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Assessment of fish-farming livelihood in the coastal areas of Los Baños, Laguna during the Covid-19 pandemic

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Abstract
The COVID-19 pandemic made a significant impact on the socio-economic status of almost every sector, including the fishing industry. Hence, this study aimed to assess the status of fish farming livelihood during the COVID-19 pandemic in the coastal barangays of Los Baños, Laguna, Philippines. Local fisher folks from five selected barangays were chosen through random sampling. Data collection was conducted through a survey questionnaire and personal interviews. Results showed a drastic plunge in the income of the fish farmers because of the decline in demand and travel restrictions to the major fish markets. Also, a low yield in fish harvest was observed because fish farmers can't afford commercial feeds. The problems encountered by fisher folk during COVID-19 include lack of funds and government support, disruptions of market flow, and natural disasters. The study also identified a variety of solutions, as well as reduction of farm fish, food reduction, reduction of cages planting, etc. The findings revealed that the decline in their income was heavily influenced by market disruptions. In effect, the lockdown provided an impetus for the adoption of new strategies to help fish farmers during difficult times.

Keywords: COVID-19, fish farming, Laguna lake, livelihood

Introduction

The first case of COVID-19 in the Philippines placed the nation under severe community quarantine, limiting travel and commercial operations (World Bank, 2021). These measures to combat the spreading pandemic had a substantial impact on family incomes, jobs, education, food security, and businesses. Also, the virus' resulting lockdowns have caused a substantial decline in the job market, compounding COVID-19's impact on poverty in the Philippines. According to NEDA (2022), the Philippines' unemployment rate has since risen due to the pandemic and lockdown measures.

Laguna Lake is the largest lake in the country and the second-largest inland body of water in Southeast Asia (Santos-Borja, 1994) [14]. Aquaculture is one of Laguna Lake's many economic uses since it supports the fishing sector by providing a living for approximately 13,000 fishermen (LLDA, 2018) [4]. The majority of the locals depend on the as a source of food, hence, they are engaged in subsistence fishing. Meanwhile, to generate more harvest and income, fish pens and fish cages are constructed in the lake (Palanca-Tan, 2020) [10]. However, LLDA (2018) [4] reported that the majority of the fish pens and cages in the lake are owned and operated by big corporations. Some local fisherfolks engage in cage and pen aquaculture as owners and operators but most of them work as laborers. According to the Laguna Lake Development Authority (LLDA) Board Resolution No. 540 of 2018, the total area for aquaculture structures is 9,200 hectares, based on the natural carrying capacity of the Laguna de Bay for aquaculture. Given these limitations, the rights of poor fishermen will be given priority, and hereby establishing an allocation of a 60:40 basis for individual permittees and corporations, respectively.

However, the pandemic caused a global socioeconomic crisis in almost every sector, including the fishing industry (Russo et. al, 2021). Due to supply chain disruptions and decreased demand, the pandemic has decreased industry profits. Lockdowns and curfews have also reduced catch volumes, thereby lowering the amount that fishermen are paid per day of work (Quallen, 2021) [11]. Because cold storage is expensive and not readily available to small-scale fishers, what they don't sell typically goes to waste. Small and medium-scale fisheries, particularly in rural regions, are the most affected, as they lack the resources that large-scale fisheries have to transition and adapt during COVID 19 (Orlowski, 2020). The pandemic affected the livelihood of fisherfolks involved in fish farming activities such as fish pens and fish cage operations. This paper will assess the socio-demographic characteristics of the fish farmers living around Laguna Lake, specifically in the municipality of Los Baños, Laguna. This study aims to serve as a piece of baseline information on what are the problems and issues faced by the fish farm owners and the perceived solutions amidst the COVID-19 pandemic. This study was carried out to generate relevant information that could be used as a guide for developing programs to assist fish farmers in mitigating the effects of the COVID 19 pandemic, specifically to enable them to sustain their livelihoods and improve their well-being.

