	33.4	9.21	0	0.01	0.05	7.33	.00006
S2	7.5	34.6	26.1	9.5	14.9	34.2	7.67	0	0.02	0.05	7.20	.00025
S3	7.7	34.7	26.4	9.6	12.3	34.2	5.53	0	0.01	0.05	7.46	.00002
S4	7.6	35.1	26.2	9.0	16.9	34.6	5.36	0	0.02	0.05	7.57	.00002
S5	7.8	35.4	26.6	9.3	14.9	34.8	2.74	0	0.01	0.04	7.70	0

Remarks:

Generally all parameters are within the acceptable level suitable for aquaculture except for phosphate level in all sites of Brgy. Dulao, Aringay, La Union. Phosphate should be less than 4 ppm. High phosphate level could be attributed to high organic input in the area.

Desirable water/soil parameter levels:

pH normal range - 6.5 to 8.5
D.O. - 4 ppm above
NH_3 - Max tolerable level 1.0 ppm
NO_3 - Max tolerable level 1.0 ppm
Total Coliform- Max. tolerable level 5,000 mpn/100 ml H20

Financial Status Report

FINANCIAL STATUS REPORT
For the 2nd SEM, CY 2004-2005

Project Title: Dissemination and Adoption of Milkfish Aquaculture Technology in the Philippines
Project Leader: Dr. Mahfuzzudin Ahmed
Lead Agency: WorldFish Center
Network: BFAR, UP Visayas, SEAFDEC

(As of December 31, 2004)

Expenses	Approved Budget		Allotment Received	Cumulative Expenditures	Expenditures this Semester	Balance to Date	Balance this Semester
	Whole duration of the project	Year under review					
WorldFish Center							
Personnel Cost	2,100,000.00	700,000.00	700,000.00	437,658.15	437,658.15	1,662,341.85	262,341.85
Travel	325,000.00	125,000.00	125,000.00	57,505.80	57,505.80	267,494.20	67,494.20
Operating Expenses	170,000.00	75,000.00	75,000.00	43,601.35	43,601.35	126,398.65	31,398.65
Capital	100,000.00	100,000.00	100,000.00	122,755.62	122,755.62	(22,755.62)	(22,755.62)
Workshops	450,000.00	150,000.00	150,000.00	-	-	450,000.00	150,000.00
Report Writing and Publication	300,000.00	75,000.00	75,000.00	-	-	300,000.00	75,000.00
Subtotal	3,445,000.00	1,225,000.00	1,225,000.00	661,520.93	661,520.93	2,783,479.07	563,479.07
BFAR	2,550,000.00	1,025,000.00	1,025,000.00	1,024,999.47	1,024,999.47	1,525,000.53	0.53
BAR	275,000.00	100,000.00	100,000.00	-	-	275,000.00	100,000.00
UPV	350,000.00	350,000.00	350,000.00	299,999.79	299,999.79	50,000.21	50,000.21
SEAFDEC-AQD	350,000.00	350,000.00	350,000.00	299,999.79	299,999.79	50,000.21	50,000.21
Admin Expenses	1,045,500.00	457,500.00	457,500.00	342,810.46	342,810.46	702,689.54	114,689.54
Grand Total	8,015,500.00	3,507,500.00	3,507,500.00	2,629,330.44	2,629,330.44	5,386,169.56	878,169.56

Financial Report for BFAR-NIFTDC Funds

Project Title : Dissemination and Adoption of the Milkfish Aquaculture Technology in the Philippines
Study Leader: Westly R. Rosario
Agency : BFAR-NIFTDC
Network : BFAR, WorldFish Center, UP Visayas, SEAFDEC
(As of December 31, 2004)

Expenses	Approved Budget		Allotment Received	Cumulative Expenditures	Expenditures this Semester	Balance to Date	Balance this Semester
	Whole duration of the project	Year under review					
BFAR							
Personnel Cost	300,000.00	100,000.00	100,000.00	0.00	0.00	100,000.00	100,000.00
Travel	290,000.00	100,000.00	100,000.00	0.00	0.00	100,000.00	100,000.00
Operating Expenses	235,000.00	100,000.00	100,000.00	0.00	0.00	100,000.00	100,000.00
(supplies, materials,	500,000.00	90,000.00	90,000.00	0.00	0.00	90,000.00	90,000.00
		100,000.00	100,000.00	0.00	0.00	100,000.00	100,000.00
communications, etc.)	500,000.00	100,000.00	99,546.30	85,210.65	85,210.65	14,789.35	14,789.35
Training, demonstration	725,000.00	435,000.00	435,000.00	0.00	0.00	435,000.00	435,000.00
and technology transfer.			460.73			460.73	460.73
Field survey and data collection.	2,550,000.00	1,025,00.00	1,025,000.70	85,210.65	85,210.65	940,250.08	940,250.08
Capital outlays							
Additional money from the bank							
Grand Total							

Expenses	Problem/s Encountered	Action/s Taken	Remark/s Recommendations
BFAR			
Personnel Cost Travel Operating Expenses (supplies, materials, communications, etc.) Training, demonstration and technology transfer. Field survey and data collection. Capital outlays Grand Total	• Delay of funds because of some minor changes in MOA • Lack of vehicle during the conduct of field visit survey, visits, etc. for both project sites.	• Requested that the budget will be through DA-BFAR for proper accounting and auditing • Followed-up changes in MOA. • Available NIFTDC vehicle were used and also private vehicles were hired during the survey. • Forwarded necessary documents to DA-BFAR for the conduct of bidding and purchase of delica van.	• The changes were approved and funds were transferred to LBP (Trust Fund for Worldfish) last Nov. 25, 2004. • Invitation to bid is yet to be approved. Constant follw-up is being done.

PREPARED BY:

FLORENCE B. CEREZO
Technical Assistant

March 21, 2005
Date

NOTED BY:

WESTLY R. ROSARIO
BFAR-NIFTDC Chief/ Project Manager

March 21, 2005
Date

Questionnaire

DISSEMINATION AND ADOPTION OF THE MILKFISH AQUACULTURE TECHNOLOGY IN THE PHILIPPINES

WorldFish Center-Philippines and
Bureau of Fisheries-National Integrated Fisheries Development and 3 Centers

Baseline Survey on the Socio-Economic and Environmental Conditions of Rural Households in Pangasinan and La Union, Philippines, 2004

Barangay _____Municipality_____ Province: _____ _____

Name of the household head _____ Sitio: _____ _____

Name of the respondent _____Relationship with household head_____
(If the respondent is not the household head)

Name of the interviewer _____ Date of interview _____

Time started interview _____ Time ended interview _____

Date of editing the questionnaire _____

1. Household composition (include members living permanently in the household and taking food from the same kitchen)

Name	Relation with head	Sex	Age	Marital status	Health status	Educational Level (completed years of schooling)		Occupation					
						Level of education	No. of years of schooling	Main occupation	Part time/ full time	2nd Occupation	Part time/ full time	3rd Occupa ton	Part time/ full time
1.													
2.													
3.													
4.													
5.													
6.													
7.													
8.													
9.													
10.													
11.													
12.													
13.													
14.													

Codes:

Relation with head
1 = Self (the farmer/fisher)
2 = Wife
3 = Son/daughter
4 = Parent
5 = Sibling (brother/sister)
6 = Daughter/son-in-law
7 = Grandchildren
8 = Niece/nephew
9 = Aunt/uncle
10= farmhelp, housemaid

Sex
1 = Male
2 = Female

Marital Status
1 = Married
2 = Widower/Widow
3 = Single
4 = Separated

Health status
1= Disabled
2 = Chronically ill
3 = Healthy

Level of education
0 = no formal educ'n
1 = elementary
2 = high school
3 = college
4 = postgraduate

Occupation
1 = Owner cultivator/farmer
2 = Tenant/Leaseholder
3 = Agricultural laborer
4 = Livestock holder
5 = Fisherman/fishfarmer
6 = Fish processor
7 = Rural industry (weaver, carpenter, mat maker, food processor, blacksmith, etc.)
8 = Repair shop, mechanic
9 = Driver (jeepney, tricycle etc)
10 = Trader/middleman
11 = Shopkeeper/vendor
12 = Sari-sari storekeeper
13 = Construction worker
14 = Personal service (barber, security guard, etc.)
15 = Government employee/Public teacher
16 = Religious leader
17 = Industrial labor/factory worker
18 = Professional (doctor, nurse, lawyer)
9 = Tailor/dressmaker
20 = Student
21 = Housewife
22 = Elderly dependent/retired
23 = Minor (not going to school)
24 = Others (specify) _____

Job tenure
1 – Full time
2 – Part time

2. Income from farm/non-farm economic activities

Activities	Husband				Wife			
	Ave. No. of months employed in a year	Ave. No. days employed in a month	Ave. no of hours each day	Income (pesos per day/month)	Ave. No. of months employed in a year	Ave. No. days employed in a month	Ave. no of hours each day	Income (pesos per day/month)
1. Agricultural labor								
2. Industrial labor								
3. Collection of wood/fuel								
4. Construction worker								
5. Vendor								
6. Trader								
7. Shopkeeper								
8. Personal services (barber, watchman, etc.								
9. Salaried service (government or private, etc.)								
10. Middleman								
11. Driver								
12. Others (specify)								

If in kind, specify and compute for the value in pesos.

Activities	Other household member 1				Other household member 2			
	Ave. No. of months employed in a year	Ave. No. days employed in a month	Ave. no of hours each day	Income (pesos per day/month)	Ave. No. of months employed in a year	Ave. No. days employed in a month	Ave. no of hours each day	Income (pesos per day/month)
1. Agricultural labor								
2. Industrial labor								
3. Collection of wood/fuel								
4. Construction worker								
5. Vendor								
6. Trader								
7. Shopkeeper								
8. Personal services (barber, watchman, etc.								
9. Salaried service (government or private, etc.)								
10. Middleman								
11. Ddriver								
12. Others (specify)								

If in kind, specify and compute for the value in pesos.

