Original Research Article

Analysis of the Impact of the COVID-19 Pandemic on the Income of Tilapia (*Oreochromis niloticus*) Fishers in Darmaraja District, Sumedang Regency

ABSTRACT

This study aims to determine the income and application of health protocols among tilapia fishers (*Oreochromis niloticus*) in Jatigede Reservoir, precisely in Darmaraja District, Sumedang Regency, during the COVID-19 pandemic. The method used in this research is a survey method. The sampling technique is purposive sampling, where data collection is done using a questionnaire technique. The primary data is obtained from a questionnaire to determine knowledge about the COVID-19 pandemic and its health protocols. In contrast, secondary data is obtained from various sources such as literature, journals, theses, books, and the Sumedang District Fisheries Service. The result of the income analysis is the amount of profit obtained from the revenue price minus production costs which are divided into fixed costs (ship maintenance costs, machinery, and fishing gear depreciation) which will not change even though fishing trip activities change, and variable costs (consumption costs and fuel costs) which will change in line with fishing trip activities. The results showed that the COVID-19 pandemic had an impact on fishers understanding and the application of health protocols which resulted in a decrease in the number of fishing trips and a decrease in fish prices resulting in supply and demand instability which affected the profits of tilapia fishers (*Oreochromis niloticus*) in Darmaraja District, Sumedang Regency.

Keywords: Advantage; COVID-19; fishers; health protocols; jatigede reservoir; revenue.

1. INTRODUCTION

The fishery is one of the fields that can improve the economy and welfare of the Indonesian people. The water resources owned by Indonesia are certainly promising for the nation's progress if they can be used sustainably. The fisheries sector can play a role in the recovery and economic growth of the Indonesian government because of the potential for fish resources that are large in number and diversity [18].

Jatigede Reservoir is a reservoir located in Sumedang Regency, West Java Province. According to [6], the construction of the Jatigede Reservoir is the government's strategy to overcome drought in the dry season and flooding in the rainy season. Activities around this reservoir are focused on fishing. In Jatigede Reservoir, there are many groups of fishers whose needs are also facilitated by the local government to manage fishing activities in Jatigede Reservoir. However, the world is currently facing the COVID-19 pandemic, which began to enter Indonesia in early 2020. Coronavirus disease 2019 (COVID-19) was first identified in December 2019 in Wuhan, China [4].

The COVID-19 pandemic occurred because discoveries and mutations of the SARS-CoV virus became very infectious and had high virulence; this became a challenge for the community because patients were in the incubation period and were falsely detected to spread the virus. Prevention measures are the main points that everyone must understand [8]. These coronaviruses can spread quickly from person to person from droplets when sneezing and coughing [3]. It is because of the very fast transmission of the corona virus that the World Health Organization (WHO) designated the corona virus as a pandemic on March 11, 2020. The status of a global pandemic or epidemic indicates that the spread of COVID-19 is taking place so quickly that almost no country in the world can ensure that it is protected. from the corona virus [19].

At the beginning of the pandemic, the economic sector suffered losses and even experienced a drastic decline. This includes the financial industry in fisheries and marine affairs. The selling price of fish has decreased by up to 50% due to the pandemic; this is not comparable to the operational cost of fishers catching fish. Changes in consumption patterns and employment have disrupted the market for food commodities, including fish. The implementation of government policies which are also stated in the Indonesian government regulation no. 21 of 2020 concerning implementing social distancing, physical distancing, work from home (WFH), and large-scale social restrictions (PSBB) are complicated for local fishers in marketing their catches, as their catches experience deterioration in quality and even decay. Due to the COVID-19 pandemic, according to [5], several cold storage warehouses have overstocked or accumulated fish raw materials due to delays in the distribution/supply process, as was usually done before the COVID-19 pandemic. The uncertainty of conditions and the deep concern that arose among the fishing communities in the Jatigede Reservoir resulted in a decrease in the number of fishers on fishing trips. Of course, it will affect the productivity of fishers in doing their work and the number of fish caught during the COVID-19 pandemic. The impact of the COVID-19 pandemic that fishers have felt is the price of fish, which has decreased drastically by up to 50% [11]. The decline in fish prices is certainly not commensurate with fishers' effort and operational costs when catching fish in the Jatigede Reservoir.

