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DETERMINATION OF WATER FEES FOR FISH CULTURE AND IRRIGATION FOR PAOAY LAKE NATIONAL PARK[1]

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DETERMINATION OF WATER FEES FOR FISH CULTURE AND IRRIGATION FOR PAOAY LAKE NATIONAL PARK[1]

ENRAP IV TECHNICAL PAPER

by

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Executive Summary

Paoay Lake National Park in Ilocos Norte province is one of the initial components of the National Integrated Protected Areas System in accordance with RA 7586. It covers 387.5 ha with five *barangays* sharing its coastline. The lake is a natural body of freshwater without tributaries. It is shallow with its deepest part at 7.5 m and the rest at 3-5 m. It also provides irrigation water to over 300 crop farmers. Until recently, a golf course used to source its irrigation water from the lake. This stopped as it has been blamed for the considerable reduction in the water level which allegedly resulted in fish kills. A recent phenomenon in the lake is the proliferation of fish cages for the culture of tilapia (primarily, *O. niloticus spp.*). To control its expansion, the Protected Area Management Board divided the lake into management zones and set a ceiling of 2 ha of fish cages for each coastal *barangay*. The lake provides services to various users, some of which are conflicting.

As a protected area, a multi-sectoral Protected Area Management Board (PAMB) oversees the management and development of the lake. It is also the forum for resolving conflicts. The de-facto arrangement in the management of the lake is the observance of the critical water level. Drawing of water for the irrigation of crops and for other purposes is allowed only if the water level is expected to be above the critical level. Otherwise, it is not permitted.

One of the issues that surfaced in the management of Paoay Lake National Park is financing its management and development. Towards this end, the DENR and PAMB are encouraged to generate revenues from possible sources since mechanisms for such activities are already set forth in the NIPAS Act. One of the possible sources of revenues is from fees for the use of resources within the protected area.

The primary objective of this study was to determine appropriate fees to be charged against the users of the waters of the lake. The focus was on the owners of fish cages and crop farmers. Specifically, the study described fish cage aquaculture in Paoay Lake as well as crop farming in areas served by the lake. It evaluated the costs and earnings of lake aquaculture and crop farming. The study also served as a pilot test of the proposed fee system guidelines that were formulated to provide sources of revenues for protected areas.

A team composed of representatives from the PAWB, Planning and Policy Studies Office of the DENR, Environmental Management and Protected Areas Service in DENR-Region I, and the ENRAP was formed for this study. Structured survey instruments for fish farmers and crop farmers were pre-tested and finalized. For the survey of fish farmers, complete enumeration was done for those who have completed at least one cropping. For crop farming, key informants were interviewed.

Fish Cage Aquaculture

At the time of the survey, there were 23 fish farmers that had completed at least one cropping. The small number of fish cages in Paoay Lake produced almost three tons of tilapia in 1997. The average production per cage per cropping was from 90-98 kg. Most of the output is sold in the market fetching an average farm gate price of PhP66.8 per kg. Total value of production is PhP6,162 per cage per crop while the cost of production is estimated at PhP5,963. Average gross profit is placed at PhP199 per fish cage per cropping. From these results, resource rent or the contribution of the lake for aquaculture was negative. This was attributed to the very low survival rate of tilapia fry/fingerling and the fact that the practice is fairly new.

A separate analysis of data on farmers who earned positive profits and sensitivity analysis of survival rates indicate that there is a big potential of fish cage aquaculture in the lake. Average gross profit for this group was over PhP3,000 per crop per cage. Improving survival rates of fry/fingerling to a level comparable to other areas will increase gross profit to PhP8,886 per crop per cage. The economic rent, however, is still negative even for this group of farmers. It is only when survival rates are increased that rents become positive.

Crop Farming

Representatives of the two irrigation associations using Paoay Lake were interviewed. The two irrigation associations have been in existence for quite some time now. The Baay Irrigation System was set up in 1988, while the Diaz Irrigation in Pasil has been in existence since the early 1900s. In Pasil, farmers do not pay a fixed fee for the use of the irrigation system. Farmers, however, give donations for maintenance and repair or they themselves undertake the repairs. Throughout the country, irrigation service fees cover only the cost of the system while irrigation water is free.

Four main crops are planted in the area: *palay*, garlic, corn, and mongo. *Palay* requires the greatest frequency of irrigation per hectare per cropping (29 times). The three other crops have lower requirements. Farmers source their irrigation water either from the lake or from the groundwater. An analysis of costs and earnings by source of irrigation water shows that farmers using the Lake enjoyed higher average gross revenues and lower average costs, thus garnering greater average gross profits. The estimated resource rents, however, were quite low for both subsistence crops (*palay* and corn) and even for commercial crops (mongo and garlic). It is noted, however, that the year covered was a particularly bad year for garlic crops due to El Niño.

A sensitivity analysis was conducted for garlic production to determine if under normal conditions, a more reasonable estimate of resource rent could be computed. Studies show that yields per hectare for garlic would range from 8 to 12 tons per hectare and resource rent could go up to PhP22,609 per hectare per year.

Recommendations

From the foregoing, the study recommends the following: For fish cage aquaculture, the PAMB could either maintain the current fee of PhP 200 per cage per year or increase it to PhP250 per cage per year in 1999 and then eventually to PhP300 in year 2000. This scheme will force the fish cage farmers to improve their operations particularly in lowering mortality rates of fry/fingerling. Some extension support from the Bureau of Fisheries and Aquatic Resources should be sought in the provision of stocking materials so farmers need not travel far. For crop farming, it is recommended that no fees be charged for subsistence crops like *palay* and corn but a fee may be imposed on commercial crops, primarily garlic. The PAMB, however, should prioritize the allocation of water to garlic during its growing season.

The PAMB should also make clear the minimum water level it has adopted. It may have to undertake consultations with all stakeholders not only in determining the exact minimum water level, but also on the manner of relaying the information to them. Related to this, the setting of a minimum water level as outlined in the Water Code implies the maximization of benefits to be derived from any body of water. The current study recognized the need for an analysis of the optimal allocation of water, but so far, it has only assessed the benefits and costs of the different uses of water. As more information is generated particularly on the hydro-geology of the lake, the study may be extended to assess the best combination of uses for Paoay Lake. Implied in this extension is a determination of the optimal level of water for the lake.

1. *Background*

1.1 *Description of the Study Area*

Paoay Lake National Park was established in 1969 through Republic Act (RA) 5631, which was amended in 1978 with the issuance of Presidential Decree 1554. It is, therefore, one of the initial components of the National Integrated Protected Areas System (NIPAS) in RA 7586. As a protected area, the following are being sought: maintenance of ecological processes and life support systems, preservation of genetic diversity, and the sustainable use of resources found therein. To ensure these, its legislative declaration as a protected landscape is being pushed.

The proposed Paoay Lake Protected Landscape is located in the municipality of Paoay in Ilocos Norte province in Northern Luzon (*Figure 1*). It covers 387.5 ha with five *barangays* sharing its coastline, namely: Suba, Sungadan, Nanguyudan, Pasil and Nagbacalan. The climate is type I characterized by pronounced wet and dry seasons. The surrounding terrestrial area of the lake is flat to moderately sloping. The lake, on the other hand, has its deepest part at 7.5 m while the shallow area ranges from 3 - 5 m.

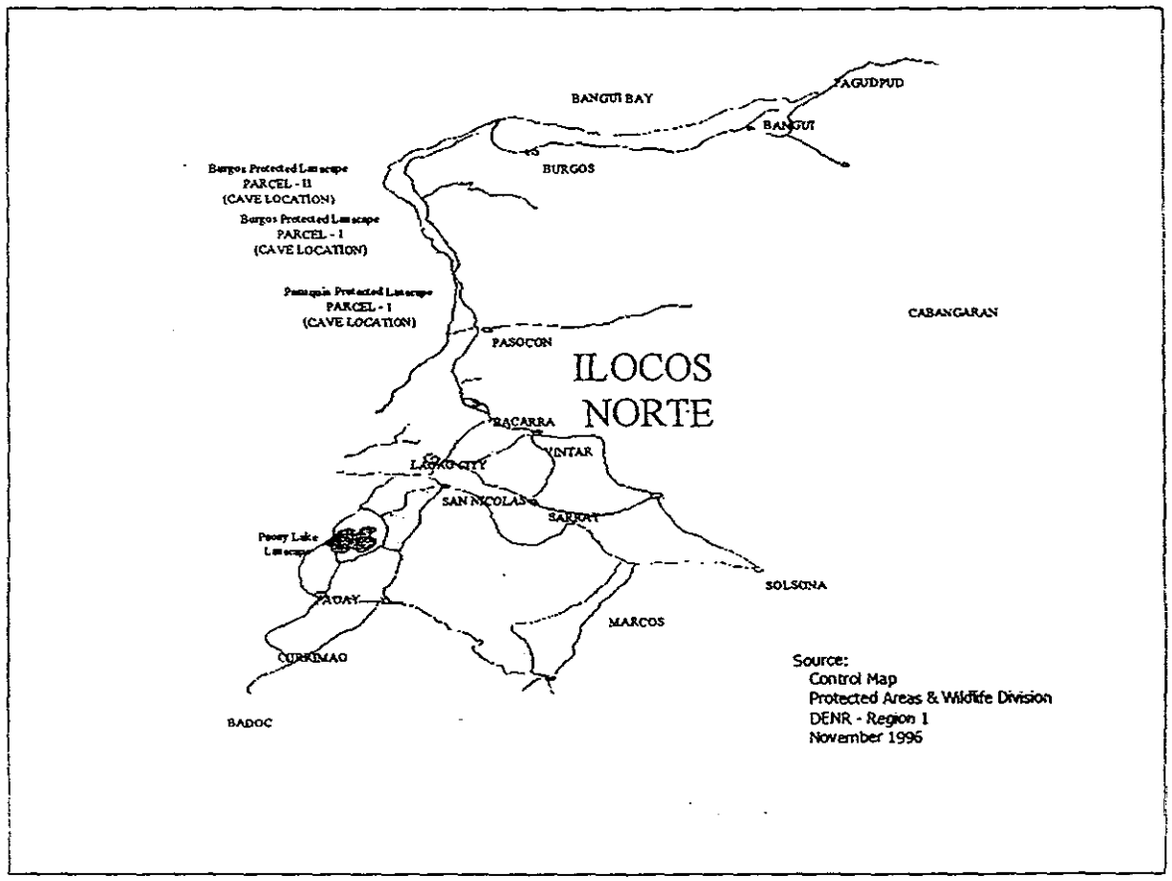

Figure 1. **Paoay Lake, Paoay, Ilocos Norte**

In 1995, the total population of Paoay was pegged at 21,253 comprised of 4,231 households. About 58 households live 50 - 100 meters from the lake's highest water level. This area is covered by the proposed buffer zone. Major livelihood activities in Paoay include fishing in the lake; livestock raising; and farming of palay, corn, garlic, beans, legumes and vegetables. Farm holdings per household range from 0.075 - 2 hectares. The low household cash income of PhP500 to PhP1,000 per month is augmented by the sale of crops and livestock and remittances from relatives working outside the country.

1.2 Management Structure and Issues

The waters of Paoay Lake support the economy of the town. It provides irrigation water to crop farmers in nearby *barangays* through two irrigation facilities. One facility was reportedly constructed prior to the First World War. Until recently, a golf course used to source its irrigation water from the lake. This stopped as it has reduced the water level considerably to the detriment of other users. A recent phenomenon in the lake is the proliferation of fish cages for the culture of tilapia (primarily, *O. niloticus spp.*). Thus, the lake provides services to various uses, some of which are potentially conflicting.

As a protected area, a multi-sectoral Protected Area Management Board (PAMB) oversees the management and development of Paoay Lake. A management plan was instituted that divided the lake into management zones to optimize its utilization with minimal environmental impact. One of the issues tackled is the proliferation of aquaculture activities. To regulate the proliferation of fish cages, a PAMB resolution setting a ceiling of 2 hectares of fish cages for each coastal *barangay* was adopted.

The lake is a natural body of freshwater without tributaries. Its water source is from ground water flow and surface run-off from the surrounding hills during rainy season. Water quality assessment conducted in the area reveals that a decrease in water level increases water temperature of the lake thereby affecting aquatic organisms thriving therein. Average temperature during the summer reaches 32.3°C. Thus, to a certain extent, the drawing of water for the irrigation of crops has negative impacts on fish farming, particularly during the dry months. If the water level of the lake falls below a critical level, temperature would further increase causing stress to cultured and wild fish which results in fish kills.

1.3 Legal Considerations

The de-facto arrangement in the management of the lake is guided by the observance of the critical water level. The drawing of water for the irrigation of crops is allowed only if water level is expected to be above the critical level. Otherwise, it is not permitted. This arrangement is consistent with the provisions of the Water Code (PD 1067) and its Implementing Rules and Regulations (NWRB, n.d.) on maintaining minimum water levels in lakes. The setting of such level considers the following:

a) adverse effects on legal appropriators;
b) priorities that may be altered on the basis of greater beneficial use and/or multi-purpose use;
c) protection of the environment, control of pollution, navigation, prevention of salt drainage, and general public use; and,
d) other factors relevant to the situation.