Remittances from family members working out of town or out of the country

Activities	Other household member 3				Other household member 4			
	Ave. No. of months employed in a year	Ave. No. days employed in a month	Ave. no of hours each day	Income (pesos per day/month)	Ave. No. of months employed in a year	Ave. No. days employed in a month	Ave. no of hours each day	Income (pesos per day/month)
1. Agricultural labor								
2. Industrial labor								
3. Collection of wood/fuel								
4. Construction worker								
5. Vendor								
6. Trader								
7. Shopkeeper								
8. Personal services (barber, watchman, etc.								
9. Salaried service (government or private, etc.)								
10. Middleman								
11. Ddriver								
12. Others (specify)								

If in kind, specify and compute for the value in pesos.

Other Non-Farm Incomes

1. Rental incomes (lease/share)

Type of property	Amount/year (pesos)	In-kind/year
Land (lease and share crop)		
Rental income from transport vehicle		
Rental income from farm equipment		
Rental income from establishments		
Other rental incomes		
Interest income from savings or investments		
Other sources of non-farm Incomes		

3. Non-land fixed assets

a. Housing: land area under homestead _____square meter b. Value of homestead land if sold now_____pesos

Type of house: (Main house). Roof _____ Wall _____ (Concrete, brick, tin, wood, bamboo, thatch, others (specify)

No. of bedrooms in the house _____ Value of the house if sold now _____

b. Ownership of machinery/equipment and household durable asset

Item	Number of Units	Year Acquired	Cost per unit (at date purchased)	No. of Years to Last	Consumer durable	Number of Units	Year Acquired	Cost per unit (at date purchased)	No. of Years to Last
1. Tractor/power tiller					1. Sewing machine				
2. Irrigation pumps/tube wells					2. Electric fan				
3. Threshing machine					3. Refrigerator				
4. Rice mill					4. TV/VCR/DVDP				
5. Animal cart					5. Radio/Stereo/Component				
6. Plow					6. Motorbike				
7. Boats					7. Bicycle				
8. Motor for boats					8. Tricycle				
9. Other fishing gears** (specify, ie. push net, gillnet, liftnet, hook and line etc)					9. Jeepney				
					10. Car				
					11. Truck/van				
10. Fish smoker/drier (oven?)					12. Other home appliances				
11. Drinking well /Handpump									
12. Other equipments									

4. CROPS

Section I. Landholding

No. of operated parcels _____(for agriculture)

Parcel No.	Parcel/ Pond ID	Land area (in sq. m or in hectares)	Tenure status	No. of cropping per year	Distance of parcel to homestead (kilometer)	Depth of flooding at the height of monsoon (for all type of parcel)	Soil Type	Quality of Soil	Source of Irrigation/ water

Codes:

Tenure status
1 = Owned
2 = Tenant
3 = Leaseholder (crops)
4 = Rented out

No. of Cropping
1 = Farm is cropped once a yr.
2 = Farm is cropped 2x a yr.

Depth of flooding
0 = not flooded
1 = up to 1 foot
2 = up to 2 feet
3 = 3 feet and above

Soil type
1 = sandy loam
2 = clay loam
3 = clay
4 = silty
5 = sandy

Quality of soil
1 = good
2 = average
3 = poor
4 = very poor

Distance of parcel/pond to homestead
1 = adjacent, less than 100 meters
2 = between 100-500 meters
3 = between 500 – 1000 meters
4 = more than 1000 meters

Source of water/irrigation
1 = not irrigated (rainfed)
2 = irrigation cannals
3 = shallow tubewells
4 = pumped from bodies of water, lake, rivers, creeks, streams or sea

Section II. Land utilization of operated plots and marketing of crops produced, 2003-2004

Parcel No.	Cropped Area (in sq. m or in ha)	Type of crop	Variety/ Species	Cropping Schedule		Actual Production at harvest (kilograms)	*Normal production (kg per unit area)	Main reason for loss of production	Qty. cons.	Qty. given away	Qty. set aside as seeds for nxt season	Sold to middleman		Sold to market		Where sold (mkt)	Dist. of mkt	Mode of transp ort
				Date of Planting	Date of Harvesting							Qty	Price per unit	Qty	Price per unit			
Cropping Season I																		
Cropping Season II																		

Codes:

Type of crop
1 = Rice
2 =Corn
3 = Peanut
4 = Mungbean
5 = Sugarcane
6 = Other crops_____
7 = Mustard
8 = Cabbage
9 = Pechay
10 = Chilli
11 = Onion
12 = Garlic
13 = Potato
14 = Tobacco
15 = Sweet potato
16 = Other vegetables____
17 = Mango
18 = Coconut
19 = Banana
20 = Other fruit trees_____
21 = Other (specify)_____

Name of the variety/species
a. For rice, write the local name and indicate if traditional or modern variety
b. For other crop, write the variety

* Definition of normal production: average yield is not affected by pests or diseases

Main reason for loss of production
1. Drought
2. Insects (specify name)
3. Diseases (specify name)
4. Rats
5. Weeds
6. Low input use (especially fertilizer)
7. Flooding
8. Insufficient water at near harvest
9. Birds
10. No experience
11. Late sowing/seeding time
12. Poor soil /poor water quality
13. Abnormal rain
14. Very cold
15. Low quality seedlings
16. shading
17. ducks/pigs/cows and other pests
18. Sloping land
19. pests/predators
20 others (specify)

Where sold:
1 = In the barngay
2 = Local market
3 = Town/ municipality market

Dist. from Market
1 = Pick-up from Farm (0 km)
2 = Within 1 km
3 = 1-3 km
4 = 3-10 km
5 = more than 10 km

Mode of transport
1 = own jeepney
2 = Tricycle
3 = Cart
4= Tractor/van/trailer
5 = Bus/truck
6 = Boat
7 = Others (specify)

Section III. Cost and Return for Crop Production (one representative plot for one season)

Please encircle which season was used for this section: 1. Wet Season 2. Dry Season

a. Basic Information

Item	Quantity	Price per unit
1. Land area (in square meters or hectares)		
2. Crop grown		
3. Variety grown		
4. Time of planting (month, week)		
5. Time of harvesting (month, week)		
6. Land tax/land rental		
7. Source of seeds		
8. Seeds Used		
9. Method of crop establishment		

Method of crop establishment:
1 = Transplanting
2 = Direct seeding
3 = Mixed

Source of seeds:
1=government
2=Own produce
3=private
4=others (specify) _____

b. Labor and Inputs

b.1. Seedling propagation (ANSWER ONLY IF TRANSPLANTED)

Activity	Frequency[a]	Family labor		Hired Labor		Wage Rate	Expenses for Snacks given to hired labor
		No.	# of hrs. spent	No.	# of hrs. spent		
Land preparation for seedbed							
Seed sowing							
Irrigating							
Spraying							
Fertilizing							
Weeding							
Uprooting							

[a]Frequency: please indicate how many times it is done. (example: weeding- 2 times per season)

Amount of fuel used for land preparation of seedbed _____ Price/unit _____
Amount of insecticide/pesticide used for seedling propagation _____ Price/unit _____
Amount of fertilizer used for seedling propagation _____ Price/unit _____

b. 2. Land preparation

Activity	Power Source[a]	If source of power is own machine/tractor, what is cost of fuel used	If source of power is rented machine/tractor, what is the contract charge	If source of power is rented carabao, what is the rate per carabao (pesos/day)	Frequency[b]	Family Labor		Hired Labor		Wage Rate	Expenses for Snacks given to hired labor
						No.	# of hrs. spent	No.	# of hrs. spent		
Plowing											
Harrowing											
Others, specify											

Power Source:[a] 1=Own draft animal 2=Rented draft animal 3=Own machine 4=Rented machine 5=others (specify)_____

[a]Frequency: please indicate how many times it is done. (example: plowing – 2 times per season)

b.3. Planting

Planting Method	Frequency[a]	Family labor		Hired Labor		Wage Rate	Expenses for Snacks given to hired labor
		No.	# of hrs. spent	No.	# of hrs. spent		
Encircle appropriate planting method used:							
1. Transplanting							
2. Direct seeding (line sowing)							
3. Broadcast seeding							
4. Others, please specify							

[a]Frequency: please indicate how many times it is done. (example: direct seeding– 1 day)

b. 4. Fertilizer Application

Kind of fertilizer	No. of Times Fertilizer was Applied	Qty. (bag)	Price/bag	Total Cost	Family labor		Hired Labor		Wage Rate	Expenses for Snacks given to hired labor
					No.	# of hrs. spent	No.	# of hrs. spent		
Urea										
14-14-14										
17-0-17										
Farm yard manure										
Others, please specify										

b.5. Irrigation

Source of water[a]	Cost		If irrigation fee is paid, how much?	Frequency[b]	Family labor		Hired Labor		Wage Rate	Expenses for Snacks given to hired labor
	Fuel (liter)	Price/liter			No.	# of hrs. spent	No.	# of hrs. spent		

[a]Source: 1=shallow tube well (STW) 2=rain 3=canal/river/creek 4=others (specify): _____

[a]Frequency: please indicate how many times it is done. (example: irrigation – 2 times per season)

b.6. Weeding

Frequency[a]	Family labor		Hired Labor		Wage Rate	Expenses for Snacks given to hired labor
	No.	# of hrs. spent	No.	# of hrs. spent		