Fishers' income is obtained from the accumulation of fishers' business results, which are influenced by various factors [9]. Based on the background of these problems, it is necessary to conduct research on the analysis of the income of tilapia fishers (*Oreochromis niloticus*) in Jatigede Reservoir, precisely in Darmaraja District, Sumedang Regency, during the COVID-19 pandemic and the application of health protocols carried out by fishers.

2. METHODOLOGY

The method used in this research is a survey method with a questionnaire to provide a detailed description of the background of a case, where fishers are directly involved as respondents. The research process includes site surveys, data collection, and conducting surveys with questionnaires with direct distribution to respondents, namely tilapia fishers (*Oreochromis niloticus*) in Darmaraja District, Sumedang Regency.

2.1 Data Collection Method

In this study, the data collected were primary data and secondary data. Preliminary data were obtained directly from the object under investigation through the results of a questionnaire that aims to determine knowledge about the COVID-19 pandemic and its health protocols and vaccine data, then to determine the perceived impact, including the income of fishers before and during the COVID-19 pandemic and the results of the number

of fishing/searching fish. Secondary data were obtained from various sources such as literature, journals, theses, books, and the Sumedang District Fisheries Service.

2.2 Data Analysis

Data analysis of fishers' knowledge level was conducted using descriptive statistics using qualitative methods, tabulations, and narratives to explain their understanding of the COVID-19 pandemic and the impact they felt due to the pandemic. At the same time, the fishers' income analysis uses quantitative methods by calculating total revenue and profit.

Total fisherman's profit income is obtained from the respondent's fisherman's payment (total amount of money produced by marketed products) minus operational costs, which consist of fixed and variable costs. The income of respondent fishers is different; fishers often get many results and little or no results, coupled with adverse pandemic conditions.

2.2.1 Revenue Analysis

Total fisherman's profit income is obtained from the respondent's fisherman's payment (total amount of money produced by marketed products) minus operational costs, which consist of fixed and variable costs. The income of respondent fishers is different; often, fishers get a lot of results and little or no results, coupled with adverse pandemic conditions.

This business income analysis aims to determine the benefits obtained from fishing efforts. A systematic analysis of operating income can be formulated as follows:

$TR = P.Q$

Where:

TR = Total revenue (Rp)

P = Product price (Rp)

Q = Number of catches (Kg)

2.2.2 Advantage Analysis

Based on [7] research, advantage analysis can be formulated as follows:

$\pi = TR - TC$

Where:

π = Advantage

TR = Total acceptance

TC = Total expenditure

Business Criteria:

TR > TC, then the decent effort

TR < TC, then the effort is not worth it

TR = TC, then the business is in a break-even state

3. RESULTS AND DISCUSSION

The COVID-19 pandemic, which began to spread in Indonesia in March 2020, considerably impacted the community in Darmaraja District. The COVID-19 pandemic has impacted fishery production, prices, and costs, affecting the decline in fishers' income in the Jatigede Reservoir, especially anglers in the Darmaraja District.

3.1 Geographical Location and Circumstances

Jatigede Reservoir has an inundation area of about 4,122 ha. Jatigede Reservoir stems from the flow of the Cimanuk River, which inundated five sub-districts in the Sumedang Regency. The five sub-districts include Jatigede District 760.55 Ha (consisting of the villages of Ciranggem, Jemah, Mekarasih, Cijeungjing, and Sukakersa), Jatigede District 239.89 Ha (consisting of the villages of Patangan and Sirnasari), Wado District 459.23 Ha (consisting of Padajaya, Wado, and Cisurat villages), Darmaraja District 1,575.67 Ha, Cisitu District 48.65 Ha (consisting of Pajagan Village) [3]. Darmaraja sub-district has the largest area and has the largest number of villages, namely as many as 12 villages consisting of Ranggon, Tarunajaya, Neglasari, Pakualam, Karangpakuan, Cieunteung, Cipeteuy, Cikeusi, Sukaratu, Sukamenak, Darmajaya, and Darmaraja villages. Every fishing community is allowed to make operational arrests; this is because the fishing community views that the resources in the waters of the Jatigede reservoir are open acess [14].

3.2 Population Condition

3.2.1 Total Population

The population in Darmaraja District is 37,343 people, based on gender, divided into 18,864 males and 18,479 females. Population data by gender can be seen in table 1.