With respect to fisheries, the minimum water level is that which will not adversely affect the existing fish habitat. As provided for in the Water Code, the minimum water level will be set by the National Water Resources Council in consultation with the Bureau of Fisheries and Aquatic Resources.

The amount of water available for crop irrigation is limited as it is subject to the minimum lake water level[2] Similarly, the area allocated to fish cages is also limited to 2 ha per *barangay* or a total of 10 ha for the entire lake. The PAMB has already set annual fees for fish culture at PhP200 per 150-sq m of cage. On the other hand, the irrigation fees that have remained at their historically low level and hardly ever collected are for the maintenance of the system. It does not include any value of the contribution of water in crop production.

1.4 ENRAP Assistance

One of the issues that have surfaced in the management of Paoay Lake National Park, or any other protected area, is the financing of its management and development. Towards this end, the DENR and PAMB are encouraged to generate revenues from possible sources since mechanisms for such activities are already set forth in the NIPAS Act. One of the possible sources of revenues is from fees for the use of resources within the protected area.

The Protected Areas and Wildlife Bureau (PAWB), with assistance from the Environmental and Natural Resources Accounting Project (ENRAP), drafted the "Guidelines and Principles in Determining Fees for Access to and Sustainable Use of Resources in Protected Areas" (*Appendix A*). The draft Administrative Order outlines suggested methods for estimating the different types of fees that may be collected including entrance fees, park user fees, resource user fees, development fees, and royalty.

2. Objectives of the Study

The primary objective of this study is to determine appropriate fees to the users of the waters of the lake. The focus will be on the owners of fish cages and crop farmers. Specifically, the study will describe fish cage aquaculture in Paoay Lake as well as crop farming in areas served by the lake. It will evaluate the costs and earnings of lake aquaculture and crop farming. The study will also pilot-test the proposed fee system guidelines, particularly the methods for computing resource user fees.

3. Methodology

The management issues and legal considerations surrounding the utilization of the waters of Paoay Lake provided the framework for this study. A complex framework may be formulated which will determine the optimal allocation of the waters of the lake across two competing uses, namely crop irrigation and fish cage aquaculture. The advantages of this approach include the following:

a) economic assessment of the legal minimum water level;
b) basis for maximizing the benefits derived from lake waters; and,
c) best basis for water pricing.

However, this approach is data intensive and requires information not readily available and expensive to collect.

A simpler approach may be adopted which assumes that a minimum water level in the lake has already been determined[3] and is the overriding consideration. Drawing of water for irrigation purposes will only be allowed as long as the water level does not fall below the minimum level. The considerations for setting this level are already discussed above. Verification with the National Water Resources Board revealed that there is not a uniform guideline in setting the minimum water level in lakes. This level is set by local government units or management councils/boards overseeing the management of each lake.

The determination of the price of using the lake for aquaculture and agriculture could be based on the resource rent, i.e., the excess profits derived from the two activities. Resource rent as a basis for pricing of natural resources particularly for fisheries is embedded in the Fisheries Code (RA 8850) of 1998.

It may be interpreted that under the simpler management approach, water for crop irrigation entails no foregone income, as it does not affect other users of the lake. However, for crop farmers, water from the lake has a positive value. Such value depends on the presence or absence of alternative sources of irrigation water for each farmer. For fish farmers, the value of the lake is its contribution to fish production as a habitat, which value may be indicated by the resource rent.

3.1 The Concept of Resource Rent

The following quote from Hartwick and Oleweiler (1998) provides a good definition of economic or resource rent:

> "Rent is a surplus - the difference between the price of the good produced using a natural resource and the unit costs of turning that natural resource into the good. The unit costs include the value of labor, capital, materials, and energy inputs used to convert the natural resource into a product. What remains after these factor inputs are netted out is the value of the natural resource itself - the land, water... fish, minerals, forests, and environmental resources such as air and water."

The above definition of resource rent is estimated from production costs and earnings using the following formulas:

$$ER = GR - CP \quad (1)$$

$$CP = W + RM + TrC + \Sigma K_i (\delta_i + r) + r^*WC \quad (2)$$

where
- ER = economic rent
- GR = gross revenues
- CP = costs of production
- W = wages
- RM = raw materials
- TrC = transport costs
- K_i = fixed capital investments
- δ_i = depreciation rate of K_i
- r = discount rate
- WC = working capital

The depreciation rate is specific to each type of investment and depends on the economic life of that particular fixed investment being measured. On the other hand, the discount rate can be

represented by the official social discount rate used in government project evaluation procedures. At present, this rate is 12 - 15 percent. Finally, working capital refers to the variable expenses borne by the producer, i.e., wages, raw material expenditures, and operating and maintenance expenses.

In the proposed fee system guidelines, a formula for computing the resource or economic rent is included. The draft guidelines propose that the PAMB may not opt to collect the entire resource rent, although it is by nature, a surplus. The portion of the surplus going to farmers is expected to serve as an incentive to innovate in their farming activities. In fish farming, this could be in the form of using better breeds of fish, sex reversal, or genetic manipulation to increase yields and profits.

For crop farmers, the opportunity cost of land was not explicitly included in the analysis. However, for tenanted land, production costs and earnings are computed from the point of view of the tenant, and production sharing arrangements with the landowners are reflected in the former's production costs. Thus, the resulting rent estimates refer only to the cost of water to the crop farmer.

To validate rent estimates, the concept of willingness to pay (WTP) is used. WTP refers to the maximum amount that the respondents are willing to pay should bidding rights be required to access the Lake. For fish farmers, the bidding rights refer to the right to operate fish cages in the Lake. For crop farmers, the bids refer to the right to access the waters of the Lake for irrigation purposes. The average WTP figures are used as proxy for the value that farmers and fish cage operators attach to the Lake. These, in turn, are compared with the rent estimates derived from production data.

Particularly for crop farmers, the costs of alternative irrigation systems are likewise used to compare with rent estimates. In the event that access to the Lake for irrigation purposes is prohibited, alternative irrigation schemes will need to be put up. The costs of doing so can be viewed as an approximation of the value of the waters of the Lake for irrigation, thus can be comparable to the estimated resource rent.

3.2 Review of Experience

This section discusses the schemes currently employed in setting fees for fish pens/cages in major freshwater lakes in the country. It also reviews the legal guidelines in setting irrigation fees, in particular the one set by the National Irrigation Administration (NIA).

3.2.1 Fees for Fish Pens/Cages

The major freshwater lakes in the country are now being used for fish pen/cage operations to supplement dwindling capture fisheries production. Fish cage/pen aquaculture was first practiced in Laguna Lake. The technology spread to other lakes such as Taal, Sampaloc, Sebu, Bulusan, and Paoay. For the freshwater lakes in Laguna, *Table 1* shows that the allotted area for fish pens/cages ranges from 9.8 - 14.3 percent of the lake area. However, except for Laguna Lake, the actual area of fish pens/cages went beyond these limits.

Table 1. Characteristics of Freshwater lakes in Laguna, 1992

Lake	Area (ha)	Average Depth (m)	Fish Pen/Cage Area		Alloted Area/ Total Area (%)
			Alloted Area	Actual Area	
Laguna Lake	90,000	2.8	10,000	5,742.19	11.11
Sampaloc Lake	105.0	27.6	15.0	28.734	14.29
Lake Pandin	24.0	61.75	2.4	2.295	10.00
Palakpakin Lake	47.98	7.7	6.0	16.057	12.51
Lake Bunot	29.6	23.0	3.5	16.4**	11.82
Calibato Lake	43.0	156.0	6.0	19.44	13.95
Lake Yambo	30.5	38.0	3.0	6.248	9.84
Tadlak Lake	22.6	---	3.0	3.8	13.27

** 1991 Survey

Sources: a)"San Pablo City Lakes", Lake Management Division, Laguna Lake Development Authority

b) Personal Interview with Ms. Maristel Espiritu, Officer-In-Charge, Lake Mgmt. Division, LLDA

Information on fees for fish pens is available only for Laguna Lake. The Laguna Lake Development Authority (LLDA) now implements a bidding system with a minimum bid of PhP 5,000 per ha per year. Blocks are offered periodically to the public for bidding. Several such offers were made in March, 1998 and the winning bids are summarized by municipality in *Table 2.* The lowest winning bid is PhP5,000 although this reached PhP20,001 per ha per year. There are location differences with the weighted average winning bids ranging from PhP5,050 to PhP13,996 per hectare.

Table 2 **Summary of Winning Bids for Fish Pens in Laguna Lake, March 1998 Bidding**

Municipality	Total Area	No. of Farms	Winning Bid Per Ha (in Pesos)		
			Average	Lowest Bid	Highest Bid
Binan	15.00	3	6,673	5,000	8,000
Binangonan	158.24	6	11,189	5,020	19,001
Calamba	50.00	1	5,500	5,500	5,000
Cardona	110.00	4	5,551	5,030	6,000
Jala-Jala	410.96	9	10,884	5,000	16,000
Muntinlupa	10.00	2	5,500	5,100	7,100
Pililla	275.00	10	11,675	6,000	15,015
San Pedro	5.00	1	5,500	5,500	5,500
Sta. Rosa	5.00	1	5,050	5,050	5,050
Taguig	55.00	2	13,996	6,789	20,001
All Municipalities	1,094.20	39	10,348	5,000	20,001

Sources: a) "Bidding of Open Fishpen Areas, List of Winning Bidders", March 05, 1998; LLDA
b) "Bidding of Open Fishpen Areas, List of Winning Bidders", March 27, 1998; LLDA

3.2.2 Irrigation Fees

Irrigation systems in the country are constructed through the NIA but its management is either turned over to an association of farmers or maintained by the NIA. Irrigation service fees (ISF) are set differently. In a communal irrigation system the association of farmers enters into an agreement with the NIA. Farmers amortize only the direct cost of the irrigation system. ISF are based on the cost of the system, the amortization period and the number of users but with a prescribed minimum irrigation fee. On the other hand, the ISF for national irrigation systems managed by NIA are determined according to the irrigation scheme, which are diversion, reservoir-backed and pumping schemes.

The new set of ISF imposed by the current administration is compared with the old set (*Table 3*). In both the communal and national irrigation systems, the new set of fees is generally lower compared to the old set of fees. This is to encourage food production being a priority of the current administration. It is also a socialized or a progressive scheme with rates increasing with the size of the farm.

Table 3 **Irrigation Fees for National and Communal Irrigation Systems**

Irrigation Scheme	Old Rates		New Rates (a)	
	Wet Season	Dry Season	Wet Season	Dry Season
A. National Irrigation Systems				
1. Diversion Schemes				
Rice (cavans/ha)	2	3	1, 2, 3 (b)	1.5, 3.0, 4.5 (b)
Other crops (cavans/ha)	60% of rates for rice		60% of rates for rice	
Annual crops (cavans/ha/yr)	5		8	
2. Reservoir-Backed Schemes				
Rice (cavans/ha)	2.5	3.5	1.5, 2.5, 4.0 (b)	2.0, 2.5, 5.0 (b)
Other crops (cavans/ha)	60% of rates for rice		60% of rates for rice	
Annual crops (cavans/ha/yr)	6		9	
3. Pumping Schemes				
Rice (cavans/ha)	6-14	6-16	Same rate as in B but the actual cost of power/energy is pro-rated to farmer beneficiaries.	
Other crops (cavans/ha)	60% of rates for rice			
Annual crops (cavans/ha/yr)	12-30			
B. Communal Irrigation Systems				
Minimum Ammortization Payment (cavans/ha/yr)	2		1.0	

(a) based on Administrative Order No. 17 signed August 31, 1998 "Adoption of a Socialized Irrigation Service Fee Communal Irrigation Systems (CIS) Amortization Rates, and Other Urgent Interim Measures to Cushion the Effects of El Nino and the Asian Currency Crisis in the Agricultural Sector, Particularly to Benefit Irrigation Farmer Beneficiaries"

(b) Fees are respectively for farms 2 has. and below, above 2 to 5 has., and more than 5 has.

The pricing of irrigation water is primarily driven by cost recovery of the irrigation development project and by the existing guidelines faced by NIA (Sosa, 1996). For instance, irrigation projects must have an economic internal rate of return of at least 15 percent. The irrigation service fees are the primary sources of funds or income of the NIA and the CIS. However, bill collection is generally low to cover all the costs of the project and its maintenance. Moreover, the rates are set to cover only infrastructure costs, hence are exclusive of the cost of water.

3.3 Field Work and Sampling Methodology

A team (*Appendix B*) composed of representatives from the PAWB, Planning and Policy Studies Office (PPSO) of the DENR, Environmental Management and Protected Areas Service (EMPAS) in DENR-Region I and the ENRAP was formed for this study. On January 12, 1998, the PAWB-PPSO-ENRAP team made a courtesy call to the Regional Technical Director (RTD) of EMPAS-Region I, and briefed him and his staff of the objectives of the study. The entire team (PAWB-PPSO-ENRAP-EMPAS, R1) then proceeded to the study site and presented the study during the PAMB meeting chaired by the EMPAS RTD. Upon approval of the conduct of the study by the PAMB, the team proceeded with activities leading to the survey of fish cage operators and farmers. The team also made a courtesy call to the Provincial Environmental and Natural Resources Officer (PENRO) in Ilocos Norte.