[a]Frequency: please indicate how many times it is done. (example: weeding – 2 times per week for 2 weeks)

b.7. Pest Management

Kind of Pesticide/Insecticide Used	Qty. Applied (unit)	Price/unit	Total Cost	Frequency[b]	Family labor		Hired Labor		Wage Rate	Expenses for Snacks given to hired labor
					No.	# of hrs. spent	No.	# of hrs. spent		
Please specify:										

[a]Frequency: please indicate how many times it is done. (example: insecticide application – 2 times per season)

b. 8. Harvesting

Item	Qty	Price
Family labor		
- No. of family members involved		
- No. hours spent per person		
Hired labor		
- No. of hired laborers		
- No. of hours spent per person or no. of man-days		
- Wage rate per day (pesos/day)		
If harvested as contract work, cost incurred (pesos)		
- Area harvested (hectares)		
- Rate per hectare (pesos)		
If harvesting labor paid in kind		
- Amount paid (sacks or kgs)		
- Price (pesos per sack OR pesos per kg)		
If harvested by machine		
- Area harvested (hectares)		
- Rate per hectare (pesos)		

b.9. Transporting/Hauling

Activity	Frequency[a]	Family labor		Hired Labor		Wage Rate	Expenses for Snacks given to hired labor	Means transport	Rate of renting transport (pesos/day)
		No.	# of hrs. spent	No.	# of hrs. spent				
Transporting harvest from field to house									
Transporting produce to market									

Means of transport: 1 = carabao
2 = tricycle
3 = jeepney
4 = Others, please specify _____

[a]Frequency: please indicate how many times it is done. (example: transporting from field to house – once per season)

b.10. Postharvesting

Activity	Frequency[a]	Family labor		Hired Labor		Wage Rate	Expenses for Snacks given to hired labor	If paid to thresher is in kind, what is the amount of paddy given
		No.	# of hrs. spent	No.	# of hrs. spent			
Threshing								
Winnowing (if applicable)								
Drying								
Shelling (applicable to corn)								
Storing								

[a]Frequency: please indicate how many times it is done. (example: threshing – once per season)

c. Crop Output for the Representative Plot

Item	Quantity	Price/unit
Total production (sacks or kilograms)		
- Landlord's share		
- Given Away		
- Home Consumption		
- Quantity set aside as seeds for next season (applicable to rice and corn)		
- Sold		
Price per kg or price per sack		
By product value if sold:		
-rice straw		
- rice bran/hull		
- crop residue		
- Others, specify		

5. Homestead Gardening

a. Income from homestead gardening, 2003-2004 (information based on previous year)

Veg./Fruit	Total production per year (kilograms)	Amount used for home consumption	Amount given away	Sold to middleman		Sold to market		Where sold (market)	Distance of market	Mode of transport
				Qty	Price per unit	Qty	Price per unit			
Vegetables										
Fruits										

Codes:

Where sold:
1 = In the barangay
2 = Local market
3 = Town/municipality market

Distance from Market
1 = Pick-up from Farm (0 km)
2 = Within 1 km
3 = 1-3 km
4 = 3-10 km
5 = more than 10 km

Mode of transport
1 = own jeepney
2 = Tricycle
3 = Cart
4= Tractor/van/trailer
5 = Bus/truck
6 = Boat
7 = Others (specify)

6. Livestock Raising

a. Animal holdings/Livestock

Livestock	Number	Market Value per head
Cattle:		
Young		
Adult		
Buffaloes/Carabaos:		
Young		
Adult		
Pigs:		
Young		
Adult		
Goats:		
Young		
Adult		
Chicken/Ducks:		
Young		
Adult		
Others:		
Young		
Adult		

Note: If there are other animals owned by the farmer, just write down below in others.

b. Estimates of income from livestock/poultry production, 2003-2004 **(during the previous year)**

Livestock/Poultry production and marketing

Items	Cattle	Carabao	Goat	Pig	Chicken	Duck
Livestock produced on farm						
Number of heads of animals sold (live)						
Adult Male						
Adult Female						
Young Male						
Young Female						
Price per kg (price per head or price per kg)						
Adult Male						
Adult Female						
Young Male						
Young Female						
Where is output sold 1 = at the house/farm 2 = brought to buyer						
Transport cost per transaction						
Number of animals slaughtered (meat)						
Slaughter weight (kg/head)						
Amount for home consumption (kg)						
Amount sold (kg)						
Price per kg						

Egg production and marketing (during the previous year)

Eggs produced on farm	**Chicken**	**Duck**
Number of laying birds		
Average no. of eggs produced per month		
Number consumed		
Number hatched		
Number sold		
Price per egg		

This information can be computed as residual:

c. What is the source of livestock feed (%)

Source of Livestock Feeds	Cattle	Carabao	Goat	Pig	Chicken	Duck
Open Grazing						
Rice Straw						
Grazing on seasonally fallow field						
Other crop residues						
Collection of grasses						
Commercial Animal feeds						
Waste/cooked rice						
Others, please specify _____						

d. Estimated cost of rice straw and other crop residues used as livestock feeds (pesos) _____

e. Time spent **each day** for animal husbandry:

Animal	Family labor		Hired Labor		Wage Rate	Expenses for Snacks given to hired labor
	No.	# of hrs. spent	No.	# of hrs. spent		
Cattle						
Carabao						
Goat						
Pig						
Chicken						
Duck						
Others, please specify _____						

[a]Frequency: please indicate how many times it is done either : daily, weekly or monthly

f. Main problems faced in livestock raising (check)

_____ Shortage of feeds

_____ Inadequate marketing facility

_____ Animal disease

_____ Poor quality of breed

_____Others (specify)

7. For Households Engaged in Capture Fishing OR Fish Trapping

Section I. Information on Capture Fishing

	Lean Season	Peak Season
Months covered		
Type of fishing gear used		
Frequency of fishing		
No. of times		
Fuel used (liters)		
Price per liter		
No. of hired labor		
Wage rate		

Frequency of fishing
1 = daily
2 = weekly

Species of Fish Caught	Home Consumption (kg)	Given Away (kg)	Sold to middleman		Sold to market		Where sold (market)	Distance of market	Mode of transport
			Qty	Price per unit	Qty	Price per unit			
Lean Season									
Peak Season									

Codes:

Where sold:
1 = In the barangay
2 = Local market
3 = Town/municipality market

Distance from Market
1 = Pick-up from Farm (0 km)
2 = Within 1 km
3 = 1-3 km
4 = 3-10 km
5 = more than 10 km

Mode of transport
1 = own jeepney
2 = Tricycle
3 = Cart
4= Tractor/van/trailer
5 = Bus/truck
6 = Boat
7 = Others (specify)

8. For Households Engaged in Fishpond Operation

Section I. Landholding

No. of ponds/____ _____ (for fishing).

Pond No.	Land area (in sq. m or in ha)	Tenure status	No. of Years of FLA/Sub-lease	No. of cropping per year	Distance of parcel to homestead (kilometer)	Depth of flooding at the height of monsoon	Soil Type	Quality of Soil/water	Source of water	Pond Use	Stocking density (per fish pond)	Dimension of fishpond

Codes:

Tenure status
1 = Owned
2 = Rented out
3 = FLA (orig. leaseholder, 1st lease)
4 = FLA (original leaseholder, renewed lease)
5 = FLA (Sub-leasing, 1st sub- lease)
6 = FLA (Sub-leasing, 2nd sub- lease)
7 = FLA (Sub-leasing, 3rd sub- lease)

No. of Cropping
1 = Farm is cropped once a yr.
2 = Farm is cropped twice a yr

Depth of flooding
0 = not flooded
1 = up to 1 foot
2 = up to 2 feet
3 = 3 feet and above

Soil type
1 = sandy loam
2 = clay loam
3 = clay
4 = silty
5 = sandy

Quality of soil
1 = good
2 = average
3 = poor
4 = very poor

Water quality of the pond/
1 = turbid
2 = green
3 = clear
4 = milky

Dist. of pond to homestead
1 = adjacent, less than 100 meters
2 = between 100-500 meters
3 = between 500 – 1000 meters
4 = more than 1000 meters

Source of water/irrigation
1 = not irrigated (rainfed)
2 = irrigation cannals
3 = shallow tubewells
4 = pumped from bodies of water, lake, rivers, creeks, streams or sea
5 = tidal fluctuation

Pond Use
1 = Hatchery
2 = Fry and fingerling raising
3 = Grow-out/Rearing monoculture
4= Grow-out/Rearing polyculture

Section II. Utilization of fishponds and marketing of fish (or prawn) produced, 2003-2004

Parcel No.	Cropped Area (in sq. m or in ha)	Type of crop	Variety/ Species	Cropping Schedule		Actual Production at harvest (kilograms)	*Normal production (kg per unit area)	Main reason for loss of production	Qty. cons.	Qty. given away	Sold to middleman		Sold to market		Where sold (market)	Dist. of mkt	Mode of transport
				Date of Planting	Date of Harvesting						Qty	Price per unit	Qty	Price per unit			
Cropping Season I																	
Cropping Season II																	

Codes:

Type of crop
1 = Milkfish
2 =Tilapia
3 = Shells/oysters
4 = Prawn
5 = Seaweed
6 = Other (specify)__

Main reason for loss of production
1. Drought
2. Insects (specify name)
3. Diseases (specify name)
4. Low input use (especially fertilizer)
5. Flooding
6. Low input use (especially fertilizer)
7. Flooding
8. No experience
9. Late seeding time
10. Poor soil /poor water quality
11. Abnormal rain
12. Very cold
13. Low quality of fingerlings
14. shading
15. others (specify)

Where sold:
1 = In the barngay
2 = Local market
3 = Town/ municipality market

Mode of transport
1 = own jeepney
2 = Tricycle
3 = Cart
4= Tractor/van/trailer
5 = Bus/truck
6 = Boat
7 = Others (specify)

