Performance analysis of small pelagic fishing unit in Tawang fishing port, Kendal Regency

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Abstract. Kendal Regency holds relatively large potential, especially small pelagic fisheries. One of the main bases of the capture small pelagic fisheries industry is Tawang fishing port (PPP). However, many fishermen still use mini trawl that can cause problems related to fish resources, social and environmental. The purpose of this research was to determine the best type of small pelagic fishing unit from technical, environmental, socio-economic and financial aspects in PPP Tawang, Kendal Regency. The research method used was a survey method using descriptive and scoring analysis. The sampling method used was purposive and snowball sampling. Based on the analysis, it was found that the purse seine gets priority I with a value of 12.27, priority II pelagic danish seine with a value of 11.87 and priority III of gillnet with value of 9.67. In conclusion, purse seine is the best small pelagic fishing unit in PPP Kendal.

Keywords: Kendal Regency, small pelagic fishing unit, Tawang fishing port.

1. Introduction

Kendal Regency is one of the districts in Central Java Province with a coastal area that holds a relatively large potential for marine fisheries business units. Kendal Regency has five fish auction places (TPI), TPI Tawang, TPI Sendang Sikucing, TPI Tanggul Malang, TPI Bandengan and TPI Karangsari. The production volume of the five TPI in Kendal Regency in 2017 was over 3 million tonnes with a production value over 29 billion IDR (DKP Kendal 2017).

One of the main bases of the capture fisheries industry in Kendal Regency is the Tawang fishing port (PPP) located in Gempolsewu Village, Rowosari District. This can be seen from a large number of volumes and production values of fisheries, fishing gear, fleets, fishermen, sellers, and fish processing businesses. Fishermen in PPP Tawang numbered 2,919 people with a fleet of 820 units and fishing gear totaling 1,322 units (PPP Tawang 2016).

The majority of fishermen in PPP Tawang are still traditional and use fishing gear that has been passed down for generations. This can be seen from the construction and how to operate a tool that is still simple. Since 2011, fishermen have been using trawlers, trawlers, gillnet nets, and trammel nets. However, fishing gear that is still widely used from 2011 to 2016 is the arad net or mini trawl compared...
to other fishing gear (PPP Tawang 2016). Arad net or mini trawl is a type of trawl fishing gear which based on Permen KP Regulation No. 71 (2016) has been banned from operating in all fishing lines and in all WPPNRI. The number of arad nets in the PPP Tawang area in 2016 was 673 or around 51% of the total number of fishing gear available (PPP Tawang 2016). The use of arad net certainly raises many problems related to fish resources, social and environmental. Therefore an alternative solution is needed to reduce the emergence of further problems related to fishing units and fish resources in PPP Tawang and the development of fishing gear which is certainly in accordance with laws and regulations.

The majority of fish landed in PPP Tawang are anchovies (*Stolephorus* sp.), selar (*Selaroides* sp.), long-jawed mackerel (*Rastrelliger* sp) and mackerel (*Sardinella* sp.), where according to Widodo (1997) the fish is a type of small pelagic fish and is one of the potential owned by PPP Tawang. The production volume of small pelagic fish in Tawang TPI was 688,677 kg from 1,035,555 kg of total production with production value of Rp 5,028,492,000 from Rp 9,170,833,000 in total production value (TPI Tawang 2017). The fishing gear used by fishermen in PPP Tawang to catch small pelagic fish is purse seine, pelagic danish seine, and gillnet (PPP Tawang 2016). Small pelagic fish are widely used for the business of selling fresh fish and processing by trader in the PPP Tawang area because it is easily processed. This is certainly very supportive for the development of an optimal small pelagic fishing business in PPP Tawang both small and large scale.

In order to utilize small pelagic fish resources in PPP Tawang, Kendal Regency, research is needed to determine the best small pelagic fishing unit from technical, environmental, socio-economic and financial aspects in PPP Tawang, Kendal Regency. The utilization of small pelagic fish resources should be done optimally for the welfare of fishermen and the sustainability of small pelagic fisheries in the long term.

