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Allocative Efficiency of Tuna Fishing Business in South Prigi Waters, East Java

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ABSTRACT Tuna resources have an important economic value and are spread across most of Indonesian waters, ranging from western Indonesian waters to eastern Indonesian waters. One of the distributions of tuna fish in Indonesia is East Java Province. Tuna fishing business is an economic activity carried out by small-scale fishermen by combining resources such as fishing costs, fishing experience, frequency of fishing, ship tonnage, engine power, and the amount of fuel used for fishing) to achieve the main goal of making a profit. This research is important to determine the factors that affect the productivity of tuna fishing business, analyze the allocative efficiency of the factors of production of tuna fishing business, and analyze the profits obtained by fishermen in their business of catching tuna in the waters of Prigi south of East Java. The research method used is descriptive through observation interviews and documentation. This research was conducted on tuna fish fishermen on the coast of Prigi, East Java Regency. The results showed that the conclusion of the factors that affect the productivity of tuna fishing business are fishing costs, fishing experience, frequency of fishing and ship tonnage. The use of fishing costs, frequency of fishing, and ship tonnage used by fishermen still has not reached the allocatively efficient level. The average production cost per year incurred is still relatively high, not proportional to the profit earned each year. This is because the biggest cost incurred is the cost of diesel fuel.

Keywords: Tuna fish resources; tuna fish; tuna fishing business

INTRODUCTION

The fisheries sector has contributed significantly to economic growth in several developed countries such as the United States, Japan, China and other countries in Europe (Buton *et al.*, 2022). The fisheries sector has become a source of "energy" for several countries for economic growth and a "growth engine" for regional economies. This is also the case in Indonesia, where the fisheries sector continues to contribute more and more to economic growth. One type of fish resource that has great potential in Indonesia is the large pelagic fish group, namely Tuna, Skipjack, and Tongkol (Firdaus, 2019). Indonesia has an important role in tuna, skipjack and skipjack fisheries in the world because Indonesia has supplied more than 16% of tuna, skipjack and skipjack production (Zaluthu, 2023). In brief, tuna fish are grouped into 2 (two) as large pelagic fish and migrate very far, namely (1) small tuna, such as skipjack (*Katsowonus pelamis*) and tuna species (*Auxis* sp. and *Euthynnus* sp.); and (2) Thunnus, such as large pelagic tunas, namely big eye tuna, madidihang tuna, and bluefin tuna (Sudirman *et al.*, 2020).

Tuna resources have important economic value and are spread across most of Indonesian waters, ranging from western Indonesian waters (Indian Ocean) to eastern Indonesian waters (Banda Sea and North Papua) (Marei *et al.*, 2023). Based on data from the Central Statistics Agency (2023), East Java Province is one of the largest tuna fish producing regions and tends to increase every year from 2019-2021. The volume of tuna fish production in 2019 reached 3,782 tones, in 2020 it increased to 7,535 tones and in 2021 it reached 9,278 tonnes. One of the regions in East Java Province that contributes to the high volume of tuna fish production is Trenggalek Regency. The potential of capture fisheries in Trenggalek Regency is quite large, characterized by the existence of the Prigi Archipelago Fishing Port (PPN).

Fisheries production plays a very important role in economic and social development. Demand for marine products is increasing day by day, resulting in greater trade to fulfil the needs of the market. To fulfil these market needs, it is necessary to increase the number of fishing operations. Many factors influence the success of fishing, including the fishing gear itself, vessels, equipment and human resources that use it. The development of tuna fishing is highly dependent on the production of fishermen's catches. The volume of fishing production can increase due to several factors that support fishing operations (Khatimah *et al.*, 2021).