Distance from Market
1 = Pick-up from Farm (0 km)
2 = Within 1 km
3 = 1-3 km
4 = 3-10 km
5 = more than 10 km

* Definition of normal production: average yield is not affected by pests or diseases or storm

Section III: Background and Physical Characteristics of Pond
Answer question (a) only if ownership type for the fish pond is owned by household.

a. Owned by household
   a.1. If owned by households, number of owners_____

   a.2. Operator's status
   1. single operator
   2. joint operator
   3. Others_____

   a.3. In case the operator is also a joint owner, what is the sharing arrangement with expenses? _____, what is the sharing arrangement with the harvest? _____ Percent of output

   a.4. Pattern of pond acquisition _____
   1. inherited
   2. purchased
   3. newly excavated

b. Investment cost for fish pond:
(i) Year when the investment was made : _____
(ii) Cost of acquiring the fish pond/cage (pesos) _____
(iii) Initial survey fee or permit fee (pesos) _____
(iii) Are you using pumps for drainage and water inflows? (check yes or no) **(for fish pond only)**
Yes_____ No _____
If Yes, cost of pumping water (pesos/season) _____

c. Source of financing the cost of pond (amount in pesos)

Own savings _____
Borrowed from relatives_____
Borrowed from local money lender _____
Loan from banks _____
Loan from cooperatives _____

d. Age of the fish pond_____

e. Pond depth
During dry season (meters)_____
During rainy season (meters)_____

f. Does the fishpond get flooded during monsoon season?_____
(Yes = 1, No = 0)

Section IV: Utilization of Pond Dikes
a. Big trees (how many?)_____
b. Trellises/vines for vegetables (Yes = 1, No = 0)_____
c. Presence of aquatic plants in pond (Yes = 1, No = 0)_____
   1. water lily
   2. kangkong
   3. others, specify_____
d. Presence of chicken/duck house (Yes = 1, No = 0)_____
e. Area of pond dike used for (in percent)
   1. gardening _____
   2. animal shed_____
   3. grazing_____
   4. storage for straws, dungs etc. _____
   5. others _____

Section V. Quantity and Value of Inputs Used (<u>one representative pond per season</u>)

a. Area of representative pond _____

b. Use or representative pond (Please encircle the type of use for the representative pond and indicate species being produced)

Use of representative pond	Species
1. Nursery	
2. Hatchery	
3. Grow-out	

c.1 Pond preparation

Inputs	Quantity	Price/unit
Owned resources:		
Cowdung (kg)		
Chicken manure (kg)		
Compost (kg)		
Others:		
Purchased resources:		
Lime (kg)		
Urea (kg)		
TSP (kg)		
Cowdung (kg)		
Chicken manure (kg)		
Compost (kg)		
Fingerlings/fry/eggs		
Commercial Feeds		
Others, please specify		

c.2 Nursery preparation

	Operator	Hired	Wage rate	Snacks/Food	Labor
(days)	_____	_____	_____	_____	

d. Principal source of fingerling/fry/egg supply (Please encircle answer below)

1. directly purchased from private hatchery
2. vendors selling from private hatchery
3. directly purchased from government/NGO
4. vendors selling from government/NGO hatchery
5. directly collected from rivers/open waters
6. vendors selling fries collected from rivers/open waters
7. purchased from middleman (source is abroad)

e. Cost of transporting fingerlings to fish pond (pesos) _____

f. Fertilizers/feed applied last year

Fertilizers/feed	Quantity	Price/unit
Owned resources:		
Chicken manure		
Rice bran		
Oil cake		
Waste/cooked rice		
Scrap bread		
Azolla/algae		
Others (specify)		

Fertilizers/feed	Quantity	Price/unit
Purchased resources:		
Urea		
All-ammonium sulfate		
Mono-ammonium sulfate		
Rice bran		
"Lablab" or natural algae		
"Lumut" or filamentous algae		
Trash fish		
Chicken entrails		
Others (specify)		

g. Pesticide.

Type of Pesticide	Quantity	Price/unit
a. Organic		
b. Chemical (please specify)		

h. Total labor requirements at different stages of pond management

Activity	Family labor		Hired labor		Wage rate	Expenses for Snacks given to hired labor
	No.	# of hrs.spent	No. of people	# of hrs.spent		
Pond preparation						
Dewatering/draining						
Sun drying						
Plowing						
Cleaning						
Pesticide Application						
Flusing/Washing						
Repairing of dikes, pen, gate						
Liming/fert. Applic.						
Interculture management						
Filling of water						
Release of fingerling/fry						
Supervision						
Feeding and fertilizing						
Harvesting (specify if contract harvesting)						
Sorting						
Marketing						

i. Survival rate of fish in pond _____(%)

j. Production/Output for **representative pond**

Type of harvest	Operator's share		Laborer's share	Given Away	Total
	Sold	Resecada			
Total harvest					
Partial harvest					
1st harvest					
2nd harvest					
3rd harvest					
Others					

k. Cost of harvesting
   i. Share of fish given to harvesters (kg) _____
   ii. Cash paid to harvesters (Pesos) _____

l. Disposal of fish produced
   l.1 How are fish marketed from your pond? ____
      1. sell harvests in the market
      2. sell harvests to fish trader
      3. Others, specify _____

   l.2 In case of self-marketing, what are the costs incurred? (specify each item and amount in pesos)
   _____

Section VI. Constraints of Adoption of Fish Culture

a. Problems of adoption of fish culture in ponds (Yes = 1, No = 0) _____
   1. pond is used for other purposes
   2. lack of manpower to supervise
   3. risk of theft
   4. lack of agreement among the co-sharers
   5. lack of capital
   6. inadequate supply of fry fingerling
   7. heterogenous supply of fingerlings
   8. lack of water in the dry season
   9. extreme turbidity of water
   10. lack of technical knowledge
   11. others (specify) _____

b. If the pond is jointly owned/operated, did all the sharers actively participate in pond fish culture? (Yes = 1, No = 0) _____

c. If yes, how were the expenses shared? _____
   1. equally
   2. proportionately to ownership share
   3. others (specify) _____

9. For Households Engaged in Fish Cage or Fish Pen Operation

Section I. Landholding

No. of cages/pens____ _____ (for fishing).

Pen No.	Land area (in sq. m or in ha)	Tenure status	No. of Years of FLA/Sub-lease	No. of cropping per year	Distance of parcel to homestead (kilometer)	Depth of flooding at the height of monsoon	Soil Type	Quality of Soil/water	Source of water	Cage/Pen Use	Stocking density (per fish pond)	Dimension of fishpond	Type of fish cage/pen

Codes:

Tenure status
1 = Owned
2 = Rented out
3 = FLA (orig. leaseholder, 1st lease)
4 = FLA (original leaseholder, renewed lease)
5 = FLA (Sub-leasing, 1st sub- lease)
6 = FLA (Sub-leasing, 2nd sub- lease)
7 = FLA (Sub-leasing, 3rd sub- lease)

No. of Cropping
1 = Farm is cropped once yr.
2 = Farm is cropped 2x/yr

Depth of flooding
0 = not flooded
1 = up to 1 foot
2 = up to 2 feet
3 = 3 feet and above

Soil type
1 = sandy loam
2 = clay loam
3 = clay
4 = silty
5 = sandy

Quality of soil
1 = good
2 = average
3 = poor
4 = very poor

Water quality of the pond/
1 = turbid
2 = green
3 = clear
4 = milky

Distance of pond to homestead
1 = adjacent, less than 100 meters
2 = between 100-500 meters
3 = between 500 – 1000 meters
4 = more than 1000 meters

Source of water/irrigation
1 = not irrigated (rainfed)
2 = irrigation cannals
3 = shallow tubewells
4 = pumped from bodies of water , lake, rivers, creeks, streams or sea
5 = tidal fluctuation

Cage/Pen Use
1 = Hatchery
2 = Fry and fingerling raising
3 = Grow-out/Rearing monoculture
4= Grow-out/Rearing polyculture

Type of fish cage/pen
1 = fixed/pen/stationary type
2 = floating type

Section II. Utilization of fish cages/pens and marketing of fish (or prawn) produced, 2003-2004

Parcel No.	Cropped Area (in sq. m or in ha)	Type of crop	Variety/ Species	Cropping Schedule		Actual Production at harvest (kilograms)	*Normal production (kg per unit area)	Main reason for loss of production	Qty. cons.	Qty. given away	Sold to middleman		Sold to market		Where sold (mkt)	Dist. of mkt	Mode of transport
				Date of Planting	Date of Harvesting						Qty	Price per unit	Qty	Price per unit			
Cropping Season I																	
Cropping Season II																	

Codes:

Type of crop
1 = Milkfish
2 =Tilapia
3 = Shells/oysters
4 = Prawn
5 = Seaweed
6 = Other (specify)__

Main reason for loss of production
1. Drought
2. Insects (specify name)
3. Diseases (specify name)
4. Low input use (especially fertilizer)
5. Flooding
6. Low input use (especially fertilizer)
7. Flooding
8. No experience
9. Late seeding time
10. Poor soil /poor water quality
11. Abnormal rain
12. Very cold
13. Low quality of fingerlings
14. shading
15. others (specify)

Where sold:
1 = In the barngay
2 = Local market
3 = Town/ municipality market

Mode of transport
1 = own jeepney
2 = Tricycle
3 = Cart
4= Tractor/van/trailer
5 = Bus/truck
6 = Boat
7 = Others (specify)

Distance from Market
1 = Pick-up from Farm (0 km)
2 = Within 1 km
3 = 1-3 km
4 = 3-10 km
5 = more than 10 km

* Definition of normal production: average yield is not affected by pests or diseases or storm