2. Materials and methods

This research was carried out from in February to April 2018 in several stages. The location of the study was conducted at the Port of Tawang Beach Fishery, Kendal Regency, Central Java.

2.1 Materials

This study used questionnaire for data collection. The questionnaire contained several questions regarding the situations of the research, technical, environmental, socio-economic, financial that existed at the research place. The tools and other supporting materials in the form of stationery were camera and laptop.

2.2 Methods

2.2.1. Data collection. Data consisted of primary and secondary data. Primary data were obtained directly from fishermen through observation and interviews using questionnaires which gather information regarding technical, environmental, socioeconomic, and financial aspects. Stakeholders involved in this research incorporate Kendal Regency’s Fisheries and Marine Affairs Office, UPT PPP Tawang, TPI Tawang, traders, and traders fisherman. Secondary data were obtained from publications and documentation derived from relevant agencies or offices, literature studies, and data from UPT PPP Tawang and Kendal Regency's Fisheries and Marine Affairs Office.

The sampling method applied in this study was purposive and snowball sampling. Respondents selected in the purposive sampling method were the Head of the Capture Fisheries Production Section of the Kendal Regency's Fisheries and Marine Affairs Office, the Head of Port and Harvest Operations Section, and the levy collector of PPP Tawang, the Head of TPI Tawang, traders, and fishermen. The involved fishermen should meet the following criteria which are the owner of the ship/shiper operation fishing gear to catch of small pelagic fish, and nature fishermen from the PPP area of Tawang.
Snowball sampling is used to take samples from a population of fishing communities that use fishing gear to catch small pelagic fish, such as purse seine, pelagic danish seine, and gillnet. According to Sugiyono (2002), the determination of the number of samples is limited to 30 respondents in each fishing unit observed. The number of sample sizes should be a minimum of 30 samples in order to obtain homogeneous data consisting of 10 purse seine fishermen, 10 pelagic danish seine fishermen, and 10 gillnet fishermen.

2.2.2. Data analysis. According to Sugiono (2012) that the Likert scale is a measurement method to measure the attitudes, opinions, and perceptions of a person or group about social phenomena and respondents are asked to indicate the level of agreement through statements given by ordinal scale. The above understanding can be concluded that the Likert scale is a method of calculating the questionnaire distributed to respondents to determine the scale of the attitude of a particular object.

Analysis to determine the type of superior fishing gear was done by the scoring method. Scoring methods were used to develop technical, environmental and socio-economic analysis in the selection of superior fishing gear. The Likert scale for grading (scoring) used was as follows: 1 = Not good, 2 = Good enough, 3 = Good, 4 = Very good.

The parameters used in the analysis of technical aspects referred to previous research according to Jungjunan (2016). Environmental aspects referred to the code of conduct for responsible fisheries (CCRF), while the criteria for socioeconomic aspects were adjusted to the need to develop the socio-economic aspects of fishing communities. Besides that, standardization of values was carried out by the value function (Mangkusubroto and Trisnadi 1985) following equation 1 and 2 below:

\[
V(x) = \frac{x - X_0}{X_1 - X_0}
\]

\[
V(A) = \frac{\sum_{i=1}^{n} v_i(x_i)}{n}
\]

For \(i = 1, 2, 3, ..., n\)

- \(V(X)\) = Function of values from variable X
- \(X\) = value of Xi variable
- \(X_0\) = The lowest value on the criterion X
- \(V(A)\) = Function of values from alternative A
- \(V_i\) = The value function of the alternatives in the i-th criterion

2.2.3. Financial analysis. There are several elements used to carry out calculations or financial analysis of business including:

2.2.3.1. Benefits. Profit is a difference between total revenue or Total Revenue (TR) and total cost or Total Cost (TC) if TR-TC results are positive, then a business can be considered profitable. Conversely, if TR-TC results are negative, then the business can be assessed loss. Whereas if TR-TC is equal to zero then the business is said to experience a Break Event Point (BEP) or break-even (Dahlan 2011).