Materials and Methods

Respondents of the Study

The study was conducted in the municipality of Los Baños, Province of Laguna. Five coastal barangays near namely, Tadlak, Bambang, Malinta, Mayondon, and Bayog were chosen as the study sites. Using a simple random sampling method, a total of 80 fish farmers, both fish pen and cage operators were identified as respondents. Specifically, the composition of the respondents was the following: Malinta (32.50%), Bambang (3.75%), Mayondon (27.50%), Tadlak (25%), and Bayog (11.25%).

Research Design and Instrument

The method used in this study was based on Hall (2008) [3], with some modifications. A cross-sectional survey in which data were collected from different individuals at a single point in time was conducted. For primary data gathering, a face-to-face survey method was used. Also, an interview schedule questionnaire served as a guide for interviewers in collecting information or data about a specific topic or issue. The questionnaire used in this study was adapted from Bonsol (2021) [1]. The questions were made up of both open and closed-ended questions. The questionnaire consisted of the following socio-demographic data: age, educational qualifications, gender, cage/pen size and number, household characteristics, the primary source of income, manner of fish disposal, yield crop per year, problems encountered, and solutions used during the COVID-19 pandemic. Before being used as a survey instrument, it was validated by experts from the different institutions involved in fisheries operation and management around Laguna Lake. Also, the validity was confirmed using the Likert scale.

Data Analysis

All collected information was compiled and analyzed using statistical software, Microsoft Excel 2019. Data were presented in textual, tabular, and graphical forms to better understand the current state of livelihood of fish cage operators in coastal barangays during COVID-19. The data and information collected were analyzed and expressed in frequency and percentage.

Results and Discussions

Demographic Profile

The demographic profile of the respondents in the 5 coastal barangays is summarized in Table 1. The present study revealed that 96.25% of the respondents were male and 3.75% were female. This indicates that fish farming is a male-dominated enterprise because of the intensiveness of fish farming labor in the study area. Men are responsible for the majority of fish farming production while women are more likely to perform tasks that are less physically and technically demanding, such as preparing feeds and feeding fish. Results indicated that most of the respondents are married and their partners would help them in managing their fish pens/cages. Meanwhile, the majority of the fish farmers have an age range of 50-59 years old (43.75%). Senior citizens (60-69 years old) account for 31.25% of the population. This showed that despite old age, they continued to engage in fish farming activities to support their families. A respondent admitted that young people nowadays tend to venture into other jobs rather than continue the fishing business, hence, they cannot retire early. Regarding their educational attainment, most of the respondents finished secondary school (50%). Notably, the 10% who finished college were graduates of Bachelor of Science in Fisheries. Also, some respondents pursued fish farming activities after receiving training from the Bureau of Fisheries and Aquatic Resources (BFAR). The size of the fisher folks' households varied, but most of them were made up of 4-6 family members (51.25%). Some households have 13-15 members in their family but not everyone is engaged in fishing activities. Despite the large family size, 12 respondents revealed that labor for fish production was not provided by the family members since most of their sons/daughters preferred white-collar jobs.

Table 1: Demographic profile of the fisherfolks in the study area

		Frequency *(f)*	**Percentage**
Gender	Female	3	3.75
	Male	77	96.25
	Total	80	100
Marital Status	Married	64	80
	Single	8	10
	Widowed	4	5
	Live-in	3	3.75
	Separated	1	1.25
	Total	80	100
Age	30-39	5	6.25
	40-49	15	18.75
	50-59	35	43.75
	60-69	25	31.25
	Total	80	100
Educational Attainment	Elementary	27	33.75
	Highschool	40	50
	College	8	10
	Vocational/technical	5	6.25
	Total	80	100
Household Size	1-3	22	27.5
	4-6	41	51.25
	7-9	10	12.5
	10-12	2	2.5
	13-15	5	6.25
	Total	80	100