Section III: Background and Physical Characteristics of Cage/Pen

Answer question (a) only if ownership type for the fish cage/pen is owned by household.

a. Owned by household

a.1. If owned by households, number of owners_____

a.2. Operator's status

1. single operator
2. joint operator
4. Others_____

a.3. In case the operator is also a joint owner, what is the sharing arrangement with expenses? _____, what is the sharing arrangement with the harvest? _____ Percent of output

a.4. Pattern of cage/pen acquisition _____

1. inherited
2. purchased
3. newly excavated

b. Investment cost for fish cage/pen:

(i) Year when the investment was made : _____

(ii) Cost of constructing fish cage/pen (pesos) _____

(iii) Initial survey fee or permit fee (pesos) _____

c. Source of financing the cost of fish cage/pen (amount in pesos)

Own savings _____

Borrowed from relatives_____

Borrowed from local money lender _____

Loan from banks _____

Loan from cooperatives _____

d. Age of the cage_____

Section IV. Quantity and Value of Inputs Used (<u>one representative cage/pen per season</u>)

a. Area of representative cage/pen _____

b. Use or representative cage/pen (Please encircle the type of use for the representative pond and indicate species being produced)

Use of representative cage/pen	Species
1. Nursery	
2. Hatchery	
3. Grow-out	

c. Nursery preparation

	Operator	Hired	Wage rate	Snacks/Food	Labor
(days)	_____	_____	_____	_____	

d. Fingerlings/fry/eggs Quantity purchased_____ Price/piece _____

e. Principal source of fingerling/fry/egg supply (Please encircle answer below)

1. directly purchased from private hatchery
2. vendors selling from private hatchery
3. directly purchased from government/NGO
4. vendors selling from government/NGO hatchery
5. directly collected from rivers/open waters
6. vendors selling fries collected from rivers/open waters
7. purchased from middleman (source is abroad)

f. Cost of transporting fingerlings to fish cage/pen (pesos) _____

g. Fertilizers/feed applied last year

Fertilizers/feed	Quantity	Price/unit
Owned resources:		
Chicken manure		
Rice bran		
Oil cake		
Waste/cooked rice		
Scrap bread		
Azolla/algae		
Others (specify)		

Fertilizers/feed	Quantity	Price/unit
Purchased resources:		
Urea		
All-ammonium sulfate		
Mono-ammonium sulfate		
Rice bran		
"Lablab" or natural algae		
"Lumut" or filamentous algae		
Trash fish		
Chicken entrails		
Others (specify)		

h. Pesticide.

Type of Pesticide	Quantity	Price/unit
a. Organic		
b. Chemical (please specify)		

i. Total labor requirements at different stages of cage/pen management

Activity	Family labor		Hired labor		Wage rate	Expenses for Snacks given to hired labor
	No.	# of hrs.spent	No. of people	# of hrs.spent		
Net preparation						
Release of fingerling/fry						
Cleaning of net/cages						
Checking and repairing of nets/cages						
Feeding						
Sizing						
Harvesting (specify if contract harvesting)						
Sorting						
Marketing						

j. Survival rate of fish in cage/pen _____(%)

k. Production/Output for **representative cage/pen**

Type of harvest	Operator's share		Laborer's share	Given Away	Total
	Sold	Resecada			
Total harvest					
Partial harvest					
1st harvest					
2nd harvest					
3rd harvest					
Others					

l. Cost of harvesting
   i. Share of fish given to harvesters (kg) _____
   ii. Cash paid to harvesters (Pesos) _____

m. Disposal of fish produced
   m.1 How are fish marketed from your pond? ____
      1. sell harvests in the market
      2. sell harvests to fish trader
      3. Others, specify _____

   m.2 In case of self-marketing, what are the costs incurred? (specify each item and amount in pesos)
   _____

Section V. Constraints of Adoption of Fish Culture

a. Problems of adoption of fish culture in cages/pens (Yes = 1, No = 0) _____
   1. pond is used for other purposes
   2. lack of manpower to supervise
   3. risk of theft
   4. lack of agreement among the co-sharers
   5. lack of capital
   6. inadequate supply of fry fingerling
   7. heterogenous supply of fingerlings
   8. lack of water in the dry season
   9. extreme turbidity of water
   10. lack of technical knowledge
   11. others (specify) _____

b. If the cage/pen is jointly owned/operated, did all the sharers actively participate in pond fish culture? (Yes = 1, No = 0)
   _____

c. If yes, how were the expenses shared? _____
   1. equally
   2. proportionately to ownership share
   3. others (specify) _____

TO BE ANSWERED BY ALL RESPONDENTS

10. Perceptions Related to Milkfish Aquaculture

Please check if the respondent answered Yes, No or No idea.

	Yes	No	No idea
1. Do you think those who were able to lease coastal land (FLA) for fishponds are those well connected to local politicians?			
2. Do you think that many or majority of the fishpond operators in our town/city are just sub-leasing from the original leaseholders of the fishponds?			
3. Do you think those who are presently operating/leasing or sub-leasing the fishponds are adequately trained and knowledgeable in fish culture?			
4. Do you think your local government has provided ordinances, rules and regulations, projects and programs, which has encouraged fish (pond/cage) operators to continue and expand their fish farming?			
5. Do you think the system of fishpond sub-leasing has encouraged higher production of fish in your area?			
6. Do you think the system of fishpond sub-leasing is supposed to be not allowed, but this arrangement has sustained fish production?			
7. Do you think the technology and practices we have been using in fish aquaculture has been learned mainly from BFAR and other government extension workers?			
8. Do you think the technology and practices we have been using in fish aquaculture has been learned mainly from other fishpond operators/ fish farmers?			
9. Do you think the problems we have experienced in fish aquaculture has been mainly due to lack of capital?			
10. Do you think the problems were have experienced in fish aquaculture has been mainly due to lack of technical know-how/ technology in fish culture?			

Section VII. Awareness of Policies.

a. Do you know of any of national laws/ legislation, and policies pertaining to fish aquaculture? (Yes or No). If yes, please specify the laws/legislations. _____

_____
_____
_____
_____
_____
_____

b. Do you know of any local ordinances, law/legislation, and policies pertaining to fish aquaculture. (Yes or No). If yes, please specify the laws/legislations. _____

_____
_____
_____
_____
_____
_____

11 a. Normal expenditure on food and daily necessities (per week)

On the average, how many times (in a day/week) do you buy food and necessities? _____
On each marketing day, how much is the amount of your budget? _____
How much (out of this budget) you spend on the following:

Item	Quantity purchased (pesos)	Price/unit
Rice		
Fish		
Meat		
Milk		
Eggs		
Vegetables		
Fruits		
Groceries (soy sauce, oil, fish sauce, etc.)		
Laundry supplies (soap, detergent etc)		
Other personal care (bath soap, shampoo)		
Cellphone load		
Liquor		
Cigarettes		
Others (specify)		

Note: Please indicate if the quantity is per day, per week or per month. Also, please indicate the units. (Example, rice – 1 cavan per month)

11 b. Major expenditures and financial transactions for one year in pesos (2003-2004)

Clothing / shoes _____ Jewelry _____
Agricultural equipment _____ Recreation _____
Livestock _____ Education _____
Social/religious ceremony _____ Medical expenses _____
Drinking Wells _____ Loan repayment _____
Investment in business _____ Lending money for mortgage _____
Donations_____ Paying back land mortgage _____
Industrial equipment _____ Water bills _____
Loan given to others _____ House repair/ improvement _____
Taxes _____ Transportation _____
Electricity bills _____ Others (specify) _____

12. Loans received during the last three years and utilization of loans (2001-2004)

Sources of loans	Amount of loan (pesos)	Duration of loan (months)	Interest rate (% per month)	Utilization of loans (pesos)					
				Agricultural Use***		Fishery Use**		Non-agricultural Use*	
				Amount	Purpose	Amount	Purpose	Amount	Purpose
1. Money lender									
2. Trader/ Shopkeeper									
3. Banks									
i) Short-term loans (less than 2 years)									
ii) Medium term loan (5-10 years)									
iii) Long term loan (more than 10 years)									
4. Friends / relatives									
5. Cooperative									
6. Others (specify)									

*** Agricultural Use (eg., purchase of inputs, seeds, payment for labor, machineries, land, livestock etc.)
** Fishery Use (eg., pond excavation, reexcavation, equipments, cage construction etc.)
* Non-agricultural use (eg. (medical expenses, houshing improvement, education of children, religious or social ceremony etc.

13. Some Social Indicators

a. Social status of the respondent (Answer Yes or No)

a.1 Are you an elected member of the local government? _____

a.2 Are you an officer/member of the local school board?_____

a.3 Are you an officer of a church organization?_____

a.4 Are you a member of a farmer organization?_____

a.5 Are you an officer of a farmer organization?_____

a.6 Are you a member of a fishery organization?_____

a.7 Are you an officer of a fishery organization?_____

a.6 Are you a member of a barangay cooperative?_____

a.7 Are you an officer of a barangay cooperative?_____

b. Are you listening to agricultural programs on radio? (Yes or No). If yes, please give the title of the programs and the radio station.

_____

_____

c. Are you watching agricultural programs on TV? (Yes or No). If yes, please give the title of the programs and channel.

_____

d. How often are you visited by the government extension workers? _____

Please state the name of unit affiliation_____

e. Are you being visited by agricultural technicians of non-government organizations (NGOs) or private companies (e.g.feedmill companies)? Please state the names of the NGO and number times visited.

_____

_____

f. Have you ever attended any training on fishing/farming? (Yes or NO)._____ If yes, please specify what kind of training.