2.2.3.2. B/C ratio. B/C ratio is intended to find out the value of the comparison of revenue and production costs used. This calculation formula as stated by Hermanto (1998) is as follows:
The criteria used are:
B/C Ratio > 1, the business of making a profit so it is feasible to run
B/C Ratio = 1, business not profit, not loss (break-even)
B/C Ratio < 1, the business has a loss so it is not feasible to run

2.2.3.3. PP (Payback Period). Payback Period is an investment assessment method based on the payment of investment costs by profits or in other words the time needed to return the invested capital (Umar 2003).

\[
\text{Payback period} = \frac{\text{capital}}{\text{profit}}
\]  

3. Results and discussion

3.1. Determination of the best small pelagic fishing unit

3.1.1. Technical aspect analysis.

The selection of fishing unit for the development of small pelagic fisheries is very important to be developed in the PPP Tawang, Kendal Regency. The results of the performance analysis of small pelagic fishing unit from the technical aspects were presented in table 1.

| No | Fishing unit       | X1  | X2  | X3  | X4  | X5   | X6   | X7 |
|----|--------------------|-----|-----|-----|-----|------|------|----|
| 1  | Purse seine        | 4   | 3.1 | 4   | 3   | 4    | 2.4  | 2.5|
| 2  | Pelagic danish     | 4   | 2.1 | 4   | 3   | 3.1  | 2.1  | 2.1|
|    | seine              |     |     |     |     |      |      |    |
| 3  | Gillnet            | 3.8 | 2.8 | 2   | 1.6 | 3    | 1.5  | 1  |

X1 = capture size; X2 = completeness of supporting tools; X3 = ice loading capacity; X4 = number of fishermen; X5 = engine capacity; X6 = load capacity of fish; X7 = size of the ship

Based on table 1, purse seine and Pelagic Danish Seine fishing unit had size of more than 150 meters and an index value of 4 according to X1. Based on the completeness of vessel and safety support equipment (X2), purse seine obtained the highest index value 3.1. The security tools commonly used by purse seine fishermen in the Tawang PPP area are styrofoam buoys and truck tires. Regarding fish loading capacity (X6), purse seine vessels had a larger fish loading capacity compared to other fishing gear. The fish loading capacity had a high correlation with the size of the ship (X7) and the ice loading capacity (X3) because size of the ship determines volume of transported and loaded fish. The loading capacity of the fish will not be separated by the amount of loading of ice used to maintain the quality of fish. Purse seine had the highest index value for fish loading capacity and ice loading capacity, which was 2.4 and 4. Based on the number of fishermen (X4), purse seine and pelagic danish seine have the highest index value of 3 because they have the number of fishermen more than gillnet fishermen. The size of the ship can affect the capacity of the engine used. The bigger the ship size, the greater the engine capacity needed. Regarding the ship's size (X7) and engine capacity (X5), the purse seine vessels are superior with sequential values of 2.5 and 4. The following are results based on the technical aspects presented in table 2. Based on the results of standardization of small pelagic fishing unit from a technical aspect that Purse Seine gets first priority with VA = 7.00, Pelagic Danish Seine gets second priority with a value of VA = 4.50, and gillnet gets third priority with a value of VA = 0.70.
### Table 2. The results of the standardization of performance analysis of small pelagic fishing unit from technical aspect.

| No | Fishing Unit          | V1 | V2 | V3 | V4 | V5 | V6 | V7 | VA | UP |
|----|-----------------------|----|----|----|----|----|----|----|----|----|
| 1  | Purse Seine           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 7.00 | 1 |
| 2  | Pelagic Danish Seine  | 1  | 0  | 1  | 1  | 0.1| 0.67| 0.73| 4.50 | 2 |
| 3  | Gillnet               | 0  | 0.70| 0  | 0  | 0  | 0  | 0  | 0.70 | 3 |

#### 3.1.2. Environmental aspects analysis

The results of performance analysis of a small pelagic fishing unit in the PPP Tawang, Kendal based on environmental aspects were presented in Table 3.

