FISHING EQUIPMENT TECHNICAL EFFICIENCY FOR FISHERIES PRODUCTION IN BANDA NAIRA

Ennis Wian Erliani 1, Mulyadi Marto 2, Erwin Tanjaya 3

1 Post Graduate Student in Bogor Agricultural University
2 Marine and Fisheries Resources Surveillance Ambon
3 Tual State Fisheries Polytechnic

E-mail: ennislerlani@gmail.com

ABSTRACT. Banda Sea has potential fish resource types developed, namely small pelagic fish and large pelagic fish. The potential for catch fisheries has increased to small pelagic fish, the relative large-sized cobs, tuna and skipjack have a tendency to decrease the proportion in catch composition. The fishermen generally do not use the appropriate combination of production input, fishing operations with fishing gear are less efficient. The low production capacity is lack of skills and education of boat crews, there are many application methods or standards of fishing outside. In addition, the number of small-scale cruisers operating causes coastal fisheries to be under high pressure. This study aims to determine the technical efficiency of fishing gear, level of use of inputs (operating time, cruiser size, driving force, length of tation, crew members, crew and captain experience or variables to produce output (catches) in Banda Naira. The method used descriptive survey method, information is collected through asking questions or interviewing respondents, then analyzing the data onto multiple linear regression using SPSS. Based on the results conducted during the study it can be seen that the average factors production cannot be utilized by fishermen.

1. Introduction

Maluku Province has a sea area with a total area of about 658,284.69 Km², with a coastline length of around 8,287 km, the area of sea management (12 miles) is 152,570 km². The dominant condition of the territorial waters being around 92.4% such conditions is very likely the development of businesses fisheries caught. That is quite large and the potential for significant aquaculture [1].

The Banda Sea has types of fish resources that are quite potential to be developed, such as small pelagic fish and large pelagic fish. Among others, mackerels, tuna and skipjack [2]. Catch fisheries in the Banda Sea have increased the types of small pelagic fish namely the kites, anchovies and lemur. The relative large-size of fish have tended to decrease the proportion of catch composition. In general, fishermen have not used the appropriate combination of production inputs so fishing operations with fishing gear are less efficient [3], less education and skills from the crew, it was found the application or methods not according to standards.

Trolling is one of the fishing gear that is suitable for the behavior of large pelagic fish, especially mackerels, skipjack and tuna. Trolling is operated on the day according to fish eating habits, so trolling is an effective fishing tool to catch these types of fish. Fishermen in Banda mostly catch the fish by using trolling, the using of fishing gear is considered easy to operate. It does not require special expertise, the cost is low. Trolling is considered fit to the deep of banda sea. Based on this, the authors are interested in conducting research on the efficiency of the using of fishing gear that affects the catch fisheries production of Banda Naira.
2. Research Method

The study was conducted in Banda Naira (Figure 1). From June to October 2016, fish data collection and trolling fishermen data were conducted at the local TPI (The collecting place) in Kampung Baru by *simple random sampling*. The research method is descriptive survey. Data collected is the data catch, the amount of production, the catch, the ship size, the engine power, the length of the fishing line and crew members.

Figure 1. Map of the Banda Naira Islands; Google Earth

The data used are primary and secondary data. Data analysis uses the Cobb-Douglas Stochastic production frontier to determine the dominant production factors and the efficiency of fishing gear use [4]. Data processing was performed using SPSS and Ms. Excel

The Cobb-Douglas functions are as follows:

\[ Y = a X_1^{b_1} X_2^{b_2} \ldots X_i^{b_i} \ldots X_n^{b_n} c^u \]

Then the linear equation is transformed:

\[ Y = a + b_1 X_1 + b_2 X_2 + \ldots + b_i X_i + u \]

Information:
- \( Y \) : Amount of production (kg)
- \( X_1 \) : Number of fishing (trip / year)
- \( X_2 \) : Ship Size (GT)
- \( X_3 \) : Engine power (PK)
- \( X_4 \) : Length of Fishing Line (m)
- \( X_5 \) : Number of ABK (people)
- \( a \) : Interception
- \( b \) : Estimation parameters
- \( u \) : Standard error

3. Results and Discussion

3.1. Production amount

The total annual production of troll fishermen in the Banda Naira islands, especially Kampung Baru in June-October is 62,667 kg / months with an average production of 12,533.4 kg / month, the average catch of fishermen in June-October per arrest trip is above 100 Kg. The amount of production can decrease due to weather factors, so fishermen sometimes get catches ranging from 30-50 kg / month or even zero. The total amount of production per trip are seen in Table 1.
3.2. Ship specifications

The development of the fishing cruiser in Banda totally shows fluctuating conditions with a downward trend. The composition of the fishing cruiser in Banda in general is still dominated by fishermen using small-scale fishing cruisers namely outboard engines and non-engine boats, for boats without the engine to move outside the ship and can be installed or removed. The size of the ship is a supporting factor of increasing the value of production, the size of the ship makes the cruising area wider and more loaded.

It is known that a troll fishing boat is a ship that weighs 2-3 GT with a size range of 10-13 meters long, 2.5 meters wide and 1.0 meters deep. The ship uses auxiliary engine units TS 23 PK, 15 PK, 30 PK and 40 PK. The type of ketinting and boats without engines (perahu) with a size of 5-7 metres, width of 1.0 meters. The use of this engine is intended to accelerate the speed of the ship in fishing operations.

The cruiser used to catch fish by Kampung Baru fishermen is generally more leased or borrowed using a profit sharing system. The connection between production and specifications and engine power can be seen in Figure 3.

Table 1. Amount of production

| Month    | Production Kg/month |
|----------|---------------------|
| Juni     | 10.134              |
| July     | 96.80               |
| August   | 152.20              |
| september| 126.81              |
| October  | 149.52              |
| Total    | 62.667              |

Figure 2. Graph of production quantities
The sharing system is usually based on an initial agreement with the owner and the fisherman, where the owner gets 70% and the fisherman 30%. The 30% yield obtained by fishermen is divided by the number of crews that go to sea. The following is the status of ownership (Figure 4).

3.3. The duration of fishing

Trolling fishermen in Kampung Baru carried out fishing activities almost all year long with an average age of 40-year-old fishermen, the duration of fishing is the length of time required in fishing operations at sea which are calculated from departure until returning to the fish landing site. Fishing trips is 24-26 times / months except July where fishing trips are 18-20 times due to bad weather. The decrease in catches in July is suspected that the longer of time needed, the greater catches obtained and otherwise.

3.4. Fishing line length

Fishing line is one of the construction tools that has an important role in the operation of the trolling line, the longer the fishing line, the wider the catching area. The fishing line used by fishermen has a long
range of 200-205 metres. The connection between the amount of production / kg / days with the length of the fishing lines / metre, Figure 5.

In addition to fishing techniques, the length of the fishing line also has an influence on the fish catch in a fishing area, the length of the fishing line of a size of 337-405 metre has a greater production than the length of the fishing line size of 200-207 metre.

3.5. Crew Number
Tonda boat fishermen usually have a crew of about 2-4 people, which consists of 1 helmsman, 2-3 crew members. The duties of each fisherman are different, depending on the expertise and experience of each fisherman. The helmsman is in charge of driving the ship and determining the fishing operation area. The crew is assigned a technical implementer in preparing and unloading fishing gear, catching fish, handling catches and tidying up fishing gear that is doing setting and hauling process of the catch operation takes place. The number of crew members affects the sharing system, time effectiveness and catches. It is known that the number of ship crews and the capacity of ship supported greater production. The average ship crew experience is 11-15 years. The captain experience is 16-20 years.

3.6. Technical Efficiency
The profit from fishing effort is inseparable from the size of the catch, the price of fish operational costs incurred. The income of crews from the catch fisheries business comes from the profit sharing system from the sale of fish. Trolling has a good criterion list of fishing gear, the drawback of this fishing gear is the cost required for ships and equipment is quite high in Banda Naira. The number of fishing trips is very much determined by the duration of the trip needed by the fisherman to go fishing. Trip duration is the length of time for loading to unload including the length of operation time. Regression coefficient (X1) the duration of fishing obtained 114.887 results means in the balance, every change of 1 unit of X1 will affect production (Y) 114.887 the duration added will increase the number of catches.

According to [5] the shape and size of the ship will affect the strength of the ship above the sea such as holding a wave, and capacity. The variable regression coefficient (X2) is 74846.3 means the other independent variables are fixed. The size of the ship has increased. The production value (Y) has increased by 74846.3. It can be interpreted that a boat with a large capacity provides more space to accommodate the fishermen to reach more fishing ground.
The variation on the speed of the ship in set fishing gear is usually 1 knot to 10 knots, this calculation is to determine the percentage of fish passed in each group that gathers or swim by emphasizing the fish escaped with the consideration that the power needed for each additional speed. The knots can be known [6]. The regression coefficient (X3) of 96.511 engine power mean that in a state of ceteris paribus, any change in the coefficient (X3) results in a change in Y of 96.511 units. The engine power is added. It will add the capacity of production. Crew will more quickly determine and reach the fishing ground area.

The length of the fishing line is very influential in success fishing, the longer of fishing line are used, the extensive area of fishing [7]. Regression coefficient (X4) length of fishing line is 33.434, in the balance, any change in coefficient (X4) results in a change in Y of 33,434. The length of the fishing line is added by 1 metre it will increase the amount of production.

Crew numbers play a role in increasing the productivity of catches [3]. Regression coefficient (X5) of the number of crew of 83.737, that means in the balance, every change in the coefficient (X5) results in a change of Y of 83,737, the number of crew is added. It will be easier and faster in operation/ fishing, especially when sett (stocking) or hauling (fishing line withdrawal). So that, the catch will get more at the same time.

3.7 Multiple correlation analysis (R)

Adding X simultaneously, it will affect the value of production. In this study, the variable coefficient (X1) the duration of fishing, (X2) the size of the ship, (X3) engine power, (X4) the length of the fishing line and (X5) the number of crew has a positive value means that there is a positive connection between the regression coefficient and the amount of production, increase the independent variable (X). It will increase to production (Y). The results of the analysis is an R value of 0.976. This shows a very strong connection between the independent variable (X) to the dependent variable (Y). The independent variables such as the duration of fishing, the ship size, the engine power, the fishing line, and the crews are important factors or highly related to the results catch (production/ output). A positive connection states that, the greater X, then Y also greater.

3.7.1. R Square

The R square figure is 95.2%. This shows that the percentage of the effect of X on Y is 95.2% of the variation on the independent variables used in the model (X1, X2, ..... Xn) is able to explain 95.2% of the variation in the dependent variable. 4.8% is influenced by other variables not included in this study.

3.7.2 F test

It is known that the calculated F value is 4.108 and the F table value is 2.91, The F count> F table then H0 is rejected, there is a significant influence by the variable X to Y. It is suspected that fishermen have bait preparations of home. They have more time for sett compared to fishermen that seek bait first. The t-count is 3.049 bigger than t-table 1.78 at 95% confidence intervals, this variable has a real influence. Furthermore, the t-count engine power of 1.519 is smaller than the t-table of 1.78. This shows that the engine power does not affect the catch allegedly because the engines used by each ship are not much different and have been around long enough. The t-test analysis found that 1,843 were bigger than the t-table, this means the length of the fishing line had a significant influence on the catch, by adding a fishing line would increase production. The t-count for the number of crews is 0.66 smaller than the t-table. This shows that the crew had no significant effect on the catch. According to [7] the number of crews must be balanced with the capacity required by ship. It is suspected that the number of crew members has not been able to contribute greatly to the catches that are affected by the crew's skills in efficient fishing techniques.
4. Conclusion

Based on the analysis results it is known that the variable X have a significant effect on production (Y), the positive value obtained indicates a positive correlation between X and Y. Other variables such as the number of crew and engine power must be balanced with the performance of these variables, then the total amount of production per fisherman in the Banda Naira islands. Especially Kampung Baru in June-October is 62,667 kg / months with an average production of 12,533.4 kg/month. The average catch of fishermen in June-October per fishing trip is above 100 Kg.

Acknowledgements

Thank you to Mr. Abdul Rahim Lestaluhu, S.Pi, M.Si who has helped improve this paper.

References

[1] The Department of Maritime Affairs and Fisheries of Mollucas Province. 2008. The Mollucas Province Fisheries Statistics Yearbook.
[2] Ministry of Maritime and Fisheries (KKP). 2012. RPP-WPP 714. Tolo Bay And Banda Sea.
[3] Fauziyah. 2011. Productivity Model Of Bottom Gillnet Catches In The Archipelago Fishery Port (PPN) of Sungailiat, Bangka Belitung Province. Science Research Journal. Brawijaya University. South Sumatra.
[4] Himawan, A.S. 2005. Gillnet and Cantrang Fishing Gear Efficiency Analyzes. Thesis. Diponegoro University. Semarang.
[5] Solicha. 2013. The Influence Of The Net Length, Ship Size, Engine PK and The Number Of Crews On The Production Of Purse Seine Fishing Gear In The Prigi Waters Of East Trenggalek Regency. Journals. Vol 1, No. 1. pp 36-43. Brawijaya University
[6] Muntaha. 2015. Study Of The Speed Of Purse Seine Vessels With Operational Modeling Of Optimal Catches.
[7] Sulandari, A. 2011. strategy To Increase Production Of Trolling Fishermen In The Waters Of The Prigi Bay (Nusantara Prigi Fisheries Port). Thesis. University of Indonesia.