_____

_____

14. Health and sanitation practices of households

a. Sources of drinking water _____

1. municipal water
2. tube wells
3. wells
4. river/stream
5. spring

b. Type of toilet owned by households_____

1. No toilet
2. Detached unit
3. Part of the house
4. others, specify_____

c. Did your children receive immunization shots when they were young?_____

1. Yes
2. No

d. If yes, what type of hospital/clinic did your children receive their immunization from?

1. private clinic
2. public clinic/center
3. public hospital
4. private hospital

15. Recent changes in rural economy

a. How do you consider your economic condition now? (Please check)
Rich _____
Middle-level _____
Moderately Poor _____
Extremely Poor _____

b. What has been the changes in economic conditions in your household for the past five (5) years?

Improved ____ Unchanged _____ Deteriorated _____

Three reasons for the improvement:
1. _____

2. _____

3. _____

Three reasons for deterioration?
1. _____

2. _____

3. _____

c. Have you shifted your land from a type of crop to another crop?

Yes _____ No _____

If yes, how much _____ hectares?

Why did you shift to other crops? 1. _____
2. _____

d. Have you shifted from crop to non-crop production, i.e., fish?

Yes _____ No _____

If yes, how much _____ hectares?

Why did you shift to other non-crop? 1. _____
2. _____

Comments

WFC

DISSEMINATION AND ADOPTION OF MILKFISH AQUACULTURE TECHNOLOGY IN THE PHILIPPINES
Comments and Suggestions

General:

- In future reviews, reports should not be presented separately on a per component basis, instead, an integrated report based on the objectives should be prepared and presented;
- The project should clearly define what is "small-holder operators" as this may create problem in the selection of cooperators and delivery of technologies. Criteria for the selection of target beneficiaries should be clearly defined;
- The poor and small-scale holders as targets should be clearly defined in the objectives (in line with the Medium Term Development Plan on which poverty alleviation is a major issue or concern);
- The project implementers should review the state-of-the start of the milkfish culture technology in the Philippines and develop or identify a package of technology (POT) for each study site.
- Project activities should be synchronized. Integration of all components must be emphasized;
- The project should consider the master plan of the municipality of selected study sites in relation to its food production thrust. Consider also the priority program of the incumbent Municipal Mayors as well as the background and competence of MAO's;
- Are the study sites a microcosm of the industry in the National Level? If not, how do you envision to replicate the results of this project to other parts of the country?
- Each component of the project should define the methodology and outputs, and integrate outputs with the other components;

Specific:

Component 1 – Technology Review and Screening (Mr. Yap)

- Cost-Benefit Analysis (Returns) should be included in all the technologies reviewed and screened. with financial indicators

- Technology assessment must be included in the screening component;

- The present productivity of the fishpen in Dulao is high but it might reach a point where it will not be sustainable due to limited circulation of water and accumulation of wastes. This would need a lot of modification or improvement of the culture system

Component 2 – Policy and Socio-Economic Review and Identification of Constraints (Dr. Subade)

- Categorize policies based on major concerns (e.g. trade, credit, tariff, etc.);

- Relate the policies identified with the problems cited by the respondents (e.g. lack of capital and various credit policies);

- Look into the study conducted by Dr. Leo Gonzales et.al in 1996 entitled "Impact of Macropolicies in the Fisheries Sector"

- Include also the various national milkfish programs implemented (on-going and completed) and identify its strengths, weaknesses, opportunities and threats to get a clear picture of the milkfish industry;

Component 3 – Over-all Research Framework and Baseline Information (Dr. Garcia)

- The conduct of impact assessment is too soon for the third year. Considering that interventions will be done on the second year, it is suggested that an assessment of the effects of interventions be done instead;

Component 4 – Pilot Testing and Dissemination of Technology (Mr. Rosario)

- Institutional support should not only focus on the provision of credit facilities but should also include marketing aspects. Linkages should not only be established with financial institutions but also with the DTI;

- Who will decide what technology to be piloted? Is it the target beneficiaries or the project team?

- Screened technology(ies) for piloting may not be strictly followed; it may be modified to suit the project sites.

- Will the products produced in the smoke drum pass HACCP requirement? Any plan to link the small processors with the big processors?

THE PROJECT SHOULD CONSOLIDATE AND INTEGRATE PROJECT COMPONENTS AND IMPLEMENT ACTIVITIES AND DECISIONS AS A TEAM.

EVALUATORS TEAM:

DR. ROGELIO O. JULIANO
Chairman

DR. TERESO A. ABELLA
Member

MS. ARLENE M. DELA VEGA
Member

MS. LILIAN G. BONDOC
Member

CONFORME:

MR. WILFREDO YAP
Study Leader, Component 1

DR. RODELIO F. SUBADE
Study Leader, Component 2

DR. YOLANDA C. GARCIA
Study Leader, Component 3

MR. WESTLY R. ROSARIO
Study Leader, Component 4

DR. MUSHFIQUR RAHMED
Project Consultant
Director, Policy Economics and Social Sciences
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DISSEMINATION AND ADOPTION OF THE MILKFISH AQUACULTURE TECHNOLOGY IN THE PHILIPPINES

BAR 1st Semi-Annual Review
December 10-11, 2004
Conference Room, BFAR-NIFTDC, Bonuan-Binloc, Dagupan, Pangasinan

The 1st semi-annual review was participated by the following members, collaborators and evaluators:

WorldFish Center	Dr. Yolanda T. Garcia	(Component 3 Study Leader)
	Mr. Boris Fabres	(Member)
	Ms. Catherine T. Aragon	(Member)
BFAR-NIFTDC	Mr. Westly Rosario	(Project Manager and Component 4 Study Leader)
	Ms. Cordelia Nipales	(Member)
	Mr. Jose Gamboa III	(Member)
	Mr. Dennis Mateo	(Member)
	Ms. Jocelyn Jovellanos	(Member)
	Ms. Edith Roxas	(Member)
BFAR Center Office	Mr. Nelson Lopez	(Project Coordinator)
	Ms. Jocelyn Enriquez	(Member)
	Mr. Nemencio Arevalo	(Member)

UPV	Dr. Rodel Subade	(Member)
BAR	Dr. Catalino de la Cruz	(BAR collaborator)
	Dr. Carmencita V. Kagaoan	(BAR collaborator)
	Ms. Ligaya Santos	(BAR collaborator)
	Ms. Digna Sandoval	(BAR collaborator)
Evaluators	Dr. Rogelio O. Juliano	(Chairman)
	Dr. Tereso Abella	(Member)
	Ms. Arlene dela Vega	(Member)
	Ms. Lilian Bondoc	(Member)

Reviewers Comments and Suggestions

General: The project should consolidate and integrate project components and implement activities and decision as a team.

1. In future reviews, reports should not be presented separately on a per component basis, instead an integrated report based on the objectives should be prepared and presented;

   Team response: Point taken, will prepare second project report according to suggestion.

2. The project should clearly define what is "small-holder operators" as this may create problem in the selection of cooperators and delivery of technologies. Criteria for the selection of target beneficiaries should be clearly defined;

   Team response: The team agreed that a survey of all milkfish operators in both the control and pilot sites will be conducted immediately so that Westly's team in NIFTDC can formulate a more detailed criteria for selection of project's cooperators/beneficiaries.

3. The poor and small-scale holders as targets should be clearly defined in the objectives (in line with the Medium Term Development Plan on which poverty alleviation is a major issue or concern);

   Team response: MOA with BAR need to be amended. WFC-Philippines will facilitate the amendment. Definition of small-scale operators should be consistent with the LandBank and QUEDANCOR definition(s) since credit to finance the operations of the cooperators will be tapped from these institutions.

4. The project implementers should review the state-of-the-art of milkfish culture technology in the Philippines and develop or identify a package of technology (POT) for each study site.

   Team response: a) This job (state-of-the-art of milkfish culture) is under the

SEAFDEC component.

b) Development of package of technology for the pilot sites – SEAFDEC promised to come up with an interim recommendation for technologies that should be piloted in the study sites. This interim recommendation will be included in the 1st semi-annual report.

5. Project activities should be synchronized. Integration of all components must be emphasized.

   Team response: To promote synchronization of component's activities, monthly updates of each component progress will be reported to the WorldFish-Philippines office which in turn will circulate the updates to all members so that everybody will know what others are doing.

6. The project should consider the master plan of the municipality of selected study sites in relation to its food production thrust, Consider also the priority program of the incumbent Municipal Mayors as well as the background and competence of the MAOs.

   Team response: a. Secure copies of the municipality master plan for fisheries and agriculture, ie., Aringay, La Union and Dasol, Pangasinan
   b. Interview respective mayors according to their priority thrusts in food production and budget allocation for fisheries programs in comparison to other sectors.
   c. Background check on competence of MAOs and ATs in extending the successful technologies to other sites.

7. Are the study sites a microcosm of the industry in the national level? If not, how do you envision to replicate the results of this project to other parts of the country?

   Team response: a. Both pond and pen culture of milkfish are represented in the chosen pilot sites. Note that cited problems of interviewed operators are typical of the constraints generally faced by milkfish farmers.
   b. Strategies for replication of successful technologies in the pilot areas shall be formulated after the piloting activities. However, lessons learned from the experiences of cooperators will be properly documented to help in strengthening future technology dissemination.

8. Each component of the project should define the methodology and outputs and integrate outputs with the other components.

Team response: The existing logframe of the project will be revised according to the BAR recommended format. This logframe will be discussed during the next team meeting which is scheduled in UPV (Miag-ao) during the 1st week of May. The final logframe will be included in the revised copy of the semi-annual report to be submitted to BAR and WorldFish Center (HQ).

Specific comments:

Component 1 – Technology Review and Screening (Mr. Yap)

a. Cost and return analysis with financial indicators should be included in all the technologies reviewed and screened;
b. Technology assessment must be included in the screening component;
c. The present productivity of the fishpen in Barangay Dulao is high but it might reach a point where it will not be sustainable due to the limited circulation of water and accumulation of wastes. This would need a lot of modification or improvement of the culture system.