Table 1. Total Population by Gender in Darmaraja District, 2021

Gender	Total	Percentage (%)
female	18.479	49,48
male	18.864	50,52
Total	37.343	100

Source: [16]

Based on table 1 above, it can be seen that the male population in Darmaraja sub-district is higher than the female population.

Table 2. Total Population by Age in Darmaraja District, 2021

Age	Total	Percentage (%)
0-5	496	7,82
6-19	1.331	20,97
20-60	11.757	53,48
More than 60	3.526	16,04

Source: [16]

The table above shows that most of the population of the Darmaraja sub-district in 2021 is at that age.

3.3 Knowledge About the COVID-19 Pandemic

In terms of understanding the COVID-19 pandemic, it is realized in the daily life of fishers to carry out health protocols. Among fishers, understanding of the COVID-19 pandemic and the application of health protocols have not been optimal, one of which is due to the level of education and information dissemination, which is still not going well due to their busy activities on fishing trips. According to research [12], in the level of understanding of fishers, there is a level that shows the level of knowing enough and the level of knowing very well. For the story of sufficient knowledge, fishers only know of the COVID-19 pandemic and learn how to prevent it, while the level of very knowing is if fishers know in detail about the COVID-19 pandemic such as modes of transmission, methods of prevention, methods of prevention, and the latest news regarding the spread of COVID-19. 19. The difference in the level of understanding of the COVID-19 pandemic is caused by several factors, such as differences in education levels, economic levels, and depending on the individual fisherman.

Then, in understanding the COVID-19 pandemic, the level of concern also has an effect. There are several levels of worry: normal, moderately worried, and very worried. These different levels of anxiety are reflected in the attitude of fishers in carrying out their daily activities. If fishers are at a familiar story, then their daily activities usually run and are not affected by the COVID-19 pandemic and do not apply health protocols in their activities. Then for fishers who are at a level that is quite worried, in their daily activities, the fishers will carry out their health protocols even though they have not been fully implemented. Fishers also begin to take care of their health. Then, fishers who are at a very worrying level in their daily activities show an alert response and strictly implement health protocols, taking precautions and controlling the spread of COVID-19.

3.4 Implementation of Health Protocol

In the application of health protocols for fishers, there are several levels, namely, not implementing health protocols, implementing health protocols, and strictly implementing health protocols. According to research [12], among fishers, information regarding health protocols initiated by the government has been received, but in practice, it returns to their respective personalities. Based on the results of survey research [12], the level of application of health protocols is divided into three, namely continuing to work and carrying out activities as usual; this belongs to the group of not implementing health protocols; then fishers continue to work but sometimes leave the house, this is classified as fishers with a level of implementing health protocols, and the last one staying at home, not working, and only going out when urgent; this condition is classified as fishers with a very high level of implementing health protocols.

3.5 Fisherman's Productivity

Fisherman productivity is the fishers ability to obtain catches per fishing trip. Based on research from [1], fishers were still carrying out fishing operations when this pandemic occurred, even though social distancing did not limit fishers to continue going to sea to meet their daily needs. Compared to before the pandemic, catch production continued to increase due to the influence of the fish season. The price of fish in the market also affects the productivity of fishers on fishing trips. If conditions of the COVID-19 pandemic require

consumers to stay at home, then markets and other public facilities are closed, demand will decrease, but supply will continue to increase. This underlies the decline in fish prices when supply is higher than demand. This condition causes the productivity of fishers to decrease, although not significantly.

3.6 Fisherman's Income

According to [2], fishers' income is the number of fish caught after fishing operations. Income is the value of money obtained from the sale of fish production, which is influenced by the large number of fish seen and the price formed at the time of landing [20].

3.6.1 Total Revenue

Fishers' income is calculated from total revenue minus production costs / operational costs. Where operational costs are obtained from fixed and variable costs, this total revenue is one aspect of determining the income of fishers. Full payment will differ for each season, depending on the number of fish in the market. The theory of supply and demand affects total revenue because supply conditions will affect market demand and vice versa. During the COVID-19 pandemic, PPKM was implemented in various regions, including in Sumedang Regency, which had implemented a level 4 PPKM policy due to the high spread of COVID-19. In this condition, all public facilities are closed, many are advised to stay home, and even some traditional markets are closed. This, of course, impacts demand in the market, which has decreased drastically, but supply remains in normal conditions resulting in a decrease in fish prices. According to [11], fish prices have drastically reduced by up to 50% during the COVID-19 pandemic. Of course, this decline in fish prices impacts the decline in the fisher's total income. This is to the Demand Determination Theory, which states, "If demand increases, relative prices will rise; otherwise, if demand decreases, relative prices will fall" [15].

In a study by [7], the total revenue from 3 types of fishing gear in the Jatigede reservoir within one year is presented in table 3.

Table 3. Total Admission of Arrest in Jatigede Reservoir

Types of Fishing Gear	Catch (kg)	Percentage (%)
Gill Net	7.000	105.000.000
Throwing Net	4.000	60.000.000
Bagan	3.000	45.000.000

Source: [7]

From the results of this study, gill net is the fishing gear with the highest total revenue each year, which is Rp. 105,000,000/year, which shows that gill net fishing gear produces the highest amount of production with a total catch of 7,000 kg—followed by throwing nets with a total income of Rp. 60,000,000/year with a total yield of 4,000 kilograms and then a chart with total revenue of 45,000,000/year with a total catch of 3,000 kg.

3.6.2 Production Costs

Production costs are all costs incurred to produce a product. Production costs are costs associated with the production function or incurred in one fishing trip activity; according to [17], production costs consist of fixed and variable costs.

Fixed costs in the fishing business include ship maintenance costs, machinery, and depreciation of fishing gear. The highest fixed costs incurred in fishing activities in the

Jatigede Reservoir were for fishers who caught fish using gill nets, followed by throwing nets and charts [7]. This fixed cost condition will not change in amount even though fishing trip activity increases or decreases.

Variable or operational costs in this fishing business include consumption and fuel costs (BBM). Variable costs are costs that will change in number in proportion to changes in activities, such as fishing trips. Variable costs will adjust the number of fishing trips according to the situation and conditions in activities. In line with research according to [13], the variable costs consist of the cost of fuel (BBM) and consumption (food and cigarettes). Fishers who catch fish with gill nets incur the highest variable costs, followed by throwing traps and charts. This variable cost difference follows the type of fishing gear used because there are differences in the size of the ship, so the use of different fuels is different.

Variable costs will, of course, be influenced by the conditions of the COVID-19 pandemic. During the COVID-19 pandemic, the prices of several essential food items increased, including fuel; this affected the total income of fishers in the Darmaraja District.

3.6.3 Advantage

The total profit obtained by fishers is obtained from a reduction in total revenue and production. Total gain can also be called the total net income of fishers. In the conditions of the COVID-19 pandemic, payment and production costs are interrelated, so the total profit earned by fishers decreases during the COVID-19 pandemic.

Based on the research [7], the total profit obtained by fishers in the Jatigede reservoir in one year with three fishing gears is presented in table 4.

Table 4. Advantages of Fish Fishing Business in Jatigede Reservoir

Types of Fishing Gear	Total Admission (Rp/Year)	Fixed Fee (Rp/Year)	Variable Fee (Rp/Year)	Advantage (Rp/Year)
Gill Net	105.000.000	5.210.000	32.850.000	72.150.000
Throwing Net	60.000.000	1.740.000	25.550.000	34.450.000
Bagan	45.000.000	1.100.000	18.250.000	26.750.000

Source: [7]

The study results found that the highest profits for fishing in the Jatigede reservoir were obtained by fishers using gill nets, followed by throwing nets and charts. This difference in total gain refers to total revenue and production costs incurred depending on the fishing gear used. This proves that the COVID-19 pandemic will ultimately impact the profits of fishers in the Jatigede reservoir.

4. CONCLUSION

Based on the results of the research that has been carried out, it can be concluded that:

1. The COVID-19 pandemic will eventually be interrelated with the economic stability of fishers in the Jatigede Reservoir
2. The COVID-19 pandemic requires everyone to implement health protocols, including for fishers in the Darmaraja sub-district, Sumedang district, so that fishers understand the COVID-19 pandemic is significant.
3. The productivity of fishers in the Jatigede reservoir showed decreased activity during the COVID-19 pandemic.

4. Total revenue decreased due to unbalanced supply and demand in the market and reduced fish prices during the COVID-19 pandemic.
5. Total profit impacts increased product prices and decreased total revenue so that the final yield can be reduced.

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