Structured survey instruments (*Appendix C*) for fish farmers and crop farmers were pre-tested and finalized. For the survey of fish farmers, complete enumeration was done for those who have completed at least one cropping. The breakdown of fish farmers by *barangay* is shown in *Table 4*.

The construction of fish cages was proceeding at a frenzied pace during the survey but only those that have sufficient data for the purposes of the study were interviewed. For the survey of crop farmers, a small number of representatives of two irrigation associations were interviewed.

Table 4 **Fish Cage Operators in Paoay Lake National Park**

A. NANGUYUDAN

NAME	GENDER	FISH CAGE NO.	AREA (SQ. M.)	DURATION	REMARKS
1. Dennis Dumlao	M	2	300	10-07-97 to 10-07-98	Resident
2. Santiago Abitong	M	1	150	-- do --	Outsider
3. Joseph Llapitan	M	3	450	-- do --	
		1	80	-- do --	Resident
4. Michael Llapitan	M	4	160	-- do --	-- do --
5. Junar Remigio	M	2	134	-- do --	-- do --
6. Oliver Cuaresma	M	3	450	-- do --	-- do --
7. Sonny G. Gonzales	M	3	450	-- do --	-- do --
8. Teodoro Padamada	M	2	300	-- do --	-- do --
9. Lydia Ventura	F	1	150	-- do --	-- do --
10. Pobrecito Miguel	M	1	150	-- do --	-- do --
11. Francisco Lanuza	M	1	150	-- do --	-- do --
12. Robert Bulong	M	4	416	-- do --	Outsider
13. Reynaldo Padamada	M	1	150	-- do --	Resident
14. Nestor Inay	M	3	450	-- do --	Outsider
15. Alex Fernandez	M	1	150	10-15-97 to 10-15-98	Resident
16. Alex Villanueva	M	2	300	-- do --	-- do --
17. Bernardino Tagatac	M	5	750	-- do --	-- do --
18. Ludivino C. Agresor	M	2	300	-- do --	DENR, PLNP Employee
19. Bernie Bajo	M	2	114	-- do --	Outsider
20. Bueno Bajo	M	2	146	-- do --	-- do --
21. Allan Pungtilan	M	1	72	-- do --	-- do --
22. Rudy Tomas	M	1	150	-- do --	Resident
23. Ruben Gonzales	M	2	300	-- do --	-- do --
24. Eddie Gutierrez	M	2	300	-- do --	-- do --
25. Ernesto Villanueva	M	3	450	-- do --	-- do --
26. Virgilio Diego	M	5	750	-- do --	Outsider
27. Maximo Verano	M	5	750	-- do --	PAMB Member
28. Vilma Gamoy	F	1	150	-- do --	Resident
29. Elvis Villanueva	M	2	300	10-15-97 to 10-15-98	Resident
30. Ernesto Ancheta	M	3	450	-- do --	-- do --
31. Albert Bagaoisan	M	5	750	-- do --	-- do --
32. Ferdinand Bagaoisan	M	5	750	-- do --	-- do --
33. Roque Aglupos	M	3	150	-- do --	Outsider
34. Orlando Salvador	M	1	150	-- do --	Resident
35. George Bulong	M	1	150	10-23-97 to 10-23-98	-- do --
36. Joseph Ramos	M	4	600	-- do --	-- do --
37. Amador Villanueva	M	3	450	-- do --	-- do --
38. Epigenio Bagaoisan	M	3	450	-- do --	Outsider
39. Jose Villanueva	M	1	70	-- do --	Resident
40. Ruben Cabel	M	2	300	-- do --	-- do --
41. Ernesto Lapitan	M	1	150	-- do --	-- do --
42. Ponciano Caluya	M	1	150	-- do --	-- do --
43. Mariano Puyaoan	M	1	150	11-03-97 to 11-19-98	Outsider
44. Jimmy Tanagon	M	5	750	11-19-97 to 11-19-98	-- do --
45. Edilberto Batoon	M	2	300	-- do --	Resident
46. Efren Dumlao	M	2	300	-- do --	-- do --
47. Orlando Cabela	M	1	150	-- do --	-- do --
48. Marcela Tagatac	F	1	150	12-09-97 to 12-09-98	-- do --
49. Ernesto Lapitan	M	1	150	-- do --	Resident/Additional
50. Rommel Ragus	M	2	300	-- do --	Resident
51. Dennis Dumlao	M	1	150	-- do --	Resident/Additional
52. Floriano Ventura	M	1	150	-- do --	Resident
53. Regie Cacayorin	M	1	150	-- do --	-- do --
54. Ruben Cabel	M	1	150	-- do --	Resident/Additional
55. Albert Cabel	M	2	300	-- do --	Resident
Sub-total		122	16642		

Table 4 cont'd.

NAME	GENDER	FISH CAGE NO.	AREA (SQ. M.)	DURATION	REMARKS
56. Orlando Cabel	M	1	150	-- do --	Resident/Additional
57. Adriano Bulong	M	1	150	-- do --	Resident
58. Rudy Guerrero	M	1	150	12-23-97 to 12-23-98	-- do --
59. Wilson Cabias	M	1	150	-- do --	-- do --
60. Magdalena Puyaoan	F	1	150	-- do --	-- do --
61. Bernesto Tagatac	M	1	150	-- do --	-- do --
62. Alex Villanueva	M	1	150	12-23-97 to 12-23-98	Resident/Additional
63. Reynaldo Padamada	M	1	150	-- do --	-- do --
64. Teodoro Padamada	M	1	150	01-22-98 to 01-22-99	-- do --
65. Ernesto Ancheta	M	1	150	-- do --	-- do --
66. Judith Bermudes	F	1	150	-- do --	Resident
67. Joseph Ramos	M	1	150	-- do --	Resident/Additional
Sub-Total		12	1,800		
Total		134	18442		
B. SUNGADAN					
1. Romeo Macalma	M	2	300	01-22-98 to 01-22-99	Resident
2. Irineo Macalma	M	3	450	-- do --	-- do --
3. George Bulong	M	3	450	-- do --	Outsider
Sub-Total		8	1,200		
C. SUBA					
1. Ismael Padayao	M	3	450	01-22-98 to 01-22-99	Resident
Grand Total		145	20,092		

SOURCE: Environmental Management and Protected Areas Staff, Department of Environment and Natural Resources-Region I

One big user of the lake for irrigation is Polar Peak Philippines, Inc., which was drawing 9,600 gallons of water per day from the lake for irrigation of its golf course. Upon verification with the firm's management and the PAMB, it was found out that the firm ceased using the lake recently. When the PAMB ruled that Polar Peak could not draw water during the summer, they decided to rely completely on groundwater sources through their deep well pumps.

4. *Results and Discussion*

This section presents the results of the survey and data analysis conducted for the two sets of resource users of Paoay Lake - the fish and crop farmers. Profiles of a typical fish and crop farmer using the lake were prepared. The next section deals with a description of farming activities, including the typical size of the farm area. For crop farmers in particular, the description covers both the existing irrigation systems and cropping patterns in the area. An analysis of costs and earnings, with the resulting gross profits, follows. Finally, the estimation of resource rent is shown. Although both sets revealed negative resource rents from the use of Paoay Lake, sensitivity analysis was performed for both sets to show how positive resource rents can be enjoyed.

4.1 Fish Farmers

4.1.1 Profile of Sample Respondents

At the time of the survey, there were 23 fish farmers that had completed at least one cropping. A fish crop is defined to include the complete cycle of maintenance of cage for stocking, actual stocking with fingerlings, feeding them until the fish grow to marketable size, and harvesting. Most of the operators are from the coastal *barangays* although the cages are concentrated in *Barangay* Nanguyudan (*Figure 2*). The average fish farmer is 39 years old, married, with at least a high school diploma, and is on the first or second year of fish cage farming (*Table 5*). There are those who have attended college or university. As fish farming is not a full-time activity, most have the time and opportunity to engage in other gainful activities such as crop farming or livestock raising, fishing in the open waters of the lake or work as an employee in government. With diversified livelihood activities, the average monthly income of the respondent reached PhP4,700 which is much higher than the reported average income for the entire municipality. Household income is higher than the respondent's own income by about PhP2,000 per month considering contributions from household members working locally or abroad.

Table 5 **Socio-Economic Characteristics of Paoay Lake Fish Cage Operators, Paoay Lake, Ilocos Norte 1997**

ITEM	NUMBER
1. Average Age (yrs.)	39
2. Civil Status (no.)	
Single	5
Married	17
Others	1
3. Educational Attainment (no.)	
Elementary Level	8
High School Level	7
Vocational Level	2
College Level	5
No Information	1
4. Average Monthly Income (in Pesos)	
Own Income	4,681
Household Income	6,782
5. Other Sources of Livelihood (no.)	
Crop Farming	8
Animal Farming	3
Capture Fishing	2
Government Employee	3
Others	4
None	3
6. Experience in Fishcage Culture	
1 yr. and below	10
2 yrs.	5
3 yrs.	2
4 yrs. and above	6

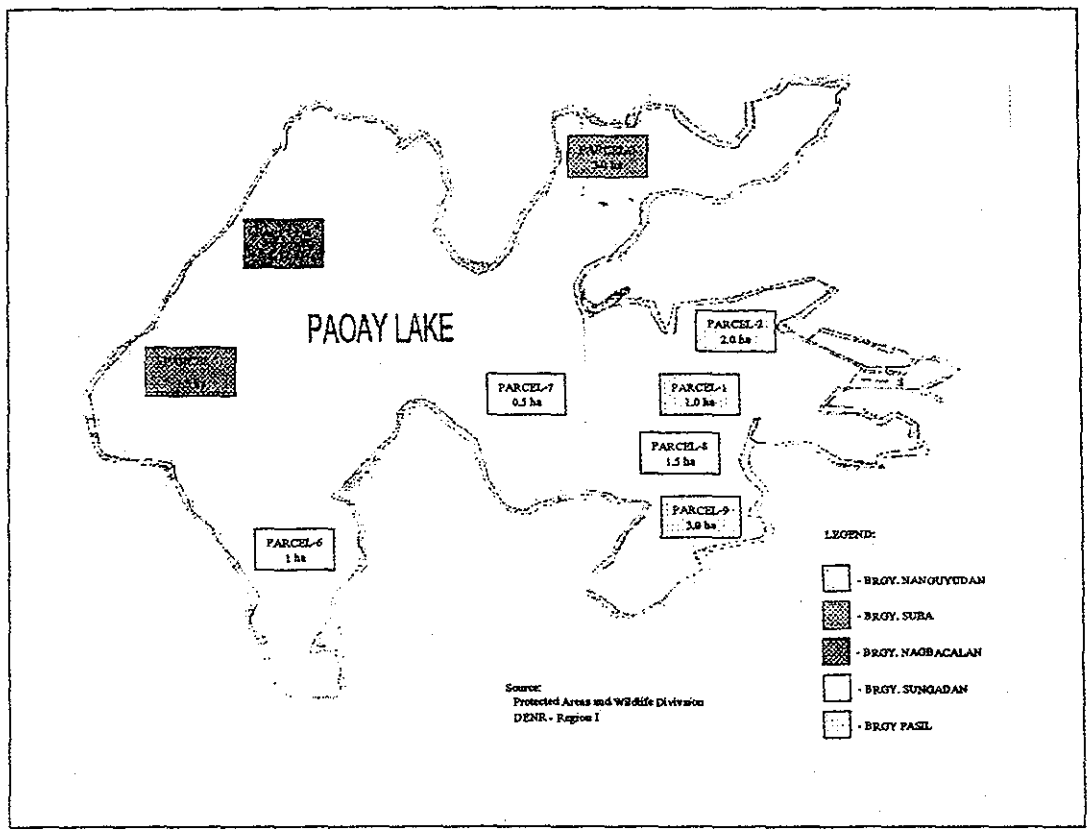

Figure 2 Allocation of Fish Cage Areas, Paoay Lake

During the same period, there were 59 cages in operation. Of the 23 fish farmers, only nine have one fish cage each (*Table 6*). Some farmers have up to five cages. The ownership distribution of fish cages has become an issue in Paoay Lake such that the PAMB limited subsequent farmers to a maximum of three each. Further, residents of the coastal *barangays* are given priority to the 2 ha allotted for fish cages. Non-residents are only allowed if the local residents are not able to fill in the total area.

