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Assessing the severity of problems of aquaculture in Laguna de Bay: practitioners' perspectives

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Laguna de Bay, also known as Laguna Lake, is the largest lake in the Philippines and among the largest in Southeast Asia. It is a highly significant natural resource with various economic uses to its surrounding population, one of which is aquaculture. Since the discovery that some fish species can be grown in controlled environments in the lake, including those that are not native to its waters, rapid aquaculture development has occurred within the lake area.

Although aquaculture is already a major industry in Laguna de Bay at present, its practice has, however, been constrained by numerous problems. Some of these problems may be widely known but their relative importance or severity has yet to be considered. With public resources increasingly becoming limited, a comparative assessment of the problems will help aquaculture institutions, managers, and researchers identify those that need most attention.

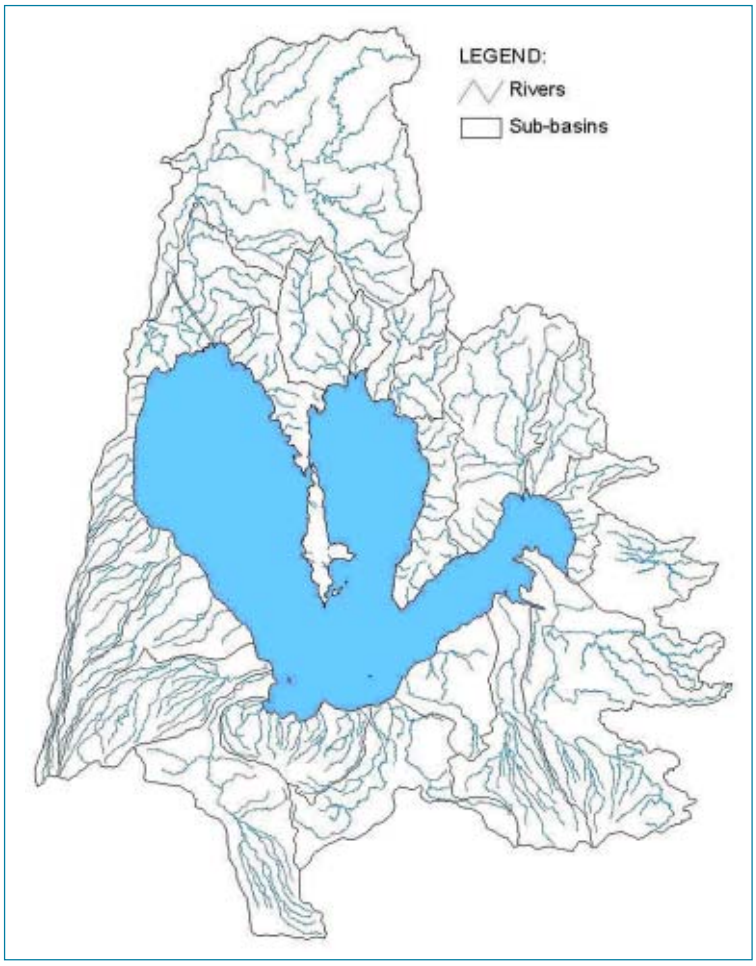
In this light, the Southeast Asian Fisheries Development Center, Aquaculture Department (SEAFDEC AQD) and the Philippine Institute for Development Studies (PIDS) are currently conducting a joint study on the current state of aquaculture in Laguna de Bay. One of the study's objectives is to identify and assess the relative importance

PIDS Policy Notes are observations/analyses written by PIDS researchers on certain policy issues. The treatise is holistic in approach and aims to provide useful inputs for decisionmaking.

This *Notes* is based on the draft report of the SEAFDEC AQD–PIDS study on the current state of aquaculture in Laguna de Bay and is a joint publication of the two collaborating institutions. The author has a Ph.D. in resource economics and is Senior Research Fellow at the Institute and Affiliate Research Specialist of SEAFDEC AQD. The views expressed are those of the author and do not necessarily reflect those of PIDS and SEAFDEC AQD or any of the study's sponsors.

of the current problems in aquaculture in the lake, particularly for the fishpen and fishcage operators who are its main practitioners. Data and information used by the study were gathered through a cross-section survey of fishpen and fishcage operators and through interviews with key public and private sector informants. This *Policy Notes* presents some of the highlights of the comparative assessment of the problems done.

Figure 1. Map of the Laguna de Bay watershed and its sub-basins



Source: Laguna Lake Development Authority

Profile of Laguna de Bay

Laguna de Bay is located in the middle part of Luzon bordering the capital region of Metro Manila and the provinces of Rizal and Laguna. Its total watershed area, also known as the Laguna de Bay region, is about 292,000 hectares (Figure 1). There are around 100 rivers and streams draining into the lake. The entire watershed spans 14 cities and 47 municipalities with a total population of 13.2 million in 2005.

Laguna de Bay has a total water surface area of about 90,000 hectares, average depth of 2.5 meters, maximum depth of 20 meters, average water volume of 2.25 billion cubic meters, and length of coastline of 285 kilometers (LLDA 2006). The numerous biological resources found in the lake include fish, molluscs, crustaceans, and other animal and plant organisms. Aside from aquaculture, Laguna de Bay is used for business, transportation, electricity, industrial cooling, agriculture, recreation, and as floodwater reservoir.

Background of aquaculture in Laguna de Bay

The practice of aquaculture in Laguna de Bay started when fishpen culture was first attempted by the Philippine Fisheries Commission in 1965 using various freshwater species (Mane 1987). Then, in 1970, the Laguna Lake Development Authority (LLDA) successfully demonstrated the commercial culture of milkfish in fishpens in its pilot project in Cardona, Rizal. As a result, fishpen

milkfish production grew by leaps and bounds in the following years. From only 38 hectares in the 1970s, fishpens in Laguna de Bay increased to more than 30,000 hectares in 1983 (Nepomuceno 2004).

Meanwhile, fishcage culture in Laguna de Bay was first attempted in the early 1970s also inside the LLDA fishpen pilot project in Cardona, Rizal (Garcia and Medina 1987). In 1977, cage culture of Nile tilapia started to develop as a commercial enterprise in the lake. The tilapia fishcage industry noticeably grew in 1981, particularly along the Binangonan and Cardona side of Talim Island in Rizal and expanded elsewhere in the lake in the succeeding years.

In 2006, there were 455 registered fishpen operators and 1,599 fishcage operators for a total of 2,054 aquaculture operators located in designated fishpen and fishcage belts in Laguna de Bay. The area covered by fishpen operators in the lake was 12,117 hectares while that by fishcage operators was 998 hectares for a total area of 13,115 hectares.

Problems of aquaculture in Laguna de Bay

Based on interviews with key informants, aquaculture in Laguna de Bay is currently facing numerous problems. For our purpose, these problems may be classified as mainly technical, production, economic, social, environmental, and institutional problems. However, it should be remembered that while the problems may be grouped as such, they are not mutually exclusive but are actually interrelated. The problems of aquaculture in Laguna de Bay are the following:

Technical problems

- Poorly sited fishpens and fishcages – some fishpens and fishcages in Laguna de Bay, although located in the designated belts, are actually poorly sited and not conducive for the practice of fish culture.
- Inappropriate culture practices – some fish culture practices used in the lake are inappropriate. For instance, the practice of monoculture in fishpens may not utilize all the available natural food for fish in the water.

Production problems

- Occasional low supply of seeds – fry and fingerling for stocking are not always available, resulting in the occasional late stocking, low stocking, or nonstocking of some fishpens and fishcages.
- Poor quality of production inputs – some of the production inputs used in aquaculture operations are of low quality, resulting in low harvest performance or higher production costs.
- High prices of production inputs – over the years, the prices of production inputs have increased because of the generally inflationary trend in the economy and the rising cost of fuel, among others.

Economic problems

- Poor quality and low price of fish – the fish produced in Laguna de Bay is perceived

In 2006, there were 455 registered fishpen operators occupying 12,117 hectares in Laguna de Bay.

to be of poor quality. As a result, the market price of the fish is relatively low compared to fish from other areas.

- Low level of fish processing – most of the fish produced in Laguna de Bay are sold in fresh or frozen form. Fishpen and fishcage operators have not benefited from value addition due to processing.
- Lack of foreign markets for fish – fish from Laguna de Bay is generally sold only in the domestic market. Fishpen and fishcage operators have not benefited from international trade.
- Lack of access to cheap capital – limited financial capital is a perennial constraint of aquaculture operators as traditional institutional sources like banks lend only at high interest rates and stiff collateral requirements.
- Too many middlemen – the presence of several middlemen, including consignacions, wholesalers, retailers, and other fish traders has diluted the income that aquaculture operators receive from their operations.

Social problems

- Poaching – poaching reduces the harvest of fishpen and fishcage operators and increases the chance of conflict as well as forces operators to spend on security measures to prevent it.
- Reduction in fishing areas – because of the construction of fishpens and fishcages, municipal fishermen fish in smaller areas, causing much enmity between them and the aquaculture operators.
- Obstruction of navigational lanes – some fishpens and fishcages obstruct navigational lanes used by other sectors, thereby causing problems between them and the aquaculture operators.
- Overcrowding of fishpens and fishcages – some fishpen and fishcage operations are highly overcrowded in aquaculture designated belts, causing conflicts between aquaculture operators.
- Existence of illegal fishpens and fishcages – unregistered and illegally constructed fishpens and fishcages exist in Laguna de Bay, including those located within and outside the aquaculture belts.
- Presence of squatters – the presence of

illegal settlers in the coastal areas has caused problems, particularly to fishcage operators near these areas as some of these squatters steal property of operators.

- Shoreline conversion – some coastal areas near aquaculture belts are already converted for residential, commercial, and industrial uses which hinder the movement of people and materials for aquaculture operations.

Environmental problems

- Occurrence of algal bloom - algal bloom causes fish mortality or fish kill as stocks die of asphyxiation due to oxygen depletion. Furthermore, the fish that survive has a tainted flesh and mud-like taste.
- Proliferation of water hyacinth – water hyacinths crowd fishpen and fishcages and cause various problems like fish mortality, destruction of pen and cage structures, and obstruction of navigation.
- Invasion of alien species – the proliferation of alien fish species, particularly janitor fish of late, has caused problems. This fish destroys nets and competes for natural food and living space with cultured species.
- Occurrence of fish diseases – cultured fish in Laguna de Bay is affected by various diseases that cause fish mortality or fish kill which in turn reduce the viability of aquaculture operations.
- Deterioration of water quality – the worsening water quality in Laguna de Bay, which is caused mainly by water pollution, leads to fish mortality, fish kill, and/or reduced quality of fish.
- Siltation and sedimentation – siltation and sedimentation has made Laguna de Bay shallow and reduced the living space for the fish and other aquatic animals as well as navigational space for man.

Institutional problems

- Obstructed saltwater inflow – aquaculture operators argue that the backflow of saltwater from Manila Bay into Laguna de Bay through the Pasig River is obstructed. Among others, this reduces the growth and natural food and contributes to the proliferation of water hyacinth.
- Poor access to training and extension – aquaculture operators have limited access to training and extension and operate mainly based on practical experience. This has contributed to the practice of traditional and less innovative aquaculture practices in the lake.

Fishcage culture in Laguna de Bay was first attempted in the early 1970s.

In general, the aquaculture problems which were considered very serious as a group by more respondents were the environmental problems. Of these problems, those which were individually considered as very serious by more respondents were the deterioration of water quality, siltation and sedimentation, and invasion of alien species.

- Difficult registration process – the registration process for fishpen and fishcage operations is considered by operators to be difficult and long, thereby increasing the time and financial costs of registration.
- Overall limited government support – overall technical, financial, economic and market support, and law enforcement by the government are inadequate. Government agencies are perceived as not doing enough to sustainably develop aquaculture in Laguna de Bay.

Other problems

- Occurrence of typhoons and floods – weather-related events like typhoons and floods destroy fishpens and fishcages causing the escape of fish stock, destruction of property, and economic losses to the aquaculture industry in the lake.

Relative severity of the aquaculture problems

Based on the survey of fishpen and fishcage operators conducted for the study, the relative importance or severity of the aforementioned problems of aquaculture in Laguna de Bay was analyzed as shown in Table 1.

In general, the aquaculture problems which were considered very serious as a group by more respondents were the environmental problems. Of these problems, those which were individually considered as very serious by more respondents were the deterioration of water quality, siltation and sedimentation, and invasion of alien species. Those which were considered as very serious by relatively fewer respondents were the occurrence of algal bloom, proliferation of water hyacinth, and occurrence of fish diseases.

Outside of environmental problems, there were individual problems belonging to the other problem classifications which were considered as very serious by more respondents than others. These include the economic problem of lack of access to cheap capital, social problem of poaching, and the institutional problem of limited overall government support.

The results also indicate that all of the problems considered within all the groupings were considered by most respondents as at least lightly serious. Furthermore, many of the problems, particularly those classified as technical, economic, social, institutional, and other problems were considered by most respondents as at least moderately serious. It is noted as well that few respondents considered any of the problems as not a problem while a substantial number of respondents had no opinion.

Table 1. Relative severity of the problems in aquaculture in Laguna de Bay, 2007

Problems	Very Serious	Moderately Serious	Lightly Serious	Not a Problem	No Opinion	Total
Technical Problems						
Poorly sited fishpens and fishcages	23	101	31	3	22	180
Inappropriate culture practices	13	103	31	4	29	180
Production Problems						
Occasional low supply of seeds	8	38	89	6	39	180
Poor quality of production inputs	8	31	98	4	39	180
High prices of production inputs	8	37	92	4	39	180
Economic Problems						
Poor quality and low price of fish	28	91	27	5	29	180
Low level of fish processing	11	90	36	8	35	180
Lack of foreign markets for fish	10	96	30	8	36	180
Lack of access to cheap capital	63	65	14	4	34	180
Too many middlemen	28	91	27	5	29	180
Social Problems						
Poaching	100	43	16	6	15	180
Reduction in fishing areas	23	95	37	3	22	180
Obstruction of navigational lanes	38	80	28	5	29	180
Overcrowding of fishpens and fishcages	23	101	31	3	22	180
Existence of illegal fishpens and fishcages	38	86	22	5	29	180
Presence of squatters	12	90	27	9	42	180
Shoreline conversion	23	95	37	3	22	180
Environmental Problems						
Occurrence of algal bloom	89	32	18	2	39	180
Proliferation of water hyacinth	89	38	12	2	39	180
Invasion of alien species	136	17	3	2	22	180
Occurrence of fish diseases	74	50	20	6	30	180
Deterioration of water quality	140	22	6	1	11	180
Siltation and sedimentation	138	24	6	2	10	180
Institutional Problems						
Obstructed saltwater inflow	15	96	35	4	30	180
Poor access to training and extension	15	102	29	4	30	180
Difficult registration process	24	63	52	1	40	180
Overall limited government support	85	58	9	3	25	180
Other Problems						
Occurrence of typhoons and floods	15	96	35	4	30	180

Note: The respondents include 60 fishpen operators and 120 fishcage operators.

Giving primary importance to the environment-related problems in Laguna de Bay should agree with the current worldwide trend for sustainable exploitation as a development strategy. Hence, it is prudent that these problems be given primacy in the efforts to further develop aquaculture in Laguna de Bay.

Conclusion

The results of the study indicate that the environment-related problems of aquaculture in Laguna de Bay may be the ones considered by fishpen and fishcage operators as the most serious of those they are facing. In light of limited resources, therefore, these problems should be prioritized by pertinent government institutions, managers, and researchers in pursuing their activities related to aquaculture in the lake. In addition to the environmental problems, the individual issues of lack of access to cheap capital, poaching, and limited overall government support should also be considered.

Giving primary importance to the environment-related problems in Laguna de Bay should agree with the current worldwide trend for sustainable exploitation as a development strategy. Hence, it is prudent that these problems be given primacy in the efforts to further develop aquaculture in Laguna de Bay. In addition to the potential gains for aquaculture, addressing the environment-related problems should provide benefits to the other economic sectors that depend on an environmentally healthy lake for the successful pursuit of their goals.

References

Garcia, A.M. and R.T. Medina. 1987. The state of development program of cage culture in Laguna Lake. Proceedings of the Seminar-Workshop on State of Development of the Laguna de Bay Area, Philippine Council for Agriculture and Resources Research and Development, Los Baños, Laguna, Philippines.

Laguna Lake Development Authority. 2006. *Laguna de Bay Environmental Monitor* 2006. A report to the stakeholders of the Laguna de Bay region.

Mane, A.M. 1987. Fishpen culture in Laguna de Bay. Proceedings of the Seminar-Workshop on State of Development of the Laguna de Bay Area, Philippine Council for Agriculture and Resources Research and Development, Los Baños, Laguna, Philippines.

Nepomuceno, D. 2004. Addressing freshwater conflicts: the LLDA experience in Laguna de Bay. Presented in the Workshop on Natural Resource-Based Conflicts in the Philippines sponsored by the United States Agency for International Development (USAID) and the Department of Environment and Natural Resources (DENR), May 13-14, Westin Philippine Plaza, Pasay City, Philippines.

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