The production factors used by fishermen to catch fish are generally limited. On the other hand, they also want to increase their fishing business. Therefore, fishermen are required to use the production factors owned in the management of capture fisheries business efficiently. In simple terms, efficiency is defined as the ratio of output to input (Ulkhaq, 2022)Indonesia. Method: The slacks-based measure (SBM. More output per unit of input reflects relatively greater efficiency. Efficiency also describes the extent to which time, effort or cost is utilized to achieve a predetermined goal. In production economics, efficiency is defined as the maximum output value that can be achieved from the use of a certain amount of input (Zahara & Saputra, 2020). One method to determine the level of efficiency in the use of production resources is to calculate how the resources owned are allocated efficiently, known as allocative efficiency. Allocative efficiency can also be achieved if fishermen know which production factors affect their fishing business (Sukiyono & Romdhon, 2016).

Tuna fishing is an economic activity carried out by small-scale fishermen by combining resources such as fishing costs, fishing experience, frequency of fishing, ship tonnage, engine power, and the amount of fuel used for fishing) to achieve the main goal of making a profit. Efficiency in this tuna fishing business will make fishermen earn profits as expected and avoid losses experienced from tuna fishing in the waters of Prigi in southern East Java. This research is important to determine the factors that affect the productivity of tuna fishing business, analyze the allocative efficiency of the factors of production of tuna fishing business, and analyze the benefits obtained by fishermen in their tuna fishing business in the waters of Prigi south of East Java.

MATERIALS AND METHODS

Materials

The research method used is descriptive. Data collection techniques using observation interviews and documentation. This research was conducted on tuna fishers on the coast of Prigi, East Java Regency. The research location was selected purposively because the research location is one of the centers of tuna fishing in East Java. This research was conducted in July-August 2023. Data analysis was carried out after the data were obtained, namely through qualitative and quantitative. Qualitative analysis was carried out based on data on the characteristics of respondents, while quantitative analysis was carried out using Microsoft Excel and SPSS software on price data and the number of catches and the use of factors of production in tuna fishing.

Methods

Factors affecting tuna fishing productivity

Factors affecting the productivity of tuna fishing in the southern Prigi waters of East Java were analyzed using multiple regression. The method used in the analysis was the Ordinary Least Square (OLS) method through the Cobb Douglas function.

$$Y = \beta_0 X_1^{\beta 1} X_2^{\beta 2} X_3^{\beta 3} X_4^{\beta 4} X_5^{\beta 5} X_6^{\beta 6}$$

From the model above it is then converted into a linear form, so that the production function can be written:

$$LnY=ln\beta_0+\beta_1 lnX_1+ \beta_2 lnX_2+\beta_3 lnX_3+\beta_4 lnX_4+\beta_5 lnX_5+\beta_6 lnX_6$$

Where:

Y = Catch productivity (kg/year)

X1 = Fishing cost (Rp/year)

X2 = Fishing experience (years)

X3 = Frequency of going to sea (times/year)

X4 = Ship tonnage (GT)

X5 = Engine power (PK)

X6 = Amount of fuel (liters/year)

$ln\beta_0$ = intercept (parameter quantity)

Furthermore, an econometric approach is carried out through the classical assumption test. This aims to obtain the Best Linear Unbiased Estimator (BLUE). Classical assumption tests include normality tests, heteroscedasticity tests, and multicollinearity tests.

Analysis of allocative efficiency

Allocative efficiency or price efficiency is achieved when the ratio of the marginal productivity value (NPMxi) of each input to the input price (Px) is 1 (Aziza *et al*., 2022). If the value of NPMxi/Pxi = 1, it means that the use of inputs is efficient. If NPMxi/Pxi > 1, it means that the use of inputs is not yet efficient, to achieve efficiency, input needs to be added. If NPMxi/Pxi < 1, it means that the use of inputs is inefficient, to achieve efficiency, inputs need to be reduced. In mathematically, it can be written as:

NPMxi/Pxi = K

The test is calculated using the t-test as follows:

Ho: K = 1, then input utilization is efficient

Ha: K ≠ 1, then the use of inputs is inefficient or not efficient

Revenue and profit analysis

Profit is the total revenue after deducting costs paid and imputed costs.

Revenue

The revenue calculation formula is as follows:

TR = P x Q

Description:

TR = *Total Revenue* (Rp)

P = *Price* (Rp)

Q = Number of Production (unit)

Revenue Cost Ratio (R/C Rasio)

The R/C ratio is an analytical tool to see the relative profit of a business in one year to the costs used in the activity. If R/C > 1, it means that the business is profitable and worth developing. Whereas R/C < 1, the business is not profitable and therefore not worth continuing. If R/C = 1 means that the business is in a break-even position (Khotimah, 2022). Formula of R/C ratio is:

R/C = TR/TC

Description:

TR = Total revenue (Rp)

TC = Total cost (Rp)

Profit

Profits are the difference between total business revenue and total business costs, which is formulated as follows:

π = TR – TC (eskplisitr+implisit), or π = Q.P – TC

RESULTS AND DISCUSSION

Use of production inputs for tuna fishing business

Tuna fishing business uses production input, which is an important aspect because it can affect production results so that it determines the success of the business being run. Some of the inputs used by tonda boat fishermen for tuna fishing in the coastal area of Prigi Beach, Trenggalek Regency, East Java Province include fishing costs, fishing experience, frequency of fishing, boat tonnage, engine power and amount of fuel. Data on the use of inputs and catches in a year can be seen in Table 1.

Table 1. Input usage and production yield.

Input	Lowest	Highest	Average	Std.Deviation
Fishing Cost (Rp/Year)	21.008.700	231.198.000	124.361.202	124.361.202
Fishing Experience (Year)	2	50	16,07142857	12,03732581
Frequency of going to sea (Times/ Year)	21	40	27,11904762	5,588325728
Ship Tonnage (GT)	3	18	9,285714286	4,629100499
Engine Power (PK)	23	30	28,0952381	2,894987458
Amount of Fuel (Liter/Year)	750	21600	9039,595238	5509,986867
Number of Catch (Kg/Year)	2400	120000	5442,19048	2014,86631

The fishing costs incurred consist of ship operating costs and crew consumption costs for one year. The annual fishing costs incurred by averaged Rp. 124,361,202, the highest cost was Rp. 231,198,000 and the lowest cost was Rp. 21,008,700. Prigi fishermen have an average fishing experience of 16 years, the longest fishing experience is 50 years, and the lowest fishing experience is 2 years. Meanwhile, the highest frequency of fishing was 40 times, the lowest was 21 times and the average fisherman made 27 arrests. The use of ship tonnage by respondent fishermen in the southern waters of Prigi, the vessels used by respondent fishermen are on average 9 GT, besides that there are those who use ships with the lowest tonnage of 3 GT and the highest is 18 GT. As for the engine power used by Prigi fishermen, the average engine power is 28 PK, the highest is 30 PK and the lowest is 23 PK. Prigi fishermen use fuel for tuna fishing business in one year on average 9,039 liters / year, with the highest use of 21,600 liters / year and the lowest of 750 liters / year. The productivity of tuna fish catches in the Prigi coastal area per year is the highest at 120,000 Kg / year. While the lowest productivity is 2400 Kg / Year, and the average catch is 5442 Kg / Year.

Classical assumption test

The classical assumption test in this study consists of normality test, multicollinearity test, heteroscedasticity test, and classical assumption test.

Normality test

The normality test is carried out to test whether the error factor, confounding or residual variables follow a normal distribution or not in the regression model. A good regression model has a normal data distribution. This study uses the Kolmogorov-Smirnov test to test whether the data is normally distributed or not using an error rate of 5%.

Table 2. Result of normality test using *one-sample kolmogorov smirnove test.*

Description	Unstandardized Residual
N	42
Kolmogorov-Smirnov Z	0,101
Asymp.Sig. (2-tailed)	0,200

Based on Table 2. The significance obtained is 0.200. According to the hypothesis used, the value is more than α (0.05) so that the residual data follows a normal distribution.

Multicollinearity test

The multicollinearity test stipulates that if the VIF value tends to be greater than 10, then there will be multicollinearity between the independent variables; otherwise, there is no multicollinearity between the independent variables (Kurniawan & Auva, 2022).

Table 3. Multicollinearity test.

Variable	Tolerance	VIF
Fishing Cost (X1)	0,465	2,151
Fishing experience (X2)	0,763	1,311
Frequency of going to sea (X3)	0,647	1,546
Ship Tonnage (X4)	0,519	1,927
Engine Power (X5)	0,648	1,543
Amount of Fuel (X6)	0,46	2,174

Based on Table 3. above, the tolerance value of all independent variables> 0.10. In addition, the VIF value of all independent variables is also <10. This means that the variables used in this study do not show any symptoms of multicollinearity, which means that all variables can be used.

Heteroscedasticity test

Heteroscedasticity is a condition or situation where there is an inequality in the variance of the residuals for all observations in the regression model. The heteroscedasticity test is needed to test whether there is inequality in the regression model.

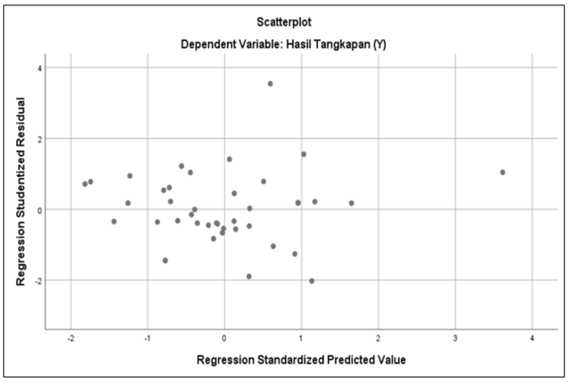

Figure 1. Diagram of *scatterplot.*

Based on the results of Scatterplots in Figure 1. The distribution of points is above and below or around zero and does not form a certain pattern such as increasing or decreasing. This shows that there is no disturbance factor in the form of heteroscedasticity in the regression model, which means that this study avoids symptoms of heteroscedasticity, so that the variance and residuals of one observation to another are constant (homoscedasticity). The results of the classical assumption test concluded that there were no deviations in the data in the regression model because it fulfilled the best linear unbiased estimator properties.

Multiple linear regression analysis
Multiple linear regression is also an analytical technique that aims to explain the relationship between two or more variables, especially between variables that contain cause and effect, which is called linear regression (Syahputra *et al.*, 2022).

Table 4. Results of multiple linear regression analysis of tuna fishing productivity factors.

Variable	Coefficient	t number	Significant
Constanta (C)w	-111.287.605	-1.753	0,088
Fishing Cost (X1)	7.767.142	2.138	0,04
Fishing experience (X2)	440.373	2.317	0,026
Frequency of going to sea (X3)	1.186.336	2.669	0,011
Ship Tonnage (X4)	1.381.147	2.306	0,027
Engine Power (X5)	-1.176.052	-1.372	0,179
Amount of Fuel (X6)	0,252	0,472	0,64
Coefficient Determinacy (R^2)	0,656		
Adjusted R^2	0,597		
F		11,118	0,000

Based on Table 4, the result of multiple linear regression of productivity factors of tuna fishing formulated as follows:

$$Y = a + bx1 + bx2 + bx3 + bx4 + bx5 + bx6 + e$$

$$Y = -111287.605 + 7767.142x1 + 440.373x2 + 1186.336x3 + 1381.147x4 - 1176.052x5 + 0.252x6 + e$$

Coefficient of regression (R^2)
The coefficient of multiple determination (Adjusted R^2) is known to be 0.656. The higher the Adjusted R2 value, the better the regression model because the dependent variable can be explained by more independent variables. The Adjusted R^2 value shows that 65.6% of the variation in tuna fishing business productivity can be explained by variations in the variables used, namely fishing costs, fishing experience, frequency of fishing, shipping tonnage, engine power and amount of fuel. The remaining 34.5% is explained by other factors outside the model studied.

F test
Simultaneous testing (F test) is used to see how much influence the independent variables have on the dependent variable together by comparing the F-statistic value with the F-table value at the 95% confidence level or α = 0.05 or simply looking at the probability number provided that the probability or significance value of the F-statistic must be smaller than = 0.05 or < 5%.

The decision rules used are as follows:

- H0: accepted if the F-statistic value < F-table and the Prob value >0.05 (α = 5%)
- H1: accepted if the F-statistic value> F-table and the Prob value <0.05 (α = 5%)

Based on Table 4. It is known that the calculated F value is greater than the F table value (11,118> 2.36), with a significant value of 0.000 <0.05. Thus, H0 is rejected Ha is accepted, which means that variables X1 to X6 if tested together or simultaneously have an effect on variable Y, namely tuna catch. The F sig. value is 0.000 which is much smaller than α. It can be concluded that the variable use of fishing costs, fishing experience, frequency of fishing, ship tonnage, engine power and amount of fuel together have a significant effect on the productivity of tuna fishing business.

T test
Partial Test (t test) aims to determine the effect of each independent variable on the dependent variable (Selvia *et al.*, 2022).

The decision rule used is as follows

- H0: accepted if t-statistic value < t-table and Prob value >0.05 (α = 5%)
- H1: accepted if t-statistic value > t-table and Prob value <0.05 (α = 5%)

The calculation results in Table 4. show variables or factors that significantly affect the productivity of tuna fishing businesses. The explanation of each factor is as follows:

Fishing cost (X1)
Based on the t test analysis, the effect of variable X1 fishing costs on variable Y fishing results is 0.040 <0.050 while for the value of t count of 2.138> t table 2.03011, where Ho is rejected and Hi is accepted, which means there is an influence of the variable fishing costs on tuna catches. This is because the cost of fishing is one of the factors supporting the success of fishing activities. According to (Dahen, 2016) the greater the cost of fishing production will certainly make the greater the opportunity to get caught and will increase the income of fishermen.

Fishing experience (X2)
Based on the t test analysis, the effect of variable X2 fishing experience on variable Y catch is 0.026 <0.050 while for the calculated t value of 2.317> t table 2.03011, where Ho is rejected and Hi is accepted, which means that there is an influence of the variable length of fishing experience on the catch. This is because the experience of fishermen plays a role in determining the construction of fishing gear, fishing locations and knowledge in oper-

ating fishing gear so that the period of time working as a fisherman during his lifetime, the experience he has will affect the productivity of fishermen(Kurnia *et al*., 2021).

Frequency of going to sea (X3)
Based on the t test analysis, the effect of variable X3 frequency of fishing on variable Y catch is 0.011 <0.050 while for the t value of 2.669> t table 2.03011, where Ho is rejected and Hi is accepted, which means there is an influence of the variable frequency of fishing on the catch. The frequency of going to sea will affect the catch of fish (fishermen's production) first so that it will have an impact on the income of fishermen. (Damayanti & Douglas, 2016) which says that the frequency of fishing or the length of the day at sea has a significant effect on the production of fishermen so that the amount of production obtained by fishermen will then have an impact on the income of fishermen.

Ship tonnage (X4)
Based on the t test analysis, the effect of variable X4 ship tonnage on variable Y catch is 0.027 <0.050 while for the calculated t value of 2.306> t table 2.03011, where Ho is rejected and Hi is accepted, which means that there is an influence of variable X4 on variable Y. This states that the shape and size of a ship will affect the strength of the ship on the sea such as holding a wave. In addition, the size of the ship affects the movement of the ship at sea. The GT of the ship affects the catch significantly. The greater the GT of the ship the greater the catch (Suryana *et al*., 2013) the vessel size, engine capacity and number of crew towards the fish production on purse seine at Prigi Trenggalek regency East Java, was held in the fish auction (TPI).

Engine power (X5)
Based on the t test analysis, the effect of variable X5 engine power on variable Y catch is 0.179> 0.050 while for the calculated t value of -1.372 < t table 2.03011, where Ho is accepted and Hi is rejected, which means there is no effect of variable X5 on variable Y. According to Andriane (2018), it states that the use of propulsion engine power must be adjusted to the size, speed, and purpose of using the ship at sea. Efficient use of engine power, effective and efficient fishing technology will minimize the cost of fishing operations with the same amount of catch.

Amount of fuel (X6)

Based on the t test analysis of the influence of variable X6 the amount of fuel on variable Y catch of 0.640> 0.050 while for the calculated t value of 0.472 < t table 2.03011, where Ho is accepted and Hi is rejected which means there is no influence of variable X6 on variable Y. This is because the amount of fuel supplied by the ship affects the distance and length of the trip that each ship can take. The type of fuel used by fishermen in the Prigi coastal area is diesel fuel which is useful for moving diesel engines (Andriane, 2018).

The analysis of allocative efficiency in this study was carried out on production factors that have a significant influence on the production of tuna fish catches. This is because the insignificance of a variable means that the addition or reduction of the variable will not affect the addition or reduction of the amount of catch (Sukiyono & Romdhon, 2016).

Based on the results of research conducted on tuna fishing in the southern waters of Prigi, East Java, it shows that the production factors that significantly affect production are fishing costs, fishing experience, frequency of fishing, and ship tonnage. However, for the variable of fishing experience, allocative efficiency analysis was not carried out because for fishing experience it could not be determined the average amount of input use and the cost of production facilities, therefore the analysis of allocative efficiency of tuna fishing was only carried out on 3 (three) other variables, such as fishing costs, frequency of fishing, and ship tonnage. The results of the analysis of allocative efficiency of tuna fishing in the southern waters of Prigi, East Java can be seen in Table 5.

Table 5. Result of allocation efficiency analysis of tuna fishing.

Variabel	Coefficient of Regression (b)	Average Usage of Production Factors on-l (xi)	NPM	Average Price of Production Number on-l (Pxi)	NPM/Pxi	Conclusion
Fishing Cost (X1)	7767,142	124361201.7	1177117	10363433	0,113	Inefficient
Frequency of going to sea (X3)	1186.336	27	83370566,390	4617493	18055,3747	Have not efficient
Ship Tonnage (X4)	1381.147	9	277141298571	21743899	12745,7039	Have not efficient

Based on the Table 5, the allocation efficiency of fishing frequency and tonnage of vessels used by fishermen in the southern waters of Prigi is not effective, while the fishing cost has not reached the level of allocative efficiency. This is indicated by the value of NPM/Pxi or the ratio between the Marginal Product Value and the price of the production factor of the fishing cost expenditure < 1, while for the frequency of fishing and the tonnage of the ship is > 1. The level of allocative efficiency of production factors for each variable is explained as follows:

Catching costs

The use of fishing costs by fishermen is not allocatively efficient as indicated by the comparison value of NPM with Pxi less than 1, which is 0.113. On average, the respondent fishermen in the research area spent Rp 124,361,201 to make a fishing trip in a year, which is inefficient and needs to be reduced. The biggest cost incurred in fishing is the cost of fuel because at that time it was scarce and there were restrictions on the purchase of diesel. Based on the results of research(Kalana *et al*., 2023) operational costs have a significant negative effect on the income of fishermen in Langsa City. So that fishermen's income can decrease if the cost of catching to go to sea is too high.

Frequency of going to sea

The frequency of fishing in the analysis of allocative efficiency resulted in an NPM/Pxi value of more than 1, which was 18055.3747, with the input price of fishing frequency measured based on the average operational costs incurred per 1 (one) fishing trip (Sukiyono & Romdhon, 2016). This value indicates that the frequency of fishing is allocatively inefficient. When viewed from the value of the marginal product produced, it is necessary to increase the frequency of fishing to increase the catch of tuna in the southern waters of Prigi, East Java. The average frequency of fishing in 1 (one) year is 27 times. The inefficient frequency of fishing allocatively can occur due to bad weather and high sea waves outside Prigi Bay. According to (Yogiswara & Sutrisna, 2021), high sea waves will simultaneously affect the production of fish catches by fishermen.

Ship tonnage

The use of ship tonnage by respondent fishermen in the southern waters of Prigi is not allocatively efficient, because it is worth more than 1, which is 12745.7039. The vessels used by respondent fishermen are on average 9 GT, while the input price for ship size (ship tonnage/GT) is generated from reducing the value of the ship by the depreciation value of the ship (current price) divided by the size of the ship (Sukiyono & Romdhon, 2016). According to (Yuliana & Budhi, 2021), differences in vessels based on the size of the outboard motor used will have an impact on the distance travelled to the fishing area because the type of vessel will determine the size of the catch obtained by fishermen. If the type of boat used is in accordance with the terrain in the fishing area, there will be no excessive costs, so that it also has an impact on higher fishermen's income. More catches will also affect the income of fishermen. The better the type of boat used; the more catches fishermen get.

Costs and profits

Profits from fishing are obtained from revenues minus the total explicit and implicit costs used to support these business activities. Explicit costs include the cost of production facilities, namely the cost of fuel, oil, ice cubes, crew supplies and other costs. Meanwhile, implicit costs include the cost of depreciation of fixed assets, boat maintenance, engine maintenance, and fishing gear maintenance. The average amount of costs and profits obtained by coastal fishermen per boat per year can be seen in Table 6.

Tabel 6. Average cost and profit per vessel per year in tuna fishing business at Prigi Beach, Trenggalek Regency, East Java.

Description	Amount
Revenue	190.470.000
Explicit Cost	125.625.786
Implicit Cost	36.609.469
Total Cost	162.235.255
Profit	28.234.745

Based on Table 6. the average total revenue received by fishermen in one year is Rp. 190,470,000. The revenue is obtained from the annual average fish catch of 5442 kg with a fish price of Rp.35,000. The average cost incurred by fishermen with an average number of trips of 27 times in one year is Rp. 162,235,255 consisting of explicit costs of Rp. 125,625,786 per year and implicit costs of Rp. 36,609,469 per year. Explicit costs incurred by fishermen include the purchase of fuel oil (diesel), oil, ice blocks and food and drink during fishing/trip. Implicit costs in fishing with tonda fishing gear include equipment depreciation costs and maintenance costs.

The purpose of a business is to obtain the maximum profit with the least possible capital (Sofiati et al., 2019). The profit from tuna fishing is obtained from subtracting total revenue from total costs. The profit of the tuna fishing business on Prigi Beach is Rp. 28,234,745 with an average of 27 trips per year and an average of 3 times per month so that in one trip the fishermen get a profit of Rp. 1,045,731. In certain months fishermen do not conduct fishing business, namely during the lean season in January-March.

CONCLUSION AND RECOMMENDATION

Conclusion

Based on the results of the research that has been done, it can be concluded that the factors that affect the productivity of the tuna fishing business are fishing costs, fishing experience, frequency of fishing and ship tonnage. The use of fishing costs, the frequency of going to sea, and the size of the ship tonnage used by fishermen still has not reached the allocatively efficient level.

Recommendation

The average production cost per year incurred is still relatively high, not proportional to the profit earned each year. This is because the biggest cost incurred is the cost of diesel fuel.

AUTHORS' CONTRIBUTIONS

Each author's contribution to the manuscript's analysis technique, English grammar check, and proofreading.

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