Table 6 **Ownership Pattern of Paoay Lake Fish Cages, 1997**

No. of Fishcages Owned	Frequency	No. of Fishcages
1	9	9
2	1	2
3	8	24
4	1	4
5	4	20
Total No.	23	59
Average No. of Fishcages Per Operator		2.6

4.1.2 Description of Farming Activities

In response to the dwindling supply of fish production from open marine and fresh water the growing of fish in captivity evolved. In coastal areas, denuded mangrove forests were enclosed with dikes, and wild fry were allowed to enter and grow to maturity. Eventually, more sophisticated methods were developed to increase production. The technology was adapted in freshwater lakes through fish cages where it has been a thriving activity initially in Laguna de Bay. Today, fish cage culture is being practiced in most freshwater lakes in the Philippines, including Paoay Lake.

The typical fish cage in the lake measures 11.24 m by 9.69 m by 4.1 m and is illustrated in a simplified version in *Figure 3*. The average surface area is 109 sq m although the cultured fish thrive in 447 cu m of water. Aquaculturists argue that the relevant consideration in fish cage culture is the volume of water rather than the cage area as the fish thrives in the entire water column, not just on the water surface. Hence, water volume presents a better basis for regulating fish cages rather than surface area.

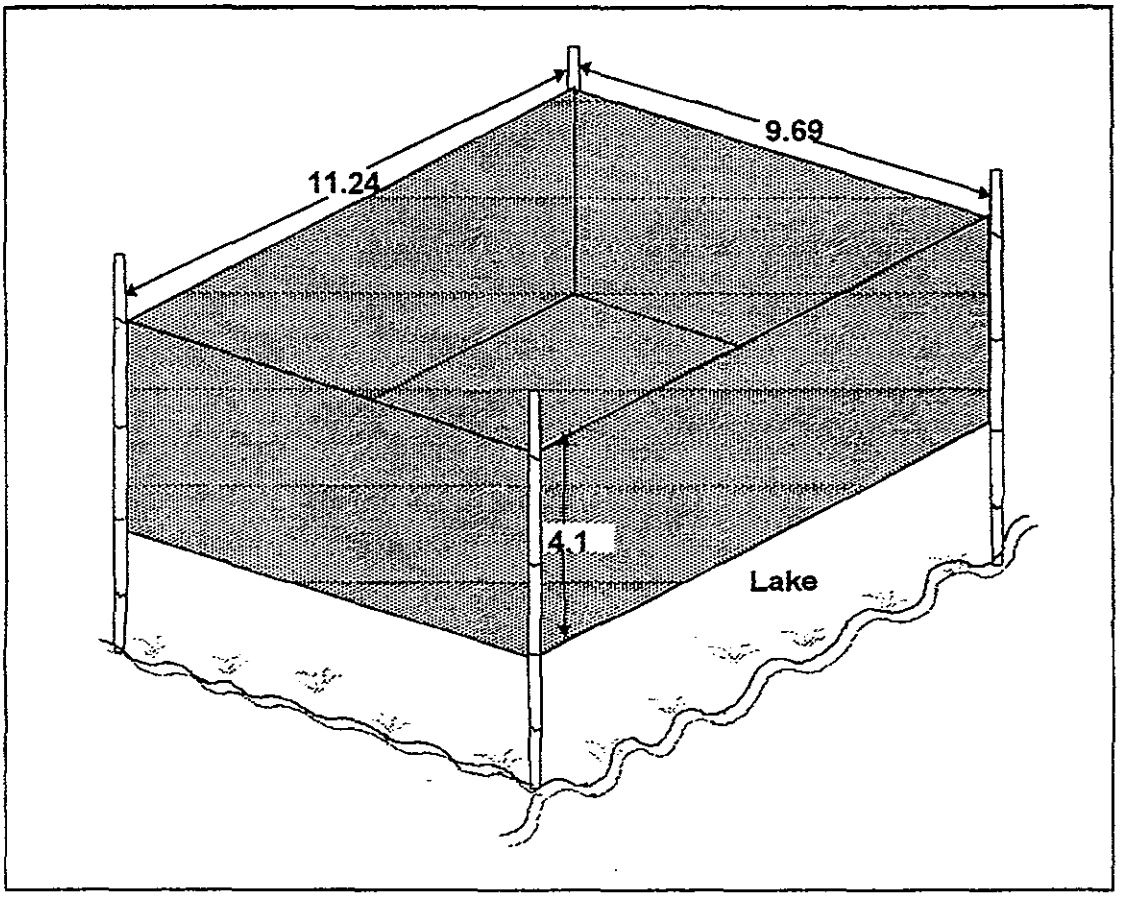

Figure 3 The Typical Fish Cage in Paoay Lake

The fish cage assembly consists of fine meshed nets resembling an upside down mosquito net. In some cases, there are several layers of cages with the inner cage having increasingly finer mesh. The outer cage protects the inner cage and prevents the escape of fry or fingerlings into the

open waters in case the latter is damaged. The fish cage assembly is supported by bamboo posts securely fastened into the lake bottom. The support structure should be strong enough to withstand storms that visit the place occasionally. The numerous bamboo poles that jut out of the waters of the lake may be unsightly for the protected landscape (*Figure 4*).

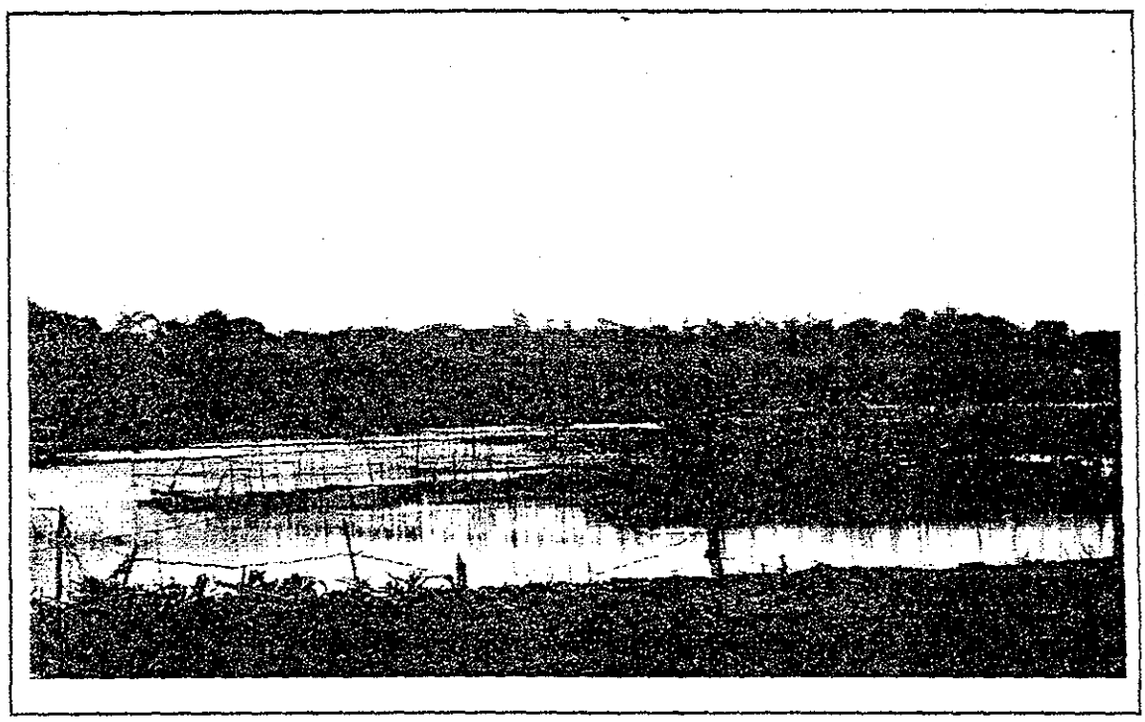

Figure 4 Paoay Lake Fish Cages, January 1998

The fish culture activities usually start with the construction of the fish cage. If the farmer has an existing cage, the cage assembly is repaired or mended and the support structure is checked for its integrity. These are continuously checked during the entire culture period, particularly the parts of the assembly and structure that are underwater. The cages are then stocked with either fry or fingerlings. Although there is a government hatchery close to the lake, it is not able to supply the requirements of the farmers. They sometimes travel to Central Luzon to purchase whatever stocking materials are available. Stocking density ranges from 333 - 5000 pieces per cage with an average of 2427. This is equivalent to 22.3 pieces per sq m of cage area or 5.4 pieces per cu m of water volume. Survival rates, however, have been quite low at 30 - 45 percent for the two crops (*Table 7*). This was attributed to the lengthy transport time for the fry or fingerlings and the lack of time to acclimatize them in the lake.

Table 7 **Cultural Practices in Paoay Lake Fish Cage Operations, 1997**

	First Crop	Second Crop
Average culture period (months)	4.6	4.9
Fish cage area		
Total (sq. m.)	2249.5	69.5
Average/cage (sq.m.)	97.8	86.4
Stocking density		
Pcs./cage	2427.5	1854.1
Pcs/sq. m.	24.8	21.5
Pcs/ cu.m.	7.1	5.8

Tilapia grows with the naturally available food in the lake albeit slowly considering the high stocking density. Thus, supplementary feeds are given to hasten growth. Tilapia fry or fingerlings are regularly fed twice a day, once usually at daybreak and then repeated late in the afternoon. Most farmers (88 percent in the first cropping) use commercial feed preparations at the rate of 215 - 250 kg per cage per crop (*Table 8*). Days before harvesting, a common practice is to feed the fish with breadcrumbs to increase their weight rapidly. The feeding rate ranges from 15 - 16 kg per cage per crop.

Table 8 **Feeding Practices in Paoay Lake Fish Cage Culture, 1997**

Type of Feed	1st Crop		2nd Crop	
	No. of Farmers	Ave. Quantity (kg./ cage)	No. of Farmers	Ave. Quantity (kg./ cage)
Commercial feeds	23	214.6	8	249.4
Bread crumbs	9	14.8	3	16.25
Other Feeds	1	1.3	-	-
All Feeds (weighted ave.)		153.6		185.8

Tilapia is reared from 3 to 6 months with an average of 4.7 months. The length of the culture period obviously depends on the size of the stocking material. Fry is smaller than fingerling and expectedly takes longer to culture. The average size of the harvested fish ranges from 6.5 - 8.6 pieces per kg for the two crops. Although there is a target market size for the fish, harvesting could be advanced or delayed depending on the market price. It is noted, however, that the demand for fish from the lake is always high given its sweet taste. This is attributed to the lake's waters which remain unpolluted. Thus, harvesting decisions may be determined more by the operator's need for cash.

The small number of fish cages in Paoay Lake produced almost three tons of tilapia for the reference year 1997. This may not be a substantial volume per se but could already be a big percentage of freshwater fish production in the province. Production per cage per crop ranged from 15 - 350 kg with an average of 90 kg for the first crop and 98 kg for the second crop (*Table 9*). Of the total output, about 92 percent are sold in the market. The remainder is either given away out of good will, consumed by the household, or given to laborers as payment for services. The average **farmgate price** of PhP66.8 per kg is already higher than the prevailing **market price** of tilapia in Metro Manila. This indicates the superior quality of the fish in Paoay Lake.

Table 9 **Production Performance of Paoay Lake Fish Cage Operations, 1997**

	First Crop	Second Crop
Production		
Total (kg.)	2076	785
Average (kg./cage)	90.3	98
Ave. pcs. per kg.	8.1	8.6
Marketed Output		
Total (kg.)	1912.5	715.5
Average (kg./cage)	83.2	89.4
Weighted Ave. Farmgate Price	66.8	66.7
Value of Output		
Total (Pesos)	138,680	52,345
Average (Pesos/cage)	6,029	6,543

Total production in 1997 was valued at around PhP191,025 equivalent to PhP6,162 per cage. The cost of production, estimated at PhP5,963, is high relative to the value of production (*Table 10*). It costs about PhP64.6 to produce one kg of tilapia. Material inputs consisting primarily of feeds and stocking materials accounted for 78 percent of the total cost followed by fixed costs at 18 percent and paid labor inputs at 4 percent. The high cost of material inputs may be attributed to the distance between Paoay Lake and the sources of these inputs – Nueva Ecija in Central Luzon for fry/fingerlings and Metro Manila for feeds. It is noted that the imputed cost of unpaid family labor inputs is not included yet in the total cost. Average gross profit is placed at PhP199 per fish cage per cropping.

Table 10 **Costs and Earnings by Cropping Period, Paoay Lake, 1997**

Item	Amount
Average Gross Revenue: Production Value	6,162
Average Costs	5,963
Material Inputs	4,655
Labor Inputs	218
Fixed Costs	1,090
Average Gross Profit	199
Less: Margin for Profit and Risk a/	701
Imputed Family Labor b/	2,679
Resource Rent	
Per cropping	(3,181)
Per year	(6,362)
Number of Sample	23

a/ Computed at 30% of total cost.
b/ Refer to footnote in text for explanation

A separate analysis of farmers who earned positive profits during the period was undertaken to determine the potentials of fish cage aquaculture in the lake. The performance of this group relative to the entire sample is summarized in *Table 11*. With average production and price of tilapia higher by 36 percent and 8 percent, respectively, the value of production is almost 50 percent more compared to the entire sample. The production advantage of this group is not fully matched by the cost structure, as it is only marginally lower by 1.5 percent. Nonetheless, the average gross profit is almost 16 times at PhP3,334 per cage per cropping.