### Table 3. The results of the performance analysis of small pelagic fishing unit from environmental aspect.

| No | Fishing Unit          | X1 | X2   | X3 | X4   | X5 | X6   | X7 | X8 | X9 |
|----|-----------------------|----|------|----|------|----|------|----|----|----|
| 1  | Purse Seine           | 1.2| 1.2  | 4  | 3    | 2.3| 2.4  | 2.3| 1  | 2.6|
| 2  | Pelagic Danish Seine  | 1.3| 3    | 3.4| 2.7  | 3.4| 3.4  | 3.4| 2  | 2.9|
| 3  | Gillnet               | 3  | 4    | 4  | 3.4  | 3  | 4    | 3  | 1  | 1  |

X1 = capture selectivity; X2 = hospitality of fishing gear; X3 = safety of fishing gear against fishermen; X4 = capture quality; X5 = the minimum wasted catch; X6 = impact on biodiversity; X7 = safety of fishing gear against protected animals; X8 = socially accepted; X9 = application of appropriate technology.

Based on Table 3, Gillnet has the highest index value of 3 for the selectivity of the fishing gear (X1) because the gillnet has a 3-4 inch mesh size. The lowest selectivity is purse seine because the net material uses a net with mesh size under 1 inch that is capable of capturing multi-species. This is also the same as the results of a study conducted by Firdaus (2017) where the ineffectiveness of purse seine is due to the body of the net material so that fish of various sizes come caught.

The eco-friendly of fishing gear criteria (X2) which has the highest index value of 4 was gillnet, this is because the mesh size gillnet is not too small between 1 to 2 inches. The fish that are not yet viable in size can escape fishing operations. Therefore gillnet provides a minimum impact on biodiversity (biodiversity) (X6) so that it can maintain the stability of fish populations and the sustainability of biodiversity.

Safety of fishing gear against fishermen (X3) also needs to be considered. The purse seine, pelagic danish seine, and gillnet got the highest value of 4, which means the fishing unit is safe to use by fishermen. Regarding the quality of the catch (X4), gillnet gets the highest value of 3.4 because every fish caught is still alive. Unlike the quality of the catch on the pelagic danish seine which has the lowest value, this is because the fish obtained, especially small fish will be crushed by other fish and rub against the net, causing deformed conditions of fish. According to Metusalach et al (2014), fishing operations can catch various types of fish in large quantities that allow fish to pile/coincide each other resulting in bruises and cuts and even fish to be physically damaged.

Based on the minimum wasted catch (X5), pelagic danish seine got the highest index value of 3.4 while the lowest value is obtained by purse seine with a value of 2.3. This is because the purse seine in PPP Tawang uses a net mesh size at a very small size which causes low gear selectivity so that many by catch fish are wasted.
The highest value for safety criteria of the fishing gear against protected animals (X7) was the gillnet with an index value of 4. Purse seine got the lowest value because it has several times obtained turtles and whale sharks (*Rhincodon typus*). The protected animal was caught because of the small size of the waring net and the size of the fishing gear reached 600 meters with a depth of 45 meters so that it touched to the bottom of the water.

The highest value index for criteria socially accepted (X8) was obtained by gillnet, this is because gillnet does not require large investment costs, is economically profitable, does not conflict with local culture and with existing regulations. Regarding the application of appropriate technology (X9), pelagic danish seine gets the highest value of 2.9 because almost every pelagic danish seine fisherman had a FAD to collect fish. Unlike the case with a gillnet, the majority are traditional fishermen and only rely on estimates.