Socioeconomic Profile

The socioeconomic profile of the respondents is displayed in Table 2. In the present study, the main occupation of the fish farmers was considered from which most of the income was earned. Fish cage is the main source of income for the fish farmer (52.5%). Around 17.5% of fish farmers reported

being construction workers and tricycle drivers. According to the respondents, the income from fish farming is not enough to support their family expenses, hence they have to work other jobs. The harvested fish from the fish cage/pens are sold directly to the market or through various channels. It was found that 37.5% of harvested fish are delivered to the town's market. Farmers sold their fish to the middleman (about 35%), makeshift markets (15%), and the remaining 12.5% of farmers states that they didn't sell as they did not harvest. According to the respondents, the lockdown coincided with an algal bloom which caused fish mortality which is why fish farmers were unable to harvest. If harvesting is possible, they are used for house consumption only due to higher transportation costs. In contrast with the study of Mandal *et al.,* (2021) [6] half of the households avoided wet markets because of COVID- 19. Before the pandemic, 80% of households bought fish from wet markets. This percentage dropped to 45% during the pandemic. Harvested and caught fish are typically traded in fish markets, where consignations serve as the dominant exchange process. However, due to COVID-19 market operations changes in terms of rules and time, such as limited daily market hours, market operations were reduced from seven to six days per week to allow for disinfection. As a result, they seek alternative market arrangements, such as selling in the middleman, sidewalk vendors, and peddling around town.

The average cage size in the study areas was found to be 80-100 sqm with some fish farmers owning 1-3 cages each. The respondents source their fingerlings from neighboring municipalities (Bay, Laguna). Meanwhile, some stated that the fry/fingerlings were provided by BFAR the most popular species stocked were common carp *(Cyprinus carpio)* and Nile tilapia (*Oreochromis niloticus)*. Before the pandemic, these species were sold at a relatively higher price of ₱100-150 per kilo. However, when COVID-19 happened, the price significantly lowered to ₱31-50 per kilo only. Some tilapia growers even try to sell off their fish even at much-reduced prices. In terms of the yield per annum, the majority of the respondents harvested 100-500 kg of fish. The respondents were unable to provide accurate records of their production and sales due to the problem of poor farm record keeping, as most of the information obtained was from their recollection only. However, the income data was meticulously gathered. Results indicated that the majority of the fish farmers have ₱1.00-200,000 annual income. However, when the pandemic happened and lockdowns became longer, their income took a sudden plunge. One respondent shared that he only earned ₱10,000 for a whole year because he was unable to sell his harvests. Cases of low per capita income mentioned by fish farmers include many household members, loss of farm income, children in school, and spending the majority of their income on basic food items such as food, clothing, and medication. Fish farmers were asked if their income from fish farming was sufficient to meet their family's needs now that COVID-19 was in place. About 61.25% of the respondents answered no and 38.75% said yes. Those who said that their income was enough owned the pens/cages and motorized boats.

Table 2: Socioeconomic profile of the respondents

		f	**Percentage**
Source of Income	Fish cage	42	52.50
	Fisherman	10	12.50
	Construction worker	14	17.50
	Others	14	17.50
	Total	80	100
Manner of Disposal			
	Town market	30	37.5
	Makeshift market	12	15
	Middleman	28	35
	Others	10	12.5
	Total	80	100
Yield per Year	100-500 kilo	76	95
	501-1,000 kilo	1	1.25
	Not yet harvested	3	3.75
	Total	80	100
Income from Fish Farming	₱1.00-200,000	60	75
	₱200,001-400,000	1	1.25
	₱400,001-600,000	1	1.25
	₱600,001-800,000	1	1.25
	₱800,001-1,000,000	1	1.25
	No income	16	20
	Total	80	100

Problems Encountered and Proposed Solutions

A number of problems/issues were reported by the respondents (Table 3). This includes lack of funds, lack of government support or assistance, marketing, natural disaster, and others. From the survey, it was found that 73.75% of the fish farmer identified lack of funds as their main problem encountered during the COVID-19 pandemic. This indicates that their income was primarily derived from fish farming, but because of the lockdown, they were not been able to meet their desire for maximum output. They also lament the lack of government support or assistance during the pandemic. Specifically, they cannot easily market their harvests because of transportation issues. About 3.75% of the respondents noted that natural disasters, marketing, and others as one of their problems. Even before without COVID-19, the aforementioned challenges had been a long-standing impediment to the sustainability of Philippine fisheries and aquaculture. For example, (Guerrero, 2019) [2]

informed that one of the primary causes of low tilapia production in tilapia aquaculture has been identified as a lack of capital and government support. Rafiquzzaman (2020) [12] reported that reducing domestic consumption, cancellation of shipment by the buyer, low prices, transport crisis, delays in summer stocking, and lack of technical service providers are the problems faced during COVID- 19. In order to prevent an outbreak, all fish farmer operators followed standard procedures to protect themselves and their families from the COVID-19 virus. The primary methods suggested were the use of alcohol and the use of a face mask when going to their cages/pens in the lake. It was evident from the data that 50% of the respondents with multiple sources of income fared better. Diversification includes other sources of income, such as home-cooked meals and variety store business. Meanwhile, 28.75% said that they reduce the feeds given to fish to lessen the expenses. However, the feed reduction affected the size of harvested fish. One respondent narrated that he would buy rejected bread from bakeries as it is less expensive than commercially manufactured feeds. He interjected that he would just give commercial feeds during the fingerlings stage and would feed bread and rice for the duration of the culture period. Additionally, about a 15% reduction in fish farming was observed during the pandemic. This was due to the low fingerling availability and high transportation costs. This situation translates to lower-income households investing more in aquaculture production. Meanwhile, about 2.5% resorted to planting vegetables to support their daily food consumption. They admitted that growing their food in a vegetable garden helped mitigate the negative effects of their decreased purchasing power and physical access to markets. Due to the pandemic, fish farmers have used various strategies to maintain their livelihoods and support their families. Manlosa *et al.*, (2021) stated that the pandemic and subsequent lockdown measures resulted in the emergence of a variety of coping strategies, including online purchasing, peddling caught fish in communities, diversifying income, and growing their food. Before the COVID-19 crisis, online buying and selling were practiced in various parts of the Philippines. This was influenced by the widespread use of Facebook. With limited physical market access and mobility, online selling and buying became an important means of market exchange we're carried out through communication using a mobile phone. A respondent shared that his children would try to sell their fish harvests on online buy and sell groups.

Table 3: Problems encountered and proposed solutions by the fish farmers during the COVID-19 pandemic

		f	Percentage
Problems Encountered	Lack of funds	57	71.25
	Lack of government support or assistance	5	6.25
	Marketing	5	6.25
	Natural disaster	2	2.50
	Others	11	13.75
	Total	80	100
Proposed Solutions	Reduction of farm fish	12	15
	Food reduction	23	28.75
	Reduction of cages	3	3.75
	Planting	2	2.50
	Others	40	50
	Total	80	100

Conclusion

The findings of this assessment of fish farming livelihood in the coastal barangays of Los Baños Laguna showed that the COVID-19 pandemic has affected the operations of the fisher folks even though they live nearby the lake and can easily access their cage/pens. During the pandemic, the fisher folks were declared as one of the frontliners as they serve food essentials. However, the implementation of the lockdown affected their livelihoods drastically wherein their income and profit were significantly reduced. Some fisher folk stopped their cage/pen operations because trading of their catch has been adversely impacted by travel restrictions. This resulted in lower demand for fish since the middlemen could not deliver the fish to major fish markets because of the increase in transportation fares and the stringent lockdown protocols. As a result, the middleman stopped buying fish or bargained for the fish at low prices which affect their income. The lack of funds has been a major problem for fisher folk even before and COVID-19 only worsened the situation of the operators. To cope with this pandemic some fisher folks started to sell their harvested fish by themselves but the profit was low because people are not allowed to leave their homes. Some fisher folks lessened such impacts by having alternative incomes such as working in construction, having a variety store, planting vegetables, and waiting for financial support from the government.

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