Table 11 **Costs and Earnings of Paoay Lake Fish Cage Farmers with Positive Profits, 1997**

Item	Amount
Value of Output (Pesos)	9,207
Production (kgs)	125
Price (Pesos/ kg)	73
Costs (Pesos)	5,927
Material Inputs	4,682
Labor Inputs	145
Fixed Costs	1,100
Gross Profit (Pesos)	3,280
Less: Margin for Profit and Risk	696
Imputed Family Labor	2,679
Resource Rent	
Per cropping	(95)
Per year	(190)
No. of Farmers	11

4.1.4 Estimates of Resource Rent

The resource rent is derived by subtracting the margin for profit and risk and the imputed cost of labor from the gross profit. For the purpose of this study, the maximum (per the proposed guidelines) margin for profit and risk of 30 percent was used; on the other hand, the imputed cost of labor was computed based on the time spent in tending the cages and the minimum agricultural wage rate in the locality. Given the fish culture practices, it is estimated that the average operator spends one-third of an average day's work hours. Based on consultations with the National Economic and Development Authority (NEDA), the shadow wage rate for unskilled labor in the agricultural sector is 60 percent of the legal minimum wage rate, which is P105[4]. Thus, the imputed daily wage rate is approximately PhP19 per day, equivalent to PhP2,679[5] per cropping. The computations in *Table 12* (first column) show negative resource rent of PhP95 per cropping per cage.

Table 12 **Sensitivity Analysis: Increase in Survival Rates and Impact on Profitability Paoay Lake, 1997**

Impacts	Increase in Survival Rate				
	Base = 38%	50%	75%	100%	125%
Resulting Survival Rate	38%	57%	67%	76%	86%
Production (kg/cage/cropping)	125	187.5	218.8	250.0	281.3
Average Price (Pesos/kg)	73.7	73.7	73.7	73.7	73.7
Value of Production (Pesos/cage/cropping)	9,207	13,811	16,112	18,414	20,728
Material Inputs (Pesos)	4,682	7,023	8,194	9,364	10,535
Labor and Fixed Costs (Pesos)	1,245	1,308	1,308	1,308	1,308
Total Cost (Pesos)	5,927	8,331	9,502	10,672	11,843
Gross Profit	**3,280**	**5,480**	**6,611**	**7,742**	**8,886**
Less: Margin for Profit and Risk	696	979	1,116	1,254	1,391
Imputed Family Labor	2,679	2,679	2,679	2,679	2,679
Resource Rent					
Per cropping	**(95)**	**1,822**	**2,815**	**3,809**	**4,815**
Per year	**(191)**	**3,643**	**5,631**	**7,618**	**9,630**

The gross profit covers the margin for profit and risk but not the imputed family labor. If the imputation of family labor is correct, the situation will be untenable over a long time, as the opportunity costs are not realized. Eventually, fish farmers will shift to other economic activities unless there are prospects for higher returns. Such potentials were also looked into in this study. Looking at their performance, survival rate is quite low at 38 percent. A sensitivity analysis on this rate showed that a 50 percent increase in survival rate will yield positive rents. A doubling of survival rate to 76 percent will produce a resource rent of over PhP7,618 per year. Increasing it even further to 86 percent will produce resource rent over PhP9,600 per year. It is reasonable to assume

this potential survival rate as the study by Morales and Padilla (1998) showed 81 percent survival rate for fish pens/cages in the riverine and coastal areas of Lingayen Gulf.

Willingness to Pay for Fish Cage Operating Rights

As mentioned in the methodology of the study, one way of validating the rent figures estimated from production data is to ask farmers their willingness to pay if operation of fish cages were bid out. Most farmers were willing to pay an amount approximately between PhP100 and PhP300 for each facility per year, save for some farmers who bid either too low or too high (*Table 13*).

The low bids are consistent with the negative resource rents being enjoyed by fish cage farmers in Paoay Lake. Should their operations improve, their willingness to pay for bidding rights will most probably increase with higher profits realized.

Table 13 **Willingness to Pay for Paoay Lake Fish Cage Operating Rights Paoay Lake, Ilocos Norte (PhP/Facility/Year)**

AMOUNT	FREQUENCY
2,500	1
300	1
275	1
250	1
220	1
200	13
100	3
60	1
50	1
TOTAL	23

4.2 Crop Farmers

4.2.1 Profile of Sample Respondents

Representatives from *Barangays* Pasil and Baay were interviewed for the survey of crop farmers. These *barangays* are the location of the two irrigation associations that draw water from the Lake. Pasil Irrigation Association has approximately 40 members, while Baay Irrigation Association has around 260 members. The total farm area being tilled in the two *barangays* is around 129 hectares, 86 ha of which is in Baay and 43 ha in Pasil (*Table 1*).

Table 14 **Total Number of Farmers and Hectares Farmed, Barangays Baay and Pasil, Ilocos Norte**

Item	Number
Baay Farmers	260
Pasil Farmers	37
Total No. of Farmers	297
Hectares Farmed in Baay	86
Hectares Farmed in Pasil	43
Total Hectares Farmed	129

Only nine farmers were interviewed for the survey. The reason for the small sample size is the sudden inclusion of crop farmers in the study only during the survey proper. Originally, the study objectives were focused on fish cage operators and Polar Peak, Philippines. This was largely based on the issues contained in the Initial Management Plan of Paoay Lake. However, upon presentation of the study to the PAMB members, it was discovered that resource use conflicts were actually between fish cage operators and crop farmers. The latter thus had to be included in the study, despite the lack of preparations for this particular survey. Nevertheless, the respondents served as key informants for the survey.

Representatives of the two irrigation associations using Paoay Lake, namely Captain Rogelio Gallardo, Barangay Captain of Pasil and member of Diaz Irrigation; and Mr. Anselmo Duldulao, President of the Baay Irrigation System, were likewise interviewed about their respective irrigation systems.

The average age of farmers drawing water from Paoay Lake is 50 years old, who has attended at least secondary school. The respondents' typical monthly income is a little over PhP3,000 each. Household monthly income is more than double at PhP6,800 - hence, farming is not the only source of income of these families. This is to be expected, given the average age of the farmer who most probably will have younger members of his family earning other incomes. The representative family size conforms to the national average of six persons per household. Each farmer typically tills 1 ha of land for crop farming. *Table 15* is a summary of the socio-economic profile of Paoay Lake farmers.

Table 15 **Socio-Economic Profile of Paoay Lake Farmers, 1997**

Item	Average
Age	50 years old
Educational Attainment	High school
Own Monthly Income	Pesos 3,178.00
Household Monthly Income	Pesos 6,807.00
Household Size	6 members
Farm Size	1 hectare

4.2.2 Description of Farming Activities

Irrigation System

The two irrigation associations have been in existence for quite some time now. The Baay Irrigation System was set up in 1988, while the Diaz Irrigation in Pasil has been in existence since the early 1900s. The Baay system includes members from neighboring *barangays* such as Bungon and Balikat, both located in Batac. The Pasil system also has members from other *barangays*, namely Surqui and Baligat.

In Pasil, farmers do not pay a fixed fee for use of the irrigation system. However, there are several ways in which they are able to raise funds for the Association. First, they ask for donations as the need arises to pay for maintenance and repairs of the system. Furthermore, the farmers themselves provide the labor requirements of such repairs. Second, the Association owns 3 ha of land that are leased to some members. Harvests therefrom are shared between the lessee and the association; the lessee keeps two-thirds, and one-third is given to the association as rental fee. Finally, penalties are assessed from members that do not attend meetings, at PhP20 per absence.

Likewise, farmers belonging to the Baay Irrigation Association do not pay any irrigation fee for the use of the system. However, amortization of the loan provided by the National Irrigation Authority (NIA) is being borne by the farmers. The loan amounting to PhP3 million was made in 1987 for the construction of the said irrigation system. According to Mr. Duldulao, farmers were required to pay only the equity part of the loan. Shares of each farmer were based on hectares farmed; however, not everyone was able to pay. *Table 16* shows the current status of the loan.

Table 16 **Baay Irrigation System: Status of Loan, 1998**

Due Date	Yearly Amortization	Amount Paid	Balance	Surcharge	Total Receivable
11/14/88	47530	47,530			
11/14/89	47530	19,207	28,323	14,445	42,768
11/14/90	47530		47,530	21,389	68,919
11/14/91	47530		47,530	18,537	66,067
11/14/92	47530		47,530	15,685	63,215
11/14/93	47530		47,530	12,833	60,363
11/14/94	47530		47,530	9,981	57,511
11/14/95	47530		47,530	6,417	53,947
11/14/96	47530		47,530	3,565	51,095
11/14/97	47530		47,530	713	48,243
11/14/98			408,564		
Not yet due	*1,901,203*		*1,901,203*		*1,901,203*
Total	2,376,503	66,737	2,309,766	103,564	2,413,330

Source: NIA, Statement of Accounts, Baay CIS, as of February 4, 1998

Farmers were asked about their alternative source of irrigation water if the Lake did not exist. All of them indicated that either a deep well or a water pump would have to be built. A deep well is defined to have a depth of 30 m or more, as opposed to a shallow well whose depth measures less than 30 meters. For individual irrigation systems of farms that measure one hectare or less, a shallow well is usually used. In conjunction with this, the centripetal pump is used to complete the irrigation system[6].

Cropping Pattern

Four main crops are planted in the area: *palay*, garlic, corn, and mongo. The type of crop grown is dictated by the season during which the farmer plants. As illustrated in ***Figure 5***, cropping patterns indicate that *palay* is the most popular crop among the farmers concerned. During the rainy season, i.e. from July to October/ November, most of the farm area is planted with *palay*. Meanwhile, during the cold months of November/ December to February and extending up to March, farmers plant either garlic or corn, save a few who venture into mongo production. Garlic is planted in November, while corn is planted in January. Farmland in the summer season is mostly fallow. During the months of April to June, farmers hardly endeavor into agricultural production.

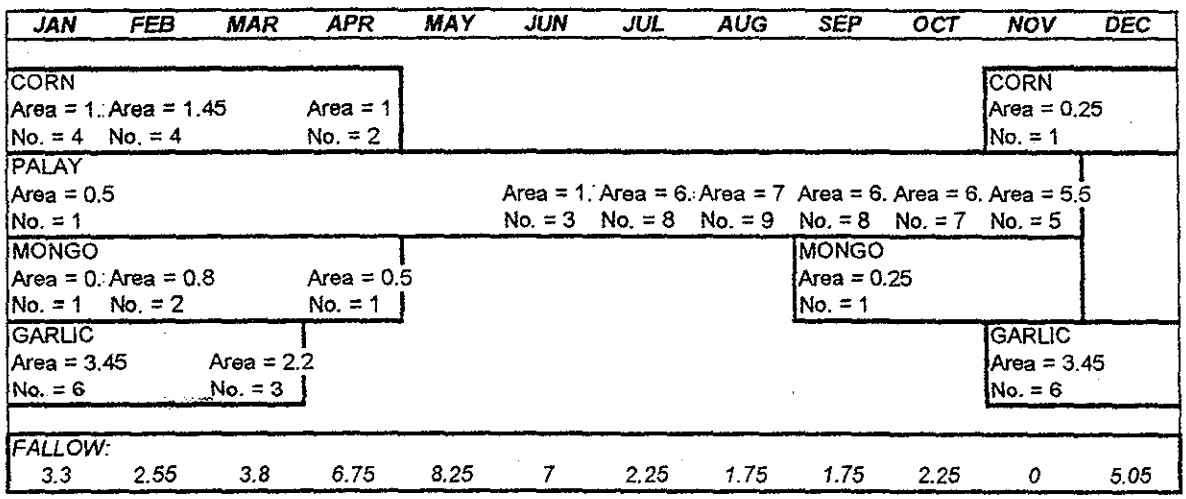

Figure 5 Barangays Baay and Pasil Cropping Calendar, 1997

As indicated in *Table 17*, *palay* requires the greatest frequency of irrigation per hectare per cropping (29 times). The three other crops have similar requirements (between four to five times per hectare per cropping). When broken down into source of irrigation water, farmers drawing from Paoay Lake irrigate their *palay* fields 41 times per hectare as opposed to five times for those drawing water elsewhere. However, there was only one farmer that was irrigating *palay* from a water source other than Paoay Lake. On the other hand, cornfields were irrigated three times per hectare per cropping when water was drawn from the Lake, while farmers that drew water from other sources irrigated 10 times per hectare per cropping.

Table 17 **Irrigation Frequency per Cropping Frequency/Hectare/Cropping**

CROP	Source of Irrigation		
	Lake	Others	All Farmers
Palay	41	5	29
Garlic	4		4
Corn	3	10	6
Mongo	4	4	4
All crops	22	6	20

4.2.3 Costs and Earnings Analysis

The nine respondents enjoyed average gross revenues of PhP42,657 per hectare for crop year 1997. On the other hand, average costs amounted to PhP39,585 per hectare, giving an average gross profit of PhP 3,072 per hectare. However, there were four farmers that experienced negative profits, which may have been due to a very bad year because of low farm gate prices and poor agricultural production due to El Niño. In considering only the five farmers that had positive profits, the average gross profit was PhP22,680 per hectare, with average revenues amounting to PhP50,771 and average costs equal to PhP28,091. *Tables 18 and 19* show the summary of these results.

Table 18 **Comparative Costs and Earnings, All Crops, by Source of Irrigation Water Barangays Baay and Pasil, 1997 Crop Year**

Item	Source of Irrigation Water		
	Lake	Deep Well/ Pump	All Farmers
Ave. Gross Revenue: Prod. Value	35,672	32,847	42,657
Ave. Costs	27,859	44,466	39,585
Ave. Gross Profit	7,813	-11,619	3,072
Less: Margin for Profit and Risk	3,982	10,631	5,695
Imputed Family Labor	19,656	19,656	19,656
Resource Rent	(15,825)	(41,906)	(22,279)

Table 19 **Comparative Costs and Earnings with Positive Profits, by Source of Irrigation Waters Barangays Baay and Pasil, 1997 Crop Year**

Item	Source of Irrigation Water		
	Lake	Deep Well/ Pump	All Farmers
Ave. Gross Revenue: Prod. Value	42,651	40,600	50,771
Ave. Costs	24,213	19,390	28,091
Ave. Gross Profit [a]	18,438	21,210	22,680
Less: Margin for Profit and Risk	3,448	1,454	4,050
Imputed Family Labor	19,656	19,656	19,656
Resource Rent	(4,666)	100	(1,026)
No. of Farmers with Negative Gross Profit	4	2	4

Note: Farmers no. 2 and 4 had negative profits under both conditions of using Paoay Lake and deepwell for irrigation

[a] Average for all farmers = Total Positive Profits/ Total no. of Farmers

An analysis of costs and earnings by source of irrigation water showed that farmers using the Lake enjoyed higher average gross revenues and lower average costs, thus garnering greater average gross profits. Those that sourced water from the Lake had average gross profits of PhP7,813 per hectare. Meanwhile, those that used water from deep wells and water pumps had an average gross negative profit of PhP(11,619).

On a per crop basis, *palay* farmers that used water from Paoay Lake had minimally higher average gross profits. Their average gross revenues were higher at PhP26,766, compared with those using deep wells whose average revenues were PhP24,640 (*Table 20*). Likewise, average costs for the former were lower at PhP15,838, while those using deep wells had average costs of PhP18,160. Thus, average profits were higher for farmers irrigating from Paoay Lake.

Table 20 **Comparative Costs and Earnings, Palay Production, by Source of Irrigation Water Barangays Baay and Pasil, 1997 Crop Year**

Item	Source of Irrigation Water		
	Lake	Deep Well	All Farmers
Ave. Gross Revenue: Prod. Value	26,766	24,640	26,529
Ave. Costs	15,838	18,160	16,070
Fertilizer	4,588	6,160	4,762
Seeds	828	0	710
Labor	4,963	5,000	4,967
Other Expenses	5,459	7,000	5,631
Ave. Gross Profit	10,928	6,480	10,459
No. of Sample	8	1	9

For corn production, farmers irrigating from the Lake had positive profits, albeit at a very small amount (*Table 21*). For mongo production, though, those that irrigated from deep wells and pumps had higher average gross profits at PhP17,105, compared with those that irrigated from the Lake (*Table 22*).

Table 21 **Comparative Costs and Earnings, Corn Production, by Source of Irrigation Water Barangays Baay and Pasil, 1997 Crop Year**

Item	Source of Irrigation Water		
	Lake	Deep Well	All Farmers
Ave. Gross Revenue: Prod. Value	2,300	5,800	4,400
Ave. Costs	2,034	13,599	8,973
Fertilizer	606	4,703	3,064
Seeds	203	2,533	1,601
Labor	1,000	1,967	1,580
Other Expenses	225	4,396	2,728
Ave. Gross Profit	266	(7,799)	(4,573)
No. of Sample	2	3	5

Table 22 **Comparative Costs and Earnings, Mongo Production, by Source of Irrigation Water Barangays Baay and Pasil, 1997 Crop Year**

Item	Source of Irrigation Water		
	Lake	Deep Well/ Pump	All Farmers
Ave. Gross Revenue: Prod. Value	4,500	26,750	19,333
Ave. Costs	992	9,645	6,761
Fertilizer	492	4,900	3,431
Seeds	0	320	213
Labor	500	425	450
Other Expenses	0	4,000	2,667
Ave. Gross Profit	3,508	17,105	12,572
No. of Sample	1	2	3

Finally, for garlic production, both sets of farmers had negative gross profits (*Table 23*) although losses for those not using Paoay Lake were greater than those irrigating from the Lake. The reason for the negative profits of farmers was mainly due to El Niño. During the fourth quarter of 1997 - particularly during the last two months, the El Niño phenomenon had started to affect agricultural production in the country. According to the Consolidated Report Re Effects of El Niño Phenomenon[7], Region I suffered damages in agricultural production amounting to

PhP16.6 million. The figure includes the first and second quarters of 1998. Nevertheless, the effects of El Niño started in the latter part of 1997, during which time garlic was planted and harvested (*Figure 5*). Corn and mongo were not affected, since most farmers produced these crops during the first quarter of the year.

Table 23 **Comparative Costs and Earnings, Garlic Production, by Source of Irrigation Water Barangays Baay and Pasil, 1997 Crop Year**

Item	Source of Irrigation Water		
	Lake	Deep Well/ Pump	All Farmers
Ave. Gross Revenue: Prod. Value	12,430	3,000	10,858
Ave. Costs	16,596	52,000	22,496
Fertilizer	3,396	12,000	4,830
Seeds	9,187	18,000	10,656
Labor	2,040	15,000	4,200
Other Expenses	1,973	7,000	2,810
Ave. Gross Profit	(4,166)	(49,000)	(11,638)
No. of Sample	5	1	6

4.2.4 Estimates of Resource Rent

As shown in the above analysis, crop farmers enjoyed an average gross profit of PhP3,072 per hectare. However, in deducting the margin for profit and risk PhP(5,695) and imputed family labor, the estimated excess profit enjoyed by crop farmers is negative at approximately PhP(22,279) per hectare. Hence, resource rent is negative. For farmers irrigating from the Lake, resource rent is equal to PhP(15,825), while for those irrigating elsewhere, rent is equal to PhP(41,906).

For farmers with positive profits (56 percent), resource rents are still negative at PhP(4,666) for those irrigating from the lake. For non-lake farmers, rent is positive at PhP100, albeit minimal. Five out of the nine farmers are covered in this category.

For *palay* production, noticeable was the huge costs under the category "other expenses". Among those who incurred other expenses (78 percent of total farmers surveyed), 86 percent were not related to irrigation. Most of those expenses (67 percent) were part of the profit-sharing scheme entered into by these farmers with the landowners. Nevertheless, resource rent from *palay* production was negative at PhP(1,578) (*Table 24*). If the share of harvest (given by tenants to landowners) is used to approximate the cost of land to the farmers, resource rents in *palay* production are even more negative (last column in *Table 24*). In any case, crop farmers are not enjoying any positive rent from the use of the Lake for irrigation, and should not be made to pay for the cost of water.

Table 24 **Computation of Resource Rent from Palay Production By Source of Irrigation Water, 1997**

Item	Actual Average	Without Other Expenses	Other Expenses w/o Share of harvest	Other Expenses = Share of Harvest
Production (Kgs./ ha.)	3,465	3,465	3,465	3,465
Average Price (Pesos/ kg.)	8	8	8	8
Average Gross Revenue (Pesos/ha)	26,486	26,486	26,486	26,486
Average Costs (Pesos/ ha.)	18,412	12,007	12,707	20,466
Fertilizer (Pesos/ ha.)	4,762	4,762	4,762	4,762
Seeds (Pesos/ ha.)	1,658	1,658	1,658	1,658
Labor (Pesos/ ha.)	5,588	5,588	5,588	5,588
Other Expenses (Pesos/ ha.)	6,405	0	700	8,458
Average Gross Profit (Pesos/ ha.)	8,074	14,479	13,779	6,020
Less: Margin for Profit and Risk (Pesos/ ha.)	2,117	1,381	1,461	2,354
Imputed Family Labor	7,535	7,535	7,535	7,535
Resource Rent (Pesos/ ha.)	(1,578)	5,563	4,783	(3,868)

A sensitivity analysis was conducted for garlic production to determine if under normal conditions, a more reasonable estimate of resource rent could be computed. For garlic production, the analysis was done using production yields normally realized in other parts of the country. The Bureau of Soils and Water Management computed for ordinary production yields per hectare for various crops grown in the Philippines. For garlic, the normal production was between 8 - 12 tons per hectare. The low production for garlic in Paoay was attributed to a very bad year, given the El Niño effects as mentioned earlier. In computing for resource rent from the Lake's waters, rent from land was deducted from gross profit, together with the margin for profit and risk and the imputed family labor. Land rent is based on prevailing production sharing agreements between tenants and landowners in the area. In the absence of information on sharing arrangements for other crops, only that for *palay* crops was used. Land rent for Paoay farmers is computed to be equivalent to 32 percent of total harvest. Under normal conditions, resource rent was estimated to be between PhP3,116 to PhP22,609. *Table 25* summarizes the results of the sensitivity analysis for garlic production.

Table 25 **Sensitivity Analysis of Garlic Production Performance, 1997**

Item	Actual Average	Ordinary Production Yield/ ha.[1] Low	Medium	High
Production (Kgs./ ha.)	1,383	8,000	10,000	12,000
Average Price (Pesos/ kg.)	7	7	7	7
Average Gross Revenue (Pesos/ ha.)	9,914	57,333	71,667	86,000
Average Costs (Pesos/ ha.)	26,029	26,029	26,029	26,029
Fertilizer (Pesos/ ha.)	4,830	4,830	4,830	4,830
Seeds (Pesos/ ha.)	12,787	12,787	12,787	12,787
Labor (Pesos/ ha.)	5,040	5,040	5,040	5,040
Other Expenses (Pesos/ ha.)	3,373	3,373	3,373	3,373
Average Gross Profit (Pesos/ ha.)	(16,116)	31,304	45,637	59,971
Less: Margin for Profit and Risk (Pesos/ ha.)	2,798	2,798	2,798	2,798
Imputed Family Labor	7,043	7,043	7,043	7,043
Resource (Land) Rent	3,172	18,347	22,933	27,520
Resource (Water) Rent (Pesos/ ha.)	(29,130)	3,116	12,862	22,609

[1] Source:"Rate of Seeding, Age at Harvest and Estimated Production of Different Farm Crops & Vegetables in the Phils. Bureau of Soils and Water Management, 1988

No additional analysis was done for corn and mongo production, considering the small number of farmers planting these crops.

Alternative Source of Irrigation without Paoay Lake

An alternative method can be used in computing for irrigation fees from crop farmers. In section 4.2, alternative sources of water for irrigation were mentioned. The survey of crop farmers included questions on how much would an alternative system of irrigation cost if Paoay Lake did not exist. A complete irrigation system would involve both a deep well and a water pump. *Table 26* shows the amount of investment and annual costs involved in putting up deep wells and/or water pumps for irrigation purposes. The annual cost of maintaining and operating a deep well is approximately PhP1,200 per hectare, while that of a water pump is more than double at PhP2,488 per hectare. Adding the fixed costs, and assuming a 25-year life for deep wells and ten years for water pumps[8] the total annual costs for an alternative system would be in the range of PhP1,845 for the deep well and PhP4,756 for a water pump. Assuming an average of three crops per year, the cost would amount to PhP615 to PhP1,585 per hectare per cropping. If the farmer invests in both a deep well and water pump, his costs would amount to PhP2,200 per hectare per cropping. If a two-cropping pattern were assumed, the range of the cost per hectare per cropping would amount to PhP922 to PhP2,378 respectively for the individual facilities, and PhP3,300 for the combined irrigation system. Fifty-six percent (56 percent) of all farmers surveyed had more than two croppings during the year.

Table 26 **Investments for Alternative Source of Irrigation Without Paoay Lake**

	Alternative Source	
	Deep Well	Water Pump
Average Investment Requirements (Pesos)	16,131	22,667
Average Operating & Maintenance Costs (Pesos/yr.)	1,200	2,489
No. In Sample	5	3

Willingness to Pay for Irrigation Services

Crop farmers were asked to indicate what their willingness to pay would be if water rights were bid out to them. As shown in *Table 27*, farmers would be willing to pay an average of PhP133 per hectare per cropping. Farmers irrigating from the Lake are willing to bid much lower, at PhP77.45 per hectare per cropping. This is despite the fact that they enjoyed much higher average gross profits than those not using Paoay Lake. On the other hand, farmers using deep wells were willing to bid PhP273 per hectare per cropping, notwithstanding their low average gross profits in 1997.

Table 27 **Willingness-to-Pay Irrigation Fees for Use of Paoay Lake, 1997**

Respondent	Total Irrigated Area for all crops (has.)	Total Amount WTP for all crops (Pesos)	Average WTP per hectare per crop (Pesos)
1	1.7	75	44
2	0.5	50	100
3	0.5	100	200
4	2.25	45	20
5	2.5	100	40
6	0.38	200	533
7	0.75	40	53
8	2.5	800	320
9	1	200	200
Average Per User	1.34	179	133

The small amount of willingness of farmers to bid for irrigation rights, relative to the computed resource rent and cost of alternative irrigation systems, is understandable considering that these people have been enjoying the services of the Lake without having had to pay for any user fee. In other words, the waters of the Lake have always had a zero price, i.e. free for its users. Although these irrigation systems have been in place for quite some time now, no attempt has been made to put a price on the Lake's resources. It is only recently that there has been a need to do so, given the conflicts arising from multiple uses of the Lake. In fact, their long existence is what farmers have been using in their claims that they be given prior rights in the use of the Lake for their purposes.

garlic production were negative. These were the two crops that were recently harvested, hence had the greatest influence on the farmers' bids.

5. *Recommendations*

5.1 *Fish Cage Aquaculture*

If the fee for fish cage operations in the lake is based on current resource rents, the negative rents from fish cage farming in Paoay Lake imply that a fee should not be imposed on operators. However, if we base the fee on the potentials of fish cage culture, a positive fee may be justified. The sensitivity analysis showed that a positive profit amounting to as much as PhP9,600 per cage per year is feasible.

Targeting a share of less than 10 percent of the resource rent may be a good strategy for the PAMB. To achieve this, it may increase the fee gradually every year until PhP300 is reached. Thus, it may increase the fee to PhP250 in year 1999, then to PhP300 in year 2000. The advantage of a fee schedule based on the potentials of fish cage culture is that it promotes efficient fish cage culture technologies in Paoay Lake. Operators who are not able to realize reasonable returns to pay up the fee will be forced to disengage in this activity and will be replaced by a more efficient group of fish farmers.

Over time, it is expected that the economic performance of fish farming will improve. For the PAMB to capture a reasonable share of the rents privately appropriated by fish farmers, it should conduct periodic monitoring of the performance of operators and should adjust the fees accordingly. The PAMB may opt to include a provision for periodic fee adjustments in its resolution regarding fees for fish cages in the lake.

5.2 *Crop Farmers*

Production for 1997 yielded negative rents per hectare for all crop farmers. If rent is computed on a per crop basis, *palay* production - which is the most water-intensive of all crops - already yields negative rents even if allocation for land rent is not included. The same cannot be said for garlic, though. Higher returns can be realized for garlic production if yields would approximate the normal national average production.

On this basis, annual irrigation fees for use of the Lake can be imposed only if certain types of crops are planted. The study recommends that no additional fees be charged for subsistence crops, such as *palay* and corn. However, for commercial crops such as garlic, a fee schedule can be set up. Garlic, under normal circumstances, can enjoy rents as high as PhP22,609 per hectare. If such were the case, PAMB will have to set up a monitoring system, since there will be two types of data that will be needed to compute for total irrigation fees per farmer. First, the PAMB will have to determine the irrigated area being applied for. Second, it will have to determine the type of crop being planted. It will collect fees only if garlic, or any other commercial crop, is planted. Initially, the PAMB can charge a fee based on less than 2 percent of potential rents from national average production, i.e., PhP400, for each hectare planted with garlic.

There is another fee, though, that the PAMB will have to consider. NIA Administrative Order No. 17 series 1998 sets the ideal rates for the use of national and communal irrigation systems (*Table 3*). For communal irrigation systems, minimum rates are prescribed. The PAMB

can therefore set fees that are above these rates, given that the NIA rates cover only the infrastructure costs of the irrigation system. The PAMB-prescribed rates will refer to the cost of water alone.

The fees can further be justified by the comparable alternative costs involved if the PAMB totally disallows crop farmers to use Paoay Lake for irrigation purposes. This can serve as the ceiling for PAMB to use.

To compensate for the absence of fees for subsistence crops, farmers can pay for the use of Paoay Lake waters by payments in kind, such as reforestation of the watershed of the Lake. The PAMB is amenable to such arrangements. The important thing is that the use of the Lake for irrigation be paid somehow, especially for *palay*, which is the most water intensive among all crops planted in the area.

In the long run, a monitoring system can be set up so that improvements in *palay*, corn and mongo production can be observed and noted, and fees for each type of crop can be adjusted accordingly.

5.3 Directions for Future Work

As mentioned earlier, the PAMB has adopted a minimum water level for the lake, which is now the basis for management. However, the study team is not aware of how such specific minimum water level is observed through, for instance, a water level indicator placed in strategic locations throughout the lake. It is thus imperative for the PAMB to undertake consultations with all stakeholders not only in determining the exact minimum water level but also on the manner of relaying the information to them.

The setting of a minimum water level as outlined in the Water Code implies the maximization of benefits to be derived from any body of water. The current study recognized the need for an analysis of the optimal allocation of water but so far, it has only assessed the benefits and costs of the different uses of water. As more information is generated particularly on the hydro-geology of the lake, the study may be extended to assess the best combination of uses for Paoay Lake. Implied in this extension is a determination of the optimal level of water for the lake.

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ENDNOTES

[1] This section is based primarily on the document "Initial Protected Area Plan of Proposed Paoay Lake Protected Landscape".

[2] The exact minimum water level is not clearly defined. However, some rules of thumb are in place with respect to the drawing of water for irrigation. It is not permitted if rain is scarce during the dry season and the water level is already deemed "low". A technical fix also prevents the use of the lake for gravity irrigation as soon as the water level goes below the water "gate".

[3] Determination of the (optimal) minimum water level may be done through the "complex" approach.

[4] Refers to minimum wage for non-plantation agricultural workers for Region 1 in 1997 (NWPC, 1997).

[5] Based on 30 days per month and 4.7 months per cropping.

[6] Based on telephone interviews with Mr. Gregorio Dumandan, OIC-Equipment Management Department, National Irrigation Authority.

[7] Report submitted by the Department of Agriculture to the National Disaster Coordinating Council, as of 14 July 1998.

[8] Based on telephone interviews with Mr. Gregorio Dumandan, OIC-Equipment Management Department, National Irrigation Authority.

LIST OF APPENDICES

APPENDIX A

PROPOSED FEE SYSTEM GUIDELINES

SUBJECT : GUIDELINES AND PRINCIPLES IN DETERMINING FEES FOR ACCESS TO AND SUSTAINABLE USE OF RESOURCES IN PROTECTED AREAS

Pursuant to the provisions of Republic Act 7586 otherwise known as the National Integrated Protected Areas System (NIPAS) Act of 1992 and its Implementing Rules and Regulations, and in order to provide guidelines and principles in accessing and sustainably using resources in protected areas, this Order is hereby issued for the guidance of all concerned.

SECTION 1. TITLE - This Administrative Order shall be known as "Guidelines and Principles in Determining Fees for Access to and Sustainable Use of Resources in Protected Areas"

SECTION 2. OBJECTIVES - It shall be the objective of this Order to set forth the procedure which DENR through the Protected Areas and Wildlife Bureau (PAWB) and the Protected Area Management Boards (PAMBs) shall follow in determining fees for access to and sustainable use of resources located in protected areas for recreational, commercial, subsistence and all other purposes.

SECTION 3. SCOPE - This Order shall cover identified major uses of all resources and facilities in areas comprising the National Integrated Protected Areas System (NIPAS).

SECTION 4. DEFINITION OF TERMS - For the purpose of this Order, the following terms shall mean as follows:

a. **Resources** - include all living and non-living, renewable or non-renewable, terrestrial, aquatic or both, surface or subsoil resources found within protected areas.

b. **Development of Land and Other Resources** - involves all forms of improvement or enhancement of land and other resources within a protected area for any purpose.

c. **Extractive Use** - is the use of resources involving gathering, tapping, diverting, or any form of removal of resources within the designated multiple use zone, sustainable use zone and buffer zone.

d. **Recreational Use** - is the use of resources for the primary purpose of personal enjoyment but which does not entail any form of extraction, except, for example, in recreational or sports fishing where a regulated number of fish may be taken.

f. **Commercial Use** - is the use of resources in excess of subsistence use.

g. **Indigenous Cultural Communities/ Indigenous People (ICCs/IPs)** - refer to a group of people or homogenous societies identified by self-ascription and ascription by others, who have continuously lived as organized community on communally bounded and defined territory, and who have, under claims of ownership since time immemorial, occupied, possessed and utilized such territories, sharing common bonds of language, customs, traditions and other distinctive cultural traits, or who have, through resistance to political, social and cultural inroads of colonization, non-indigenous religions and cultures, became historically differentiated from the majority of Filipinos. ICCs/IPs shall likewise include peoples who are regarded as indigenous on account of their descent from the populations which inhabited the country, at the time of conquest or colonization, or at the time of inroads of non-indigenous religions and cultures, or the establishment of present state boundaries, who retain some or all of their own social, economic, cultural and political institutions, but who may have been displaced from their traditional domains or who may have resettled outside their ancestral domains (RA 8371).

h. **Tenured Migrants** - or communities within protected areas are those who have actually and continuously occupied such area five (5) years before the designation of such as protected area in accordance with the NIPAS Act and are solely dependent on the resource for subsistence. (RA 7586)

i. **Marketed Resources** - are resources whose use entail voluntary exchange involving monetary transaction or non-monetary transaction as in the case of barter.

j. **Non-marketed Resources** - are resources whose use do not entail market transaction.

k. **Fishing** - is the taking of fishery species from their wild state or habitat, with or without the use of fishing vessels.

l. **Final consumption** - refers to the use of resources where the resource is no longer used as input to production of other goods or services.

m. **Carrying capacity** – refers to the ability of the natural or environmental resource to absorb stress without experiencing unacceptable instability and degradation.

SECTION 5. TYPES OF USES – The following are the types of uses of resources in protected areas on which fees shall be assessed or may be applied.

5.1 Subsistence uses shall include but not be limited to hunting of wildlife for household consumption, gathering of forest products for house construction, agriculture or fish culture to raise crops or fish for household consumption. Subsistence uses shall apply to indigenous cultural communities and tenured migrants only.

5.2 Recreational uses shall include but not be limited to: a) water-based activities such as snorkelling, scuba diving, swimming, boating; b) land-based activities such as mountain climbing, trekking, picnicking, and bird watching; c) either

land- or water-based activities such as filming and photography; and d) all other similar activities.

5.3 Extractive uses shall include but not be limited to: a) extraction or diversion of water for irrigation or domestic uses; b) collection or gathering of forest products such as vines, rattan, bamboo, resin, ornamental plants, bird nest, guano; c) collection of wildlife such as monkeys, wild pigs, butterfly, honey; d) extraction of flora and fauna and its by-products, parts and derivatives, including, but not limited to leaves, blood and samples; e) fishing either in small-scale or commercial scale.

5.4 The development of land and other resources for commercial uses shall be categorized in terms of capital investment of each development project into the following in accordance with Department of Trade and Industry (DTI) guidelines: small-scale; medium-scale; and others. The current estimate of investment required for each development are as follows: 150,000 pesos and below for micro-scale; 150,000 pesos to 1.5 million pesos for cottage; above 1.5 million pesos to 15 million pesos for small; above 15 million pesos to 60 million pesos for medium; and above 60 million pesos for others.

The development of land and other resources shall include but not be limited to the following: kiosks for vending food and souvenir items; restaurants; shops for rental of recreational equipment such as boats; fishpens and fishcages; tapping of geothermal energy or impounding of water for electric power generation and for any other purpose; construction of tourist facilities with lodging facilities; construction of highways, relay stations and similar communication or transportation structure.

SECTION 6. TYPES OF FEES

6.1 Protected Area Entrance Fee - is a fee paid to enter a protected area for recreational purposes.

6.2 Protected Area User Fee - is a fee paid for the privilege of using man-made facilities inside a protected area.

6.3 Resource User Fee - is a fee paid for the sustainable commercial use of a specified quantity of resources within a protected area over a specified period of time.

6.4 Concession charge - is a fee paid for the use of land or other resources or the privilege of undertaking micro-scale and cottage-scale development. The concession charge is for a specified period of time and for a specific nature of development. The concession is granted to a person or entity.

6.5 Development Fee - is a fee paid for the use of land or other resources or the privilege of undertaking small-scale, medium-scale and other bigger scale development in protected areas for whatever purpose. The fee is for a specified period of time and for a specific nature of development. The privilege is granted to a person or entity.

6.6 Royalty may be defined as a fee paid based on the gross output value or gross sales from products out of resources derived from a protected area.

SECTION 7. OVERRIDING PRINCIPLES IN THE UTILIZATION OF RESOURCES IN PROTECTED AREAS.

7.1 Sustainability is the overriding consideration in determining all types and rates of use of all resources in protected areas. Sustainable use shall be operationalized as follows:

a. For the extraction of renewable resources such as forest flora and fauna and other forest products, surface and ground water, fisheries, geothermal energy and similar resources, sustainable use shall be the rate of extraction that is lower than either the rate of regeneration or the rate that shall not endanger life forms inside the protected area. The rate of use shall be within the carrying capacity of the protected area and its immediate surroundings when taken individually or collectively or in relation to other uses of the area.

b. Any development of land and other resources in a protected area shall not alter the landscape and shall not significantly disrupt normal ecological functions and processes.

c. The recreational use of resources for tourism, for filming or photography, shall preserve the natural landscape and shall not put significant stress on living resources by considering the carrying capacity of the protected area. Any form of use shall preserve the socio-economic and cultural aspect of the area.

d. In the process of resource utilization, the introduction of substances or chemicals harmful to the environment shall not be allowed.

7.2 Subsistence use of resources by IPs and tenured migrants shall be exempt from the payment of user fees.

7.3 Pending the issuance of certification by the National Commission on Indigenous People (NCIP) in accordance to the Indigenous Peoples Rights Act (IPRA), IPs in protected areas shall be given preferential access to and be levied lower fees for the commercial extraction of allowable resources in protected areas.

7.4 Prior to the full implementation/operation of the IPRA Law, free and informed prior consent from indigenous people shall be sought in the gathering of biological and other resources within protected areas.

7.5 The collection and research of biological and genetic resources in protected areas for scientific and/or related purposes shall be governed by the provisions of Executive Order No. 247 and its implementing rules and regulations.

SECTION 8. SPECIFIC GUIDELINES AND PRINCIPLES IN DETERMINING FEES - One or more guidelines and/or principles may be employed in determining fees based on the following: a) capability to approximate closely the

correct fee; b) availability of data as basis for computations; and c) costs to be incurred in estimating the fee.

8.1 Protected Area Entrance Fees and User Fees

Guidelines

a. Protected Area Entrance Fees shall cover access to the natural attractions of the protected area. If applicable, an additional Protected Area User Fee shall cover access to and the use of man-made facilities in the protected area.

b. For Protected Area Entrance Fees, the willingness-to-pay principle shall be the priority basis for computing fees. However, if information is not available, the cost-recovery principle shall be the basis of computation.

c. For Protected Area User Fees on man-made facilities managed by private entities, these shall be determined by the private entity but shall be comparable to fees for the use of similar facilities in a comparable location. All Protected Area User Fees shall be determined in consultation with the PAMB.

d. For Protected Area User Fees on man-made facilities managed by the government, these shall be determined using the cost-recovery principle but shall be comparable to the fees for the use of privately managed facilities with similar characteristics.

e. A three-tiered system of Protected Area Entrance Fees shall be developed: lower rates for Filipino students and senior citizens; normal rates for other Filipino visitors; higher rates for all foreign visitors.

Specific Principles

a. Cost-recovery principle. For Protected Area Entrance Fees, collected revenues shall cover, as much as possible, all costs incurred in protecting, maintaining and enhancing the natural attractions of the protected area. For Protected Area User Fees, collected revenues shall cover, as much as possible, a reasonable proportion of all costs incurred in providing and maintaining the man-made facilities in the protected area.

b. Willingness-to-pay principle. For Protected Area Entrance Fees, these shall be based on the willingness-to-pay estimates of the visitors based on appropriate surveys.

8.2 Resource User Fees, Development Fees and Concession Charges

Guidelines and Principles

a. The PAMB shall, to the extent feasible, enter into co-production, joint venture or production-sharing agreements with interested parties in the commercial extraction and/or development of resources in protected areas.

b. The government share of the protected area in these agreements shall be a reasonable proportion of the excess profits derived from the commercial extraction of resources.

c. All types of development are required to undergo the EIA system as prescribed by PD 1586 and other pertinent laws and regulations.

8.3 Royalty

Guideline and Principle

For any use of resources that results in the sale of goods or services where the value of total sales can be easily monitored, the resource fee may be based on royalty.

SECTION 9. OTHER PROVISIONS

9.1 The computation of the excess profit shall be guided by the formula specified in the technical annex. The corresponding government share from the excess profit shall be determined consistently with the appropriate instrument agreed upon by the contracting parties.

9.2 The rate of subsistence use shall be specified for each resource and where possible, for each household of indigenous people and tenured migrants. Such rate shall be in accordance with the rural annual per capita threshold income by region which is determined by the National Economic and Development Authority (NEDA). The subsistence rate of use shall be indicated explicitly in the rights of indigenous peoples and in the tenure instruments granted to tenured migrant communities in protected areas and shall be updated in accordance with the NEDA guidelines.

9.3 The classification of development projects in protected areas in terms of investments shall be updated in accordance with DTI guidelines.

9.4 The guidelines and principles enumerated herein shall be elaborated and operationalized in a handbook that shall be developed after pilot-testing in a sufficient number of protected areas.

SECTION 10. RESPONSIBILITIES OF PAWB AND PAMB

10.1 PAWB shall:

a. take the lead in pilot-testing these guidelines and principles in key resources and uses in collaboration with the PAMBs and DENR field offices;

b. develop a manual to be used by PAMBs in the implementation of the guidelines and principles after pilot testing in a sufficient number of areas;

c. assist the PAMBs to operationalize the manual; and

d. assist in providing experts required by the PAMBs in the implementation of the guidelines and principles.

10.2 PAMB shall:

a. collaborate with PAWB in the pilot testing of the guidelines and principles;

b. be guided by the manual developed by PAWB in implementing the guidelines and principles;

c. approve all types of uses of resources in a protected area through a Memorandum of Agreement with the concerned entity;

d. conduct public consultations/ dialogues with interested parties on proposed fees;

e. formulate and pass all resolutions required to enable and facilitate the collection of fees; and

f. determine through consultations with indigenous people the traditional uses of resources within protected areas.

This Order shall take effect fifteen (15) days after publication and revokes, supersedes, and amends any order and/or instructions inconsistent herewith.

ANTONIO CERILLES
Secretary

APPENDIX B

STUDY TEAM FOR THE FIELD SURVEYS

I Protected Areas and Wildlife Bureau

Teresita Blastique	Senior Environmental Management Specialist
Sarah Jane Cabrera	Computer Programmer II

II Planning and Policy Studies Office-DENR Central Office

Bella Nuñez	Statistician I

III Environmental Management and Protected Areas Service- Region I

For. Federico Sabado	Supervising EMS

IV Environmental and Natural Resources Accounting Project Phase IV-B

Jose E. Padilla	Deputy Project Leader
Rina Maria P. Rosales	Research Associate
Bernardo Batayola	Driver

COMPUTATION

A. COMPUTATION OF EXCESS PROFIT

The excess profit per year that arises from a natural resource-based activity shall be computed using the following formula.

Excess Profit = gross sales (GS) of natural resource-based product or service
less cost of production
less margin for profit
less margin for risk

where:

GS = (quantity of product or service) x (farm-gate price)

Cost of Production includes:
- payment for wages;
- material costs, e.g., gasoline;
- rentals for equipment, buildings, etc.;
- depreciation; and
- payments for taxes normally paid by any business enterprise (e.g, income taxes, permit fees, etc.).

Margin for Profit = normal return to entrepreneurial capital, usually determined through prevailing conditions in the financial market

Margin for Risk = a premium to cover losses from natural calamities and other causes

The margin for profit and risk shall be set at a maximum of 30% of the total cost of production.

B. COMPUTATION OF WILLINGNESS-TO-PAY

The willingness-to-pay for a natural resource good or service shall be computed from appropriate surveys employing accepted economic tools such as travel cost method or the contingent valuation method. These surveys shall arrive at an estimate of the willingness-to-pay for a natural resource good or service taking into account factors such as income, education, occupation, and nationality, among others.

APPENDIX C

SURVEY OF FISH CAGE OPERATORS AT PAOAY LAKE

In June 1992, Congress passed the NIPAS Act. The law designates certain areas in the country as protected areas. Paoay Lake National Park is included in the list of protected areas in the country. The NIPAS Act further states that appropriate fees can be charged to finance the operation and maintenance activities for protecting the area. In accordance with this, the PAMB, composed of government and non-government representatives, is considering to impose appropriate fees that will be charged against the users of Paoay Lake's resources.

The operation of fish cages has been identified as one of the major economic activities in the area. In this connection, a survey is being conducted among fish cage operators to determine the economic rents derived therefrom, which will be used as basis for determining the appropriate resource user fees.

I. Profile of Respondent

1. Position : _____
2. Age : _____
3. Fish Cage Experience (yrs.) : _____
4. Educational Attainment : _____
5. Sex : _____
6. Ethnicity : _____
7. Civil Status : _____
8. Other sources of livelihood : _____
9. Respondent's gross monthly income before taxes : _____
10. Household gross monthly income before taxes : _____
11. Location of residence : _____

II. Location of Fish cage

(1) _____
(2) _____
(3) _____

III. Total Area of Fish Cage (meters)

Length _____ Width _____ Depth _____
Length _____ Width _____ Depth _____
Length _____ Width _____ Depth _____

IV. Date Established (month, year) : _____

V. Expenses (Pesos/year)

A. Taxes : _____
B. Permits : _____

Table 1
1997 Crop Production Data (Fishcage # ___)

Crop Number	1	2	3	4	5
1. Culture Period (days)					
2. a. Species Cultured (for monoculture)					
b. Species 1 (for polyculture)					
c. Species 2 (for polyculture)					
3. Grow-out Area (has.)					
4. Total no. of Pieces Harvested					
5. Ave. no. of Pcs./kg.					
6. Marketed Output					
a. Adult (no. of kg.)					
b. Others (wild)					
i.					
ii.					
iii.					
7. Price (PhP)					
a. Adult (per kg.)					
b. Others (wild)					
i.					
ii.					
iii.					

Table 2: 1997 Material Input Data

Crop Number	1		2		3		4		5	
Inputs	**Qty**	**Unit Cost**	**Qty**	**Unit Cost**	**Qty**	**Unit Cost**	**Qty**	**Unit Cost**	**Qty**	**Unit Cost**
1. Stocking Material										
Species 1										
a. Fry										
b. Fingerling										
Species 2										
a. Fry										
b. Fingerling										
2. Feeds (kg.)										
a. Commercial Feeds										
b. Trash Fish										
c. Bread Crumbs										
d. Others, specify[1]										
i.										
ii.										
iii.										

[1] Others such as feed additives (e.g., vitamins, minerals, enzymes, hormones, etc.)

Table 3: 1997 Labor Input Data for Daily/Weekly Laborers

Crop Number	1		2		3		4		5	
Inputs	Total Man-days	Total Cost	Total Man-days	Total Cost	Total Man-days	Total Cost	Total Man-days	Total Cost	Total Man-days	Total Cost
1. Stocking										
2. Growing										
3. Harvesting										
4. Other Activities[2]										
a.										
b.										
c.										
d.										
e.										

Table 4: 1997 Labor Input Data for Monthly/Yearly Laborers

Position	Duration of Employment	Monthly Salary	Bonuses/ Incentives	Percent Time Spent Per Crop				
				1	2	3	4	5
1								
2								
3								
4								
5								

[2] Others such as feed additives (e.g., vitamins, minerals, enzymes, hormones, etc.)

Table 5: Fish Cage Structure and Equipment/Machinery (Since Start of Operations)

Item	Acquisition/ Construction Costs (Initial)	Average Yearly Maintenance Cost	Economic Life (Yrs.)
1. Farm House			
2. Cage Structure			
3. Net Structure			
4. Other Structures (i.e., sinkers, etc.)			
a.			
b.			
c.			
d.			
5. Equipment/ Machinery			
a. Harvesting Nets			
b. Bancas			
c. Others, specify			
i.			
ii.			
iii.			
iv.			

Table 6: Credit Information (Only for Fishcage Operation – For Loans Still Outstanding)

Year	Source	Amount (PhP)	Collateral	Yearly Interest Rate (%)	Purpose

Code:

1 - Fish Cage Development
2 - Purchase of Equipment
3 - Purchase of Inputs
4 - Others, specify

GENERAL QUESTIONS

1. Have you attained maximum production potential of your fishcage?
   _____ *Yes* _____ *No*

   If not, what constraints have you encountered?

Crop 1: _____
Crop 2: _____
Crop 3: _____
Crop 4: _____
Crop 5: _____

2. In addition to the above, what other problems have you encountered in fishcage operations?

_____

_____

3. Has the productivity of your fishcage decreased over the years?
_____ *Yes* _____ *No*

a. If yes, to what factors would you attribute this?

_____

_____

b. What measures have you taken to increase productivity?

_____

_____

4. Can you think of any negative impact of fishcage aquaculture?

_____

_____

5. Suppose the municipal government requires bidding of rights to construct and operate fishcages, how much are you willing to bid for your facility per year?

_____

THANK YOU VERY MUCH FOR YOUR COOPERATION

To be filled up by the interviewer:

NAME OF INTERVIEWER : _____
DATE OF INTERVIEW : _____
TIME OF INTERVIEW : _____
LOCATION OF INTERVIEW: _____

COMMENTS OF INTERVIEWER:

_____
_____
_____

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