Following the results of the standardization of small pelagic fishing gear at the Tawang Beach fishing port, Kendal Regency based on environmental aspects presented in table 4.

| No | Fishing Unit        | V1 | V2 | V3  | V4 | V5 | V6 | V7 | V8  | V9 | VA | UP |
|----|---------------------|----|----|-----|----|----|----|----|-----|----|----|----|
| 1  | Purse Seine         | 0  | 0  | 1   | 0.43| 0  | 0  | 0  | 0.84|    | 2.27| 3  |
| 2  | Pelagic Danish Seine| 0.06| 0.64| 0  | 0  | 1   | 0.63| 0.65| 0.50| 1  | 4.47| 2  |
| 3  | Gillnet             | 1  | 1  | 1   | 1   | 0.64| 1  | 1  | 1   | 0  | 7.64| 1  |

Based on the results of the standardization of small pelagic fishing unit from an environmental aspect that gillnet gets first priority with VA = 7.64, pelagic danish seine gets second priority with a value of VA = 4.47, and purse seine gets third priority with a value of VA = 2.27.

3.1.3. Social and economic aspects analysis. Table 5 presents the results of the performance analysis of small pelagic fishing unit in PPP Tawang, Kendal Regency based on social and economic aspects.

| No  | Fishing gear      | X1 | X2 | X3 | X4 | X5 |
|-----|-------------------|----|----|----|----|----|
| 1   | Purse Seine       | 4  | 4  | 3.4| 3  | 1.6|
| 2   | Pelagic Danish Seine| 3.4| 4  | 3.1| 2.8| 1.9|
| 3   | Gillnet           | 3  | 2.7| 3.2| 2.4| 2.2|

X1 = operating costs; X2 = profit; X3 = independence of fishermen; X4 = satisfaction of stakeholder services; X5 = compliance with regulations

Table 5 in the operational cost criteria (X1), the highest value index is found in purse seine with a value of 4. Operating costs in purse seine average around Rp 500,000-Rp 1,000,000. The expenditure is usually for the costs of fishing supplies, such as food and cigarettes for a number of crew members, diesel fuel for boat engines, axles, and light generators, as well as the purchase of ice blocks to maintain the freshness of the caught fish.

The highest profit (X2) obtained in one trip is obtained by purse seine and pelagic danish seine with an index value of 4. Purse seine and pelagic danish seine on average have a profit above Rp 2,000,000. Once at sea at least the fishing gear is able to catch about 3 quintals-3 tons of fish with a selling value of tens of millions of rupiah. Based on the independence of fishermen (X3) in the manufacture and
maintenance of fishing gear, the highest value index was found in gillnet fishing gear of 3.2. Making and maintaining gillnet is very easy and inexpensive so that fishermen have high independence when compared to other fishing gear. Based on the criteria of satisfaction with stakeholder services (X4) with the highest value of 2.8, which is found in the pelagic danish seine, while the lowest is gillnet. This is because pelagic danish seine fishermen feel that stakeholder service is good, but it is different from the gillnet fishermen assessment. Gillnet fishermen feel less satisfied with stakeholder services, especially in the service of ship permits and enforcement of prohibition of fishing gear that is considered detrimental to fishermen because the fishing gear is considered not environmentally friendly, damaging habitat, and depleting fish resources at sea.

Fishermen obedience to regulation (X5) in PPP Tawang with the highest value is in the gillnet of 2.2. That is because there are many fishermen who have inactive license boat or past the validity period. Fishermen inactive license boat because of the long and difficult process of making the current license boat. Following are the results of the standardization of small pelagic fishing unit in the PPP Tawang, Kendal Regency based on the social and economic aspect presented in table 6.

### Tabel 6. The results of the standardization of the performance analysis of small pelagic fishing unit from the social and economic aspect.

| No | Fishing gear     | V1 | V2 | V3 | V4 | V5 | VA | UP |
|----|------------------|----|----|----|----|----|----|----|
| 1  | Purse Seine      | 1  | 1  | 0  | 1  | 0  | 3  | 1  |
| 2  | Pelagic Danish Seine | 0.40 | 1  | 0  | 1  | 0.5 | 2.90 | 2  |
| 3  | Gillnet         | 0  | 0  | 0.33 | 0  | 1  | 1.33 | 3  |

Based on the results of standardization of small pelagic fishing unit from social and economic aspects that purse seine gets first priority with VA=3.00, pelagic danish seine gets second priority with a value of VA=2.90, and gillnet gets third priority with VA=1.33.

### 3.2. The Selection of the Best Small Pelagic Fishing Unit

The fishing units that will be used by fishermen must be developed and optimized as much as possible so that the development of small pelagic fisheries can run well. The results of the combined assessment of technical, environmental, and social-economic aspects can be used as a reference for the development of a small pelagic fishing unit in PPP Tawang, Kendal Regency, which is presented in table 7. purse seine excels in technical aspects (X1) and social and economic aspects (X3), while gillnet fishing gear excels in environmental aspects (X2).

### Tabel 7. The results of the combined assessment analysis of technical, environmental and social economic aspects.

| No | Fishing gear     | X1   | X2   | X3   | X5   | UP |
|----|------------------|------|------|------|------|----|
| 1  | Purse Seine      | 3.29 | 2.22 | 3    | 3.2  | 1  |
| 2  | Pelagic Danish Seine | 2.91 | 2.83 | 2    | 3.04 | 2  |
| 3  | Gillnet         | 2.24 | 3.27 | 1    | 2.7  | 3  |

Information: X1 = Technical Aspects; X2 = Environmental Aspects; X3 = Socio-Economic Aspects

The combined results of the standardization of small pelagic fishing unit in PPP Tawang based on technical, environmental, and social-economic aspects can be seen in table 8. Purse seine becomes the most appropriate small pelagic fishing gear to be developed in PPP Tawang with VAG=12.27 which makes purse seine have priority I. Priority II is pelagic danish seine with VAG=11.87 and Priority III is gillnet with VAG=9.67.
### Table 8. The combined results of the standardization of small pelagic fishing units in PPP Tawang based on technical, environmental and social-economic aspects.

| No | Fishing gear       | V1  | V2  | V3  | VAG | UP |
|----|-------------------|-----|-----|-----|-----|----|
| 1  | Purse Seine       | 7.00| 2.27| 3.00| 12.27| 1  |
| 2  | Pelagic Danish Seine | 4.50| 4.47| 2.90| 11.87| 2  |
| 3  | Gillnet           | 0.70| 7.64| 1.33| 9.67 | 3  |

### Table 9. Financial analysis of Purse Seine in a year.

| No | Description                        | Count | Unit       | Cost     | Amount (IDR) |
|----|------------------------------------|-------|------------|----------|--------------|
| A  | Investment                         |       |            |          |              |
| 1  | Ship                               | 1     | Unit       | 250,000,000 | 250,000,000  |
| 2  | Machine                            | 2     | Unit       | 25,000,000   | 50,000,000   |
| 3  | Purse seine nets                   | 1     | Unit       | 200,000,000  | 200,000,000  |
| 4  | Lights                             | 1     | Set        | 100,000,000  | 100,000,000  |
|    | **Total Investment**               |       |            |          | 600,000,000  |
| B  | Fix Cost                           |       |            |          |              |
| 1  | License                            | 1     | Year       | 2,500,000   | 2,500,000    |
| 2  | Depreciation Costs                 | 10    | Year       | 5,000,000   | 50,000,000   |
|    | - ship                             | 5     | Year       | 5,000,000   | 25,000,000   |
|    | - machine                          | 5     | Year       | 10,000,000  | 50,000,000   |
|    | - net                              | 1     | Year       | 3,000,000   | 3,000,000    |
|    | **Total Fix Cost**                 |       |            |          | 130,500,000  |
| B  | Variable Cost                      |       |            |          |              |
| 1  | Supplies                           | 180   | Trip       | 800,000    | 144,000,000  |
| 2  | Diessel fuel                       | 12,600| Liter     | 5,500     | 69,300,000   |
| 3  | Lubricating oil                    | 135   | Liter      | 25,000    | 3,375,000    |
| 4  | Ice blocks                         | 360   | Block      | 25,000    | 9,000,000    |
| 50 | Percen                             |       |            |          | 1,038,762,500|
|    | **Total Variabel Cost**            |       |            |          | 1,264,437,500|
|    | **Total Cost**                     |       |            |          | 1,994,937,500|
|    | **INCOME**                         |       |            |          |              |
| Anchovy | 210,000 Kg                      | 10,600|           | 2,226,000,000|
| Long Jawed Mackarel  | 3,000 Kg                   | 18,500|           | 55,500,000   |
| Sardine   | 7,000 Kg                     | 3,100 |           | 21,700,000   |
| TOTAL INCOME |               |         |           | 2,303,200,000 |
|    | **PROFIT**                         |       |            |          | 308,262,500  |
| R/C       |                                  |       |            |          | 1.2          |
| **Payback Period (Year)** | |       |            |          | 1.9          |

### 3.3. Financial analysis

Financial analysis is used to analyze the business feasibility of the pelagic fishing unit. A fishing unit can be said to be superior if the fishing gear is profitable economically. The following is an analysis of the purse seine fisheries business in table 9. The R/C value obtained from the calculation results shows a value greater than one (R/C> 1) meaning that the business activity is feasible and profitable. The R/C...
value on 11 GT Purse Seine vessels is 1.2, which means that every one rupiah issued is able to generate revenue of Rp. 1.2. Payback period (PP) analysis, which was the time period required to recoup the investment spent, on 11 GT Purse Seine vessels, the value of PP means 1.9 times the time needed to return the investment for 1.9 years or 22.8 months. Financial analysis of the feasibility of the Pelagic Danish Seine fishing gear business can be seen in table 10.

**Table 10. Financial analysis of Pelagic Danish Seine in a year.**

| No | Description                  | Count | unit    | Cost       | Amount (IDR) |
|----|------------------------------|-------|---------|------------|--------------|
| A  | Investment                   |       |         |            |              |
|    | 1. Ship                      | 1     | Unit    | 40,000,000 | 40,000,000   |
|    | 2. Machine                   | 2     | Unit    | 5,000,000  | 10,000,000   |
|    | 3. Pelagic Danish Seine Net  | 1     | Unit    | 30,000,000 | 30,000,000   |
|    | 4. FAD                       | 20    | Unit    | 1,000,000  | 20,000,000   |
|    | **Total Investment**         |       |         | **100,000,000** |   |
| B  | Fixed Cost                   |       |         |            |              |
|    | 1. License                   | 1     | Year    | 2,500,000  | 2,500,000    |
|    | 2. Depreciation Costs        | 5     | Year    | 2,500,000  | 12,500,000   |
|    | - ship                       | 5     | Year    | 500,000    | 2,500,000    |
|    | - machine                    | 5     | Year    | 3,000,000  | 15,000,000   |
|    | - net                        | 1     | Year    | 2,000,000  | 2,000,000    |
|    | **Total Fixed Cost**         |       |         | **34,500,000** |   |
|    | Variable Cost                |       |         |            |              |
|    | 1. Supplies                  | 60    | Trip    | 300,000    | 18,000,000   |
|    | 2. Diesel fuel               | 3,000 | Liter   | 5,500      | 16,500,000   |
|    | 3. Lubricating oil           | 45    | Liter   | 25,000     | 1,125,000    |
|    | 4. Ice Block                 | 60    | Block   | 25,000     | 1,500,000    |
|    | 5. Profit-sharing            | 50    | Percent |           | 149,187,500  |
|    | **Total Variable Cost**      |       |         | **186,312,500** |   |
|    | **Total Cost**               |       |         | **320,812,500** |   |
|    | **INCOME**                   |       |         |            |              |
|    | Sardine                      | 150,000 | Kg     | 3,100      | 124,000,000  |
|    | Mackarel                     | 5,000  | Kg      | 5,300      | 26,500,000   |
|    | Long Jawed Mackarel          | 10,000 | Kg      | 18,500     | 185,000,000  |
|    | **TOTAL INCOME**             |       |         | **335,500,000** |   |
|    | **PROFIT**                   |       |         | **14,687,500** |   |
|    | **R/C**                      |       |         | 1.0        |              |
|    | **Payback Period (Year)**    |       |         | 6.8        |              |

Pelagic Danish Seine business analysis results found that the value of R/C on the 3 GT Pelagic Danish Seine ship is 1.0, which means that each rupiah issued is able to generate revenue of Rp. 1.0. Payback period (PP) analysis on 3 GT Pelagic Danish Seine ships PP value of 6.8 means the time required to return the investment for 6.8 years or 81.6 months. Financial analysis of the feasibility of gillnet fishing gear business can be seen in table 11.

The results of the gillnet business analysis found that the R/C value on the 2 GT gillnet ship was 1.4, meaning that every one rupiah issued was able to generate revenue of Rp. 1,4. Payback period analysis
(PP) on a 2 GT gillnet ship PP value of 0.7 means that the time required to return the investment for 0.7 years or 8.4 months.

### Table 11. Financial analysis of gillnet fishing unit in a year.

| No | Description | count | unit | Cost (IDR) | Amount (IDR) |
|----|-------------|-------|------|------------|--------------|
|   |             |       |      |            |              |
| **Investment** | | | | | |
| 1. Ship | 1 | Unit | 40,000,000 | 40,000,000 |
| 2. Machine | 2 | Unit | 5,000,000 | 10,000,000 |
| 3. Gillnet | 1 | Unit | 6,000,000 | 6,000,000 |
| **Total Investment** | | | | 56,000,000 |
| **Fixed Cost** | | | | |
| 1. Licenses | 1 | Year | 100,000 | 100,000 |
| 2. Depreciation cost | | | | |
| - Ship | 5 | Year | 2,500,000 | 12,500,000 |
| - Machine | 5 | Year | 300,000 | 1,500,000 |
| - Net | 5 | Year | 1,000,000 | 5,000,000 |
| 3. Maintainance cost | 1 | Year | 500,000 | 500,000 |
| **Total Fixed Cost** | | | | 19,600,000 |
| **Variable Cost** | | | | |
| B 1. Supplies | 60 | Trip | 150,000 | 9,000,000 |
| 2. Diessel fuel | 1,200 | Liter | 7,000 | 8,400,000 |
| 3. Lubricating Oli | 10 | Liter | 5,000 | 50,000 |
| 4. Ice block | 15 | Block | 25,000 | 375,000 |
| **Total variabel cost** | | | | 17,825,000 |
| **Total cost** | | | | 93,425,000 |
| **INCOME** | | | | |
| Kembung fish | 9000 | Kg | 15,000 | 135,000,000 |
| **TOTAL INCOME** | | | | 135,000,000 |
| Profit | | | | 41,575,000 |
| R/C | | | | 1.4 |
| **Payback Period (Year)** | | | | 0.7 |

### 4. Conclusion

Purse Seine is a leading small pelagic fishing gear from technical, environmental, socio-economic and financial aspects in PPP Tawang, Kendal based on this study.

### References

Dinas Kelautan dan Perikanan Kabupaten Kendal 2017 Perikanan Dalam Angka Kabupaten Kendal Tahun 2017

Dahlan M N 2011 Pembangunan perikanan tangkap di kabupaten belitung: suatu analisis trade-off ekonomi berbasis lokal [Thesis] (Bogor: Institut Pertanian Bogor)

Firdaus I, Fitri A D P, Sardiyatmo and Kurohman F 2017 Analisis Alat Penangkap Ikan Berbasis Code of Conduct for Responsible Fisheries (CCRF) di Tempat Pelelangan Ikan (TPI) Tawang, Kendal Jurnal Saintek Perