

# Aquaculture and Its Impact of The Covid-19 Pandemic on The Fish Processing Industry: Case Study from Local Community

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**Abstract.** The Indonesian government has facilitated farmers through the role of agricultural extensionists (AE). Covid-19 pandemic has caused heavily impacts on the fisheries sector especially on the socio-economic conditions of the stakeholders, e.g., fishers, fish farmers, traders, as well as consumers. This impact on aquaculture is about its production is largely influenced by the demand from the food service sectors, processing factories, and export. Movement restrictions of fish farmers and less demand from consumers needs to maintaining the stocks of cultured commodities becomes more expensive as most of the products could not be harvested. From the snow ball sampling methods and research interview, the covid-19 pandemic makes the fish processing industry decrease more than 56%. It impacts 3 main activities, such as reducing demand for fish, low prices due to cancellation of shipment by buyer and lack of technical service provider. This decrease has a positive impact on the community to overcome the existing problem, diversifying the product and recognize need for new strategies to identify marketing opportunities that use technology.

## 1 Introduction

### 1.1 Background

The COVID-19 outbreak has disrupted the lives and livelihoods of everyone around the world. Covid-19 spreads very quickly, mutates, and changes the economy and livelihoods of the entire population. As a result, the export potential for many industries has declined significantly, including the fishing sector, particularly shrimp and lobster production (1). The Covid-19 pandemic is a world-changing event that has caused a severe economic downturn in the fishing sector that has changed the lives and livelihoods of countless workers around the world (1), but especially those related to small-scale fisheries and coastal fishing communities, including Indonesia.

The movement of fishing activities in Indonesia mainly includes capture, aquaculture, and fish processing products. The impact of the WFH system that is implemented to avoid

the spread of Covid-19 has more or less affected the fishing industry. Most online media reported lower fish prices caused by lower levels of consumer demand from households to exporters. Therefore, in some areas, fishers have stopped fishing because they fear that their production will not be absorbed by the market. Fish market activity in certain areas over the past month has begun to decline due to lack of buyers, so many fish are in decline in the market.

The Covid-19 pandemic has become a major challenge for the national fisheries sector in Indonesia. The short and long-term impacts of the pandemic have the potential to significantly reduce the welfare of small fishermen and coastal communities who are very vulnerable due to declining demand for fishery products. This study aims to determine the impact of the Covid-19 pandemic on the production and distribution of fishery products in local communities, especially fish processing industry.

Indonesia which has three different time zones in its territory: Western Indonesia Time (WIB) — seven hours ahead (UTC+07:00); Central Indonesia Time (WITA) — eight hours ahead (UTC+08:00); and Eastern Indonesia Time (WIT) — nine hours ahead (UTC+09:00) makes it has different characteristics either in their fisheries resources and also the way to added value of their fish product. Comparative between three time zones is needed to have a look the way its changes and factors which affected its changes. In this study, it will discuss focused on the time zone Western Indonesia Time (WIB), how the pandemic impact of the fish processing industry.

Several study site in Western Indonesia has been selected, one of which is in Jakarta Capital and its surrounding due to several places known as the key player in fish processing activity, one of which is in Muara Angke. Based on the Governor's Decree No. 2293 of 1984 that Muara Angke is one of the centers for processing traditional fishery products, one of which is salted fish. Muara Angke fish processing, is one of the largest salted fish or dried fish producing areas in Jakarta. The center of the salted fish processing industry is in the salting block of Muara Angke in the Kapuk village, Penjaringan sub-district, North Jakarta. Muara Angke is a very busy fishing village and also one of the largest in the capital area. This industry even supplies most of the fish needs for the people of Jakarta and its surroundings. In addition to the existence of traditional fishermen, Muara Angke is also a place to market fish from various regions on the island of Java.

Early when the Covid-19 pandemic hit, the amount of salted fish production was still stable and did not decrease. Nevertheless, with rules enforcement of restrictions on community activities (PPKM) insulation in some cities, especially Jakarta makes the marketing of fishery products to be blocked. For the medium to large scale fish processing industry, this is something that needs to be adjusted quickly. However, like some household-scale processing industries, of course it will be different, where in this area there are tens to hundreds of small-scale salted fish processing. Seeing these existing conditions, the level of community vulnerability to pandemic conditions needs to be studied more deeply and in detail. In this study, it is the first step to determine the supporting factors so that the current capital assets, namely in the form of salted fish processing activities to be able to continue to survive so that the community can carry out livelihood strategies.

Most of the fish processing activity derives from the Jakarta Bay (JBE) ecosystem on the mainland and in the islands. Small pelagic fish are one of the major resources of the JBE [2], [4]. Apart from being a cheap source of nutrients, it can increase the income and welfare of coastal communities. Studies reported that the types of species found in JBE were *Rastrlliger brachysoma* (kembung), *Rastrlliger kanagurta* (banyar), *Selar crumenophthalmus* (selar), *Selaroides leptolepis* (selar kuning), *Atule mate* (selar hijau), *Megalaspis cordyla* (tetengkek), *Sardinella* sp. (tembang), *Amblygaster sirm* (siro), and *Stolephorus* sp. [5].

According to the quantitative data from Ministry of Marine Affairs and Fisheries (2020) [6], the recent fish stock decline linear with increasing population in Jakarta [7]. It can be

indicated from the several species lost and the number declined. Development of Jakarta City, human activities as well as some domestic waste flow to JBE, give a negatively impact for the communities who dependent on the fisheries sector [10]. These environmental changes likely have the major impact of the fisheries resources in JBE as fish resources to support communities in their fish resources used

## **2. Method**

### **2.1 Data Collection**

This research was part of out in several stages to obtain an overview of the impact they felt during the pandemic condition, then linked it to the Sustainability Livelihood Framework on the activities of the fish processing industry players and make it comparable between several places in Indonesia. However, this research is still in the early stages where primary data is obtained using a questionnaire and secondary data is obtained from government institutions such as data from the Central Statistics Agency and the Ministry of Marine and Fisheries.

Recently, on the first stage, the survey was carried out using a questionnaire to collect the relevant information from different stakeholders in Indonesia. The information was collected through WhatsApp, email and discussion via zoom to the respondents.

To understand the resource use in fish processing activity, a ranking of the preferred species was conducted which result in ten different targeted species that are considered as the major economically important to the respondents in the study areas. Economically important in this term means “Resources that can be either consumed or sold” where multiple answer was possible. According to their answers, some species were grouped based on three ranks; 1-highest, 2-medium, 3-lowest.

### **2.2 Data Analysis**

Data Analysis was divided into two parts: statistical analysis and descriptive analysis. Quantitative answers were obtained in the data collection method. To achieve the significant difference in both study sites, a non-parametric test for independent sample was used. A cross-tabulation was used to show the relationship between two or more categorical variables by SPSS (Statistical Package for Social Sciences) [8] IBM series 20. Chi-square (X<sup>2</sup>): testing for goodness to fit used to test the hypotheses regarding statistical distribution on people perception of resources changes. Data on socioeconomic characteristics including location, community structure, occupation, resource use and livelihood will be explained

In this study, increased population, highly dependent on coastal resources are contributing to declining coastal resources stock. Due to these factors, the majority of the people that live in these coastal communities live below the poverty line with poor sanitation. This environmental crisis is likely to have major consequences for the livelihoods of those dependent upon these resources. To find out the livelihoods in both study areas, a framework about Sustainable Livelihood Approach (SLA) should be described.

### **2.3 Sustainable Livelihoods Approach (SLA)**

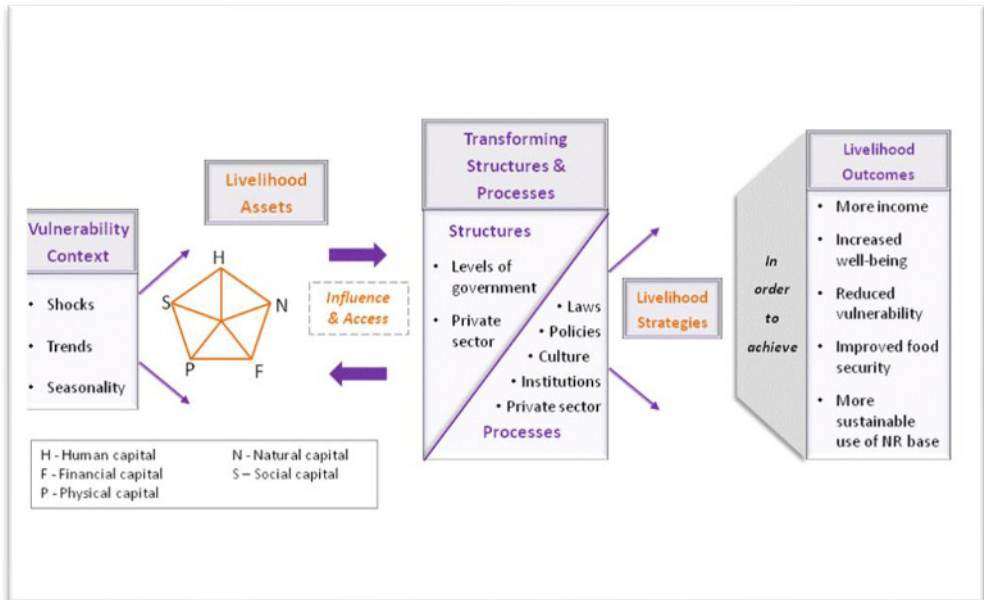
The Sustainable Livelihood Approach (SLA) in the coastal context was developed in the frame of the Sustainable Coastal Livelihoods (SCL) Project South Asia funded by the UK Government’s Department for International Development’s (DFID) Policy Research Program. Krantz (2001) reported, the adoption of a livelihood approach within DFID resulted from the publication of the 1999 UK Government White Paper on International Development.

Apart from DFID, there are other organizations using SLA. They include the International NGOs CARE, OXFAM, Save the Children, ITDG (Intermediate Technology Development

Group), as well as bilateral organizations (DANIDA, SIDA) and multilateral organizations (UNDP, FAO, WFP, IFAD, World Bank).

DFID (1999) defined, “A livelihood comprises the capabilities, assets and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now in the future, while not undermining the natural resources base”.

Sustainable Livelihoods Framework (SLF) is a way of looking at the complexity of people’s lives and responding to that complexity (Figure 1), used to understand and examine the livelihood of the poor [8].



**Fig. 1.** Sustainable Livelihoods Framework

The SLF constructed based on five principal categories of livelihood assets (human, social, physical, financial, and natural) Carney (1998). In this study, comparison of livelihood assets between the islands and the mainland are based on the SLF with respect to the adaptive capacity of the fishermen.

### 3. Results and Discussions

#### 3.1 Marine Living Resource Use

The most important species mentioned by the interviewed households differed between islands and mainland communities (Table 1). The mean ranks of species from the household survey on the islands and the mainland are presented below:

**Table 1.** List economically important species (in term of consumption and trade)

No.	Local name	Latin name	English name
1	Ekor kuning	<i>Caesio cuning</i>	Redbelly yellowtail fusilier
2	Tongkol	<i>Euthynnus affinis</i>	Mackerel tuna
3	Banyar	<i>Rastrelliger kanagurta</i>	Indian mackerel
4	Kerapu	<i>Epinephelus</i> sp./ <i>Plectropomus</i> sp.	Grouper
5	Selar kuning	<i>Selaroides leptolepis</i>	Yellowstirpe scad
6	Baronang tompel	<i>Siganus guttatus</i>	Rabbit fish
7	Tembang	Clupeidae: <i>Sardinella albella</i> , <i>Sardinella brachysoma</i> , <i>Sardinella</i> <i>fimbriata</i>	Fringe scale sardine
8	Lemuru	<i>Sardinella lemuru</i> , ( <i>Amblygaster</i> <i>leiogaster</i> )	Bali sardinela
9	Tenggiri	<i>Acanthocybium solandri</i>	Narrow - barred spanish mackerel
10	Kerang hijau	<i>Perna viridis</i>	Green mussel

In this study, economic importance was defined as use of these resources either for consumption or as a source of income. According [9] who wrote about the economic theory of natural resource utilization, economically means the resources can be processed in the fishing industry to achieve sustainable usage and economic values should represent the financial benefits, which are based on the demand of that community [12].

Ten categories of marine resources were listed related to economic importance. This information was gained from the respondents assigning ranks for the resources. Three ranks were used based on importance both for consumption and trade; 1-highest, 2-medium and 3-lowest. Observed differences in target species are due to four reasons; differences in fishing ground, types of fishing gear, market demand, and the availability of technology.

Large-Scale Social Restrictions (Pembatasan Sosial Skala Besar known as PSBB) in several cities in accordance with PP No. 21 of 2020 in the context of handling the Covid-19 outbreak in Indonesia which regulates restrictions on the movement of people, academic and workplace activities, religious activities, activities in public facilities, and distribution of goods to other cities. Another region. The implementation of this policy caused the Indonesian fisheries sector to experience a significant decline, including aquaculture, fishing and processing of fishery products. Countless workers, who normally work long hours in fishing operations have also had to stop working to prevent the spread of Covid-19.

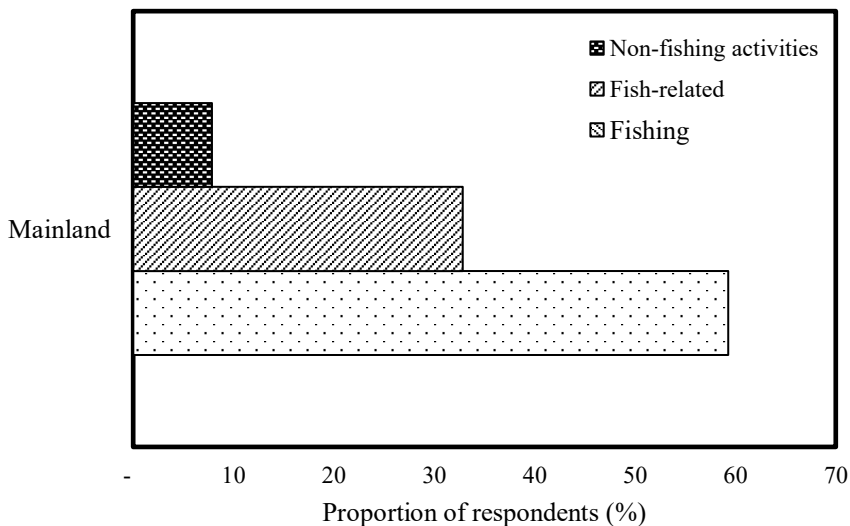
The Covid-19 pandemic has impacted national fishery products, decreased market value of seafood, and consumer demand, including restaurants and hotels, resulting in the closure of many retail businesses, disruption of trade routes, and increased potential for pollution related to unsold fish products and excessive packaging for avoid the transmission of Covid-19 during transportation. The pandemic causes a 30-40% drop in export demand.

The results of the study found that there are several factors that make a difference to the sales of the medium-scale and traditional processed fish sector, namely, the source of raw materials, processing processes, and human resources. In terms of raw materials, local communities use high-grade fish raw materials freshness is very low. Of course, this affects the quality of the salted fish produced and ultimately affects the selling value. Then, in terms

of fish processing, salted fish use the wet salting method, namely salting using a salt solution and soaking it for 12-24 hours.

### 3.2 Financial Capital

In general, the majority of fishermen both on the islands and the mainland depended on fishing as their main source of income (Figure 2). Fishermen tended to save their income every day to fulfill their daily needs. However, as the fish stock is decreasing most fishermen had two or more sources of income to increase their financial standing. These additional sources of income are grouped here into fish-related and non-fishing activities.



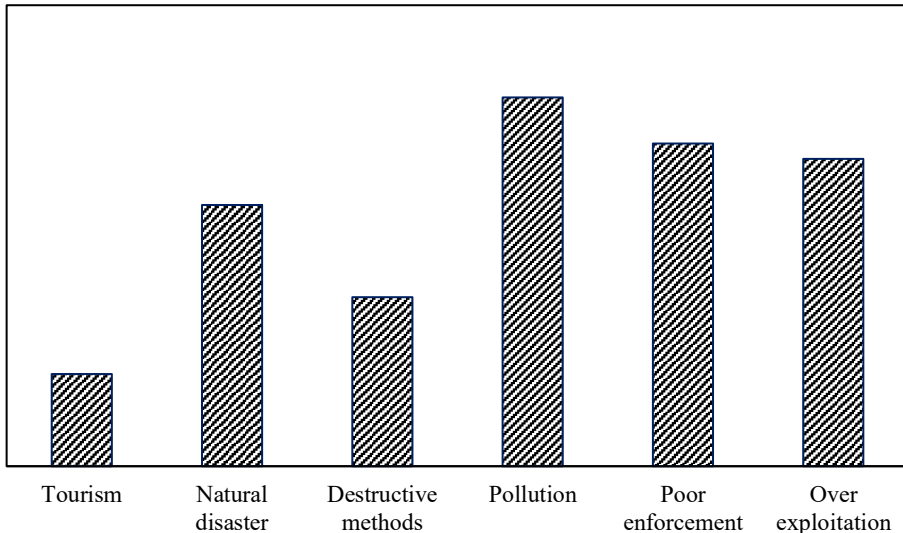
**Fig. 2.** Main sources of income of respondents on the mainland

There are two main sources of financial capital; available financial stocks (savings, credit) and regular inflows of money (pensions, other transfers, and remittances) [8]. According to the respondents, both on the islands and the mainland, the financial capital is a highly fluctuating and uncertain asset for developing their livelihoods. Fishing is a high-risk occupation [17], as it is seasonal [7] and subject to cyclical fluctuation in stock size [1] and highly unpredictable occurrence of stocks.

As a result, the fishermen cannot guarantee how much money they stand to earn in a day. Under this condition, they aim to save any extra income to build sufficient reserves. But in reality, the amount of money accumulated was barely sufficient to cover their daily needs. An example was given by one fisherman in Kamal Muara. During the dry season he was not able to go fishing regularly. This situation caused him to fish harder. Normally, he would earn up to IDR 70,000 a day, but in the dry season, that figure would be halved. Sometimes, he did not even make any money from fishing, and only caught enough fish to eat.

On the other hand, the effort of fishermen to fish harder can affect the financial assets they have. By aiming to catch more fish, fishermen in JBE try to move to other fishing grounds, which means they need more money to buy fuel. This may lead to the condition where the use of motors can be detrimental in both the dry and wet season on economic grounds. In that case the fishermen used more fuel, but did not catch enough fish to cover their cost.

Local communities mentioned pollution as a major cause of perceived changes. With a high number of tributaries flowing into Jakarta Bay and about 50 factories, the coastal waters of JBE are increasingly affected by human and natural impacts [4]. Pollution not only affects fisheries resources, it also can cause illness. It was reported that *Escherichia coli* was found in the water pollution [5] and it's as the cause of health effects in several diseases; eye, skin, respiratory and gastrointestinal. In the present study, respiratory diseases were mentioned most frequently as being caused by pollution, which indicates a high perception of air pollution.



**Fig. 3.** Cause of perceived changes

Besides pollution, natural disasters and poor enforcement were mentioned to different degrees as perceived causes on the islands and mainland. Natural disasters are frequently experiencing on the mainland in the form of flooding, which occurs frequently and erosion increases along the coast. Already 25 years ago, it is reported that the coast of Jakarta Bay changes due to urban stress on the coastal environment [16]. Furthermore, the high number of respondents perceiving poor enforcement as a cause of environmental degradation on the mainland may be related to the fact that many here have felt direct impacts of corruption in their daily life. On the islands, people are less frequently involved with bureaucracy or the details of official life in the city, thus reducing their exposure to corruption.

## 4. Conclusion

Fish processing industry influenced the fishers' decision, as Indian mackerel is a valuable fish resource with a high economic value after value addition, which is done by the communities themselves. To the inhabitants of both areas, fishery is a way of life. It has a high cultural value rather than simply being a source of livelihood. During the pandemic, local community has a positive impact on the community to overcome the existing problem, diversifying the products in the smoked fish business in several other commodities such as milkfish, gourami and catfish smoked fish can be good a strategy to be adapted. They also recognize the need for new strategies to identify marketing opportunities that use technology.

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