Component 2 – Policy and Socio-economic Review and Identification of Constraints (Dr. Subade)

a. Categorize policies based on major concerns (e.g., trade, credit, tariff etc.);
b. Relate the policies identified with the problems cited by the respondents (e.g., lack of capital and various credit policies);
c. Look into the study conducted by Dr. Leo Gonzales et.al. in 1996 entitled "Impact of Macropolicies in the Fisheries Sector";
d. Include also the various national milkfish programs implemented (on-going and completed) and identify its strengths, weaknesses, opportunities and threats to get a clear picture of the milkfish industry;

Component 3 – Over-all Research Framework and Baseline Information (Dr. Garcia)

a. The conduct of the impact assessment is too soon for the 3rd year. Considering that interventions will be done on the 2nd year, it is suggested that an assessment of the effects of interventions be done instead.

Component 4 – Pilot testing and Dissemination of Technology (Mr. Rosario)

a. Institutional support should not only focus on the provision of credit facilities but should also include marketing aspects. Linkages should not only be established with financial institutions but also with the DTI;
b. Who will decide what technology to be piloted? Is it the target beneficiaries or the project team?
c. Screened technology(ies) for piloting may not be strictly followed; it may be modified to suit the project sites;
d. Will the products produced in the smoke drum pass HACCP requirement? Any plan to look the small processors with the big processors?

General response of the project team:

Respective study leaders will properly address all the specific comments of the evaluators in future preparation of semi-annual reports. So far, there are two needed documents to complete the revision of the 1st semi-annual report, i.e.,

1. An interim recommendation from SEAFDEC for technologies to be piloted in the project sites.
2. A revised log frame for the project following the recommended format by BAR.

The revised report will be submitted after the team meeting in May.

Boris Fabres
28th February 2004

Comments on the 1st Semi-Annual Review of the Project *"Dissemination and adoption of the milkfish aquaculture in the Philippines"*, 10-11th February, Dagupan City.

In general, the review went well, though the Evaluation Team tended to be generous and gentle with the progress of the project. For future reviews it is advised that the evaluation team include an expert in fish processing, to address particularly post-harvest issues related to safety and marketing.

The comments offered are tangential to the conclusions reached by the evaluation team and general discussion at the meeting, and relate mainly to project management and WorldFish issues.

(1) WorldFish and use of CGIAR Funds. Since this is the first use of CGIAR restricted funds by the Philippine government for fisheries, and therefore a very visible project, all attempts should be made to ensure its success – not only with reports, papers, and presentations as project products but also visible and documented real attempts to change aquaculture practices. In the last analysis, despite the sub-contracted activities farmed out to UPV, BFAR and SEAFDEC it is the WorldFish Center that has been given the responsibility for the project and will be held accountable

(2) Project Promotion and Visibility. The project needs more visibility within the WorldFish Center and in the Philippines. Project staff should therefore be encouraged to actively promote and present the project and results to meetings, seminars and workshops e.g. the upcoming 2nd National Bangus Conference in Dagupan City, and other national opportunities (the Bureau of Agricultural Research, UP, SEAFDEC and BFAR can provide a list of events in 2005 from which key opportunities can be selected). International opportunities should also be examined. This applies not only to the WorldFish team but other project partners as well.

Other promotional opportunities also include launching a page on the WorldFish Center Web Site (as other projects have), preparation of a few quality key brochures, flyers, simple newsletter outlining the project's aims etc. At present the project is known almost completely only to its proponents and project partners and access to project information by others is difficult. Digital copies of content can also be maintained on the web site noted above

(3) Student Research. Students at UP, UPV and also University of Pangasinan etc. should be encouraged to undertake thesis (graduate and under-graduate) and project studies related to the project. These can be in the respective areas of the project e.g. socio-economics, agribusiness management, development communication

(4) Technical Inputs from WorldFish Head Office. To match the importance of the project to the Philippines, especially noting (1) above, the project would benefit by greater and more regular technical input and proactive over-sight from WorldFish head-office, rather than in a stimulus-response mode to project issues.

(5) Increased Cohesion and Reporting among Project Implementers. Project partners need to exchange information (and meet more frequently if necessarily) and report in a standardized format on a monthly basis, given the short duration of the project. Reports need to be clear in terms of targets, exactly what has been achieved, and organized along the objectives of the project not as project component reports as some objectives include several components or institutions. It is suggested that the WorldFish Project office produce and maintain a GANTT type chart for all project activities for the entire project duration, noting the reporting and output milestones. This can also be done electronically so all project partners are aware of each other's progress.

(6) Preparation of a "Bangus Bibliography". Access to milkfish information is a problem in the Philippines. It is scattered across many organizations and report forms in addition to international publications. All project partners should contribute an accurate listing of documents they are using or have identified as having milkfish information, including gray literature, theses etc. The WorldFish project office can be responsible for compiling this list. It would be advantageous as well that hard or digital copies be obtained for all used publications. The result can be a simple "Bangus Bibliography" with all project partners as co-compilers (BAR, BFAR, UPV, UPLB, SEAFDEC, WorldFish). I have received from the WorldFish HQ library literature searches from ASFA and CABI, plus its internal databases LIBRI and NAGA. The project should investigate how other bibliographic databases can be searched cost effectively e.g. WorldFish has free access to "Fish and Fisheries WorldWide", the milkfish references in FishBase, the FAO database etc. Whilst not essential, it would be desirous if a full set of available documents be given to all project partners at the end of the project as well.

(7) Issues, Challenges and Bottle-necks. The Workshop revealed a number of issues that need to be addressed if the reliability of the research is to be considered adequate and results of value to farmers and the country. A number of these appear not to fall directly within the capacity of the project given its duration and financing but others can perhaps be addressed. These include:

a) Dissimilarity of one of the two pairs of control and impact sites. This needs to be addressed by examining the choice of a new control or impact site or internal control/impact evaluation in one site
b) Environmental impact assessment seems to be lightly dealt with in the project. The project runs the risk of recommending technology that generates milkfish production efficiently but can be environmentally damaging to the surrounding ecosystems. The project does not also seem to have an Integrated Coastal Zone Management perspective
c) Water-related issues have been found to represent about 30% of the problems identified by project survey respondents. These include turbidity, lack of water, low oxygen, salinity, floods. The project does not appear to have an output to mitigate much of this (though some e.g. flooding may clearly be outside the control of the project)
d) The extension component of the project would benefit from more modern approaches of engaging farmers, use of information technology and customizing approaches. It was noted that BFAR-NFTDI needed reference materials for benthos identification. Digital (electronic) identification keys can be developed for these that are more cost-effective in the long-term and can have a greater out-reach impact
e) The issue of access to capital by farmers was raised as the single most pressing need by the survey made. The project would be well-advised to investigate this further and review government and private lending systems in place for milkfish farming, loan performances etc. If capital cannot be raised by farmers, efficient technology is of limited use country-wide and advantage can only be taken of the disseminated technology by the non-poor. In particular a study of the LandBank and Quedancor experience would be useful
f) Definition of project target beneficiaries was raised at the workshop e.g. definitions of small-scale, poor, vulnerable groups etc. It would be useful to review national institutional criteria for these, as well as other agencies e.g. the ADB, SEAFDEC
g) Delivery of HACCP skills and related capacities to farmers need to be further investigated. Especially disturbing is the report during the meeting, of farmers switching to use of Sodium Cyanide to destroy predators
h) A farmer-directed financial analysis tool of the recommended culture technology is needed, building on the "Species Culture Profiles" developed by SEAFDEC that integrated biology, rearing, feeding, disease and financial analysis for culture species. This can be developed through a combination of SEAFDEC and WorldFish initiatives (with computer programming inputs perhaps provided by WorldFish)
i) Inclusion of Gender and family issues could be considered in the next survey of farms; or as a student project.

Logical Framework

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS (OVI)	MEANS OF VERIFICATION (MOV)	IMPORTANT ASSUMPTIONS
Goal: Increase the income and volume of production of small-scale milkfish operators engaged in grow-out operation and create livelihood for new operators in fry production and milkfish processing	• Percent increase in income of milkfish operators over baseline • Percent increase in volume of milkfish traded domestically over baseline • Increase in no. of people involved in milkfish operation over baseline	• Baseline survey vs. Impact survey - Operators survey - Cost and return data	• Farmer cooperators adopted the piloted technologies • Project funds released on time to support piloting activities
Purpose: 1. To pilot test recommended production and processing technologies for future replication in other parts of the country	• No. of farmers using the pilot-tested technologies • Places/areas where the pilot-tested technologies are adopted	• Farm record keeping forms • Process documentation of the piloted technologies	• Cooperators for the three piloted technologies (nursery, grow-out and processing) will finish the testing phase of the project
2. To identify constraints and opportunities to help promote the growth of the milkfish industry	• List of constraints that hinder growth of the industry • List of opportunities that promote the growth of the industry	• Published and unpublished literature on the milkfish industry • Key informant interviews of researchers, extension workers, milkfish operators	
3. To formulate an industry development plan/road map for adoption by the poor and small-holder milkfish operators	• Road map for dissemination of selected milkfish technologies	• Integrated results of project studies on policies, technical, institutional, environmental and socio-economic aspects of the milkfish industry	
Outputs: **For objective 1** 1.1 Report on the evolution of the milkfish industry in the Philippines with emphasis on policies, institutions (e.g. market, credit, extension, research, organizations), technology and trade	1.1 Inventory/documentation of various milkfish production and processing technologies 1.2 A review of the historical and evolutionary trend of policies in the milkfish industry 1.3 A review of the historical and evolutionary trend of institutions (market, credit, extension, research) in the milkfish industry 1.4 A review of historical and evolutionary trend of trade in the milkfish industry	• Published/unpublished literature on milkfish technologies and practices as well as institutions and policies that provided support to the milkfish industry • Key informant interviews of BFAR, SEAFDEC, PCAMMRD, UPV researchers, extension workers, and/or administrators as wells as milkfish policy makers • BFAR, BAS, Foreign trade statistics	• Availability and accessibility of relevant documents/literature to research staff

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS (OVI)	MEANS OF VERIFICATION (MOV)	IMPORTANT ASSUMPTIONS
For objective 2 2.1 Report of past and present policies, institutional and socio-economic factors affecting the Philippine milkfish industry	2.1.1 list/database of policies and institutions pertaining to milkfish aquaculture and post-harvest operations 2.1.2 review of policies, socioeconomic factors and institutions (market, credit, extension, research) that has helped or hindered the adoption of milkfish production and processing technologies, and the growth of the milkfish industry as a whole	• Published and unpublished policy and socioeconomic studies on the milkfish sector • Key informant interview (KI) of the municipal planning & development offices of the four project sites • KI of SB members of the four project sites who chairs the SB committee on agriculture • KI of the MAO of the four study sites • Focused group discussions (FGD) with fishpen & fishpen operators in the 4 project sites • Fishery Administrative Orders (FAOs) and Repubic Acts • Operators survey	• Availability and accessibility of documents/literature to research staff
2.2 Report documenting/ identifying the constraints and opportunities to technology adoption	2.2.1 identified constraints and opportunities to technology adoption	• Results of operators survey (adoption study) • Published and unpublished literature on milkfish technology adoption	
2.3 Proposed credit schemes for poor milkfish operators for possible funding by Quedancor, LandBank or other lending institutions	2.3.1 number and type of credit schemes developed	• Survey results • Published and unpublished literature on case studies of small-scale credit programs	
For objective 3 3.1 Report on milkfish production, supply and demand requirement in local and foreign markets	3.1.1 milkfish supply and demand requirement in local and international markets examined	• Published and unpublished literature on milkfish production, marketing and trade • BFAR production data	
3.2 Analysis of macroeconomic factors affecting the progress of the Philippine milkfish industry	3.2.1 review of macroeconomic policies which affected milkfish aquaculture directly or indirectly	• Published and unpublished policy and socioeconomic studies on the milkfish industry	

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS (OVI)	MEANS OF VERIFICATION (MOV)	IMPORTANT ASSUMPTIONS
For objective 4 4.1 Assessment of the role of research and technology transfer in the development of the Philippine milkfish industry	4.1.1 profile of milkfish research and extension programs in the country by research institution and by research area 4.1.2 classification of developed technologies into "young" and mature technologies 4.1.3 relationship of growth in milkfish industry and RD&E efforts of the private and public sectors	• Completed and on-going researches on the milkfish industry of different research institutions • Published and unpublished literature on RD&E in the milkfish industry • KIs in research institutions to identify constraints and opportunities in research and technology transfer	
For objective 5 5.1 Manual/handbook on milkfish production and post-harvest technology profiles	5.1.1 number of technology profiles developed by type of technology (production and post-harvest)	• Published and unpublished literature on milkfish production and post-harvest technologies • Operators survey	
For objective 6 6.1 Pilot-scale dissemination of prioritized technologies	6.1.1 no. of milkfish operators trained on production 6.1.2 no. of residents trained on processing 6.1.3 no. of milkfish operators who continuously adopted recommended technologies	• List of identified technologies for pilot-testing (from SEAFDEC)	
6.2 Inclusion of the analysis on the socio- and economic viability and environmental sustainability of the pilot-tested technologies	6.2.1 measured socio-economic indicators for technological viability 6.2.2 measured environmental indicators for technological sustainability	• Research reports • Monitoring and evaluation reports • Water-quality monitoring reports • Cooperators survey • Farm record keeping forms	
6.3. Industry development plan road map formulated	6.3.1 industry development road map	• Research outputs of the study	
Activities: **For objective 1:** 1.1.a conduct key informant interviews of BFAR, SEAFDEC, PCAMMRD, UPV researchers, extension workers, and/or administrators as wells as milkfish policy makers	**Inputs:** Collaborators: UPV & SEAFDEC (Year 1)		

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS (OVI)	MEANS OF VERIFICATION (MOV)	IMPORTANT ASSUMPTIONS
1.1.b compilation and review of published/ unpublished literature on milkfish technologies and practices as well as institutions and policies that provided support to the milkfish industry			
1.1.c secondary data collection (BFAR, BAS, Foreign Trade Statistics)			
1.1.d data analysis and report writing			
For objective 2: 2.1.a secondary data collection and review of studies on policies, socioeconomic factors and institutions (market, credit, extension, research) affecting the milkfish industry	Collaborators: UPV (Year 1)		
2.1.b conduct KI of personnel of the municipal planning & development offices, SB members who chair the SB committee on agriculture and MAO in the four project sites			
2.1.c FGD with fishpen & fishpen operators in the 4 project sites			
2.1.d data analysis and report writing			
2.2.a review of published and unpublished literature on milkfish technology adoption	Collaborators: WFC (Year 1)		
2.2.b conduct operators survey to identify constraints and opportunities to technology adoption			
2.2.c data entry and validation			
2.2.d data analysis and report writing			

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS (OVI)	MEANS OF VERIFICATION (MOV)	IMPORTANT ASSUMPTIONS
2.3.a review of published and unpublished literature on case studies of small-credit programs	Collaborators: WFC (Year 1)		
2.3.b conduct operators surveys concerning credit needs, requirements, problems			
2.3.c data entry and validation			
2.3.d data analysis and report writing			
For objective 3: 3.1.a secondary data collection and literature review on milkfish production, marketing and trade	Collaborators: UPV (Year 1)		
3.1.b data analysis and report writing			
3.2.a secondary data collection and literature review on macroeconomic studies on the milkfish industry	Collaborators: UPV (Year 1)		
3.2.b data analysis and report writing			
For objective 4: 4.1.a secondary data collection on public and private research program profiles	Collaborators: SEAFDEC (Year 1)		
4.1.b secondary data collection from research institutions on completed and on-going researches on the milkfish industry			
4.1.c conduct KIs in research institutions to identify constraints and opportunities			
4.1.d data analysis and report writing			
Objective 5: 5.1.a collection, organization and analysis of baseline information on available technology in milkfish culture and processing thru review of published materials	Collaborators: SEAFDEC & BFAR-NIFTDC (Year 1)		

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS (OVI)	MEANS OF VERIFICATION (MOV)	IMPORTANT ASSUMPTIONS
5.1.b Conduct field visits to validate and update secondary findings (field visits to milkfish hatcheries, nurseries, brackishwater ponds, fishpens, and fish cages)			
5.1.c Interview milkfish operators and technicians			
5.1.d Data analysis and write-up of manual/handbook			
6.1.a development of framework for pilot testing of technologies targeted to poor and small-holder operators	Collaborators: WFC & BFAR-NIFTDC (Year 1)		
6.1.b identify the pilot sites for technology intervention	Collaborators: WFC & BFAR-NIFTDC (Year 1)		
6.1.c identify and prioritize technologies for dissemination and adoption by smallholder farmers	Collaborators: SEAFDEC & BFAR-NIFTDC (Year 1)		
6.1.d selection of cooperators (consultation with and screening of prospective farmer cooperators, operators and processors	Collaborators: BFAR-NIFTDC (Year 1)		
6.1.e awareness seminar, educational tour, etc.)	Collaborators: BFAR-NIFTDC (Year 1)		
6.1.f preparation of training modules/materials	Collaborators: BFAR-NIFTDC (Year 1)		
6.1.g training on milkfish production and processing technology	Collaborators: BFAR-NIFTDC (Year 1)		
6.1.h conduct monitoring, and recordkeeping of activities of project cooperators	Collaborators: BFAR-NIFTDC & WFC (Year 1 & 2)		
6.1.i Conduct a cooperator's survey to evaluate the socio-economic condition of the cooperators	Collaborators: WFC & BFAR-NIFTDC (Year 1)		
6.1.j Conduct of impact survey	Collaborators: WFC & BFAR-NIFTDC (Year 3)		

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS (OVI)	MEANS OF VERIFICATION (MOV)	IMPORTANT ASSUMPTIONS
6.2.a Obtain list of milkfish operators in selected pilot sites	Collaborators: BFAR-NIFTDC (Year 1)		
6.2.b Design of survey instrument (one questionnaire which includes information for technology adoption study, credit study and financial viability study)	Collaborators: WFC (Year 1)		
6.2.c pre-testing of questionnaire for operators survey	Collaborators: WFC & BFAR-NIFTDC (Year 1)		
6.2.d training of enumerators	Collaborators: WFC (Year 1)		
6.2.e conduct of baseline survey in the community of the pilot sites to gather socio-economic & demographic information regarding the status of milkfish farmers relative to other livelihood sectors in the area	Collaborators: WFC & BFAR-NIFTDC (Year 1)		
6.2.f conduct milkfish operators survey	Collaborators: WFC & BFAR-NIFTDC (Year 1)		
6.2.g identification of sites for water quality monitoring	Collaborators: BFAR-NIFTDC (Year 1)		
6.2.h regular collection of soil and water samples for laboratory analysis	Collaborators: BFAR-NIFTDC (Year 1 & 2)		
6.2.a Consolidate all reports to develop industry road map	Collaborators: BFAR-NIFTDC (Year 3)		
6.2.b Communication of results to policy makers and RD&E agencies through conduct of workshop	All Collaborators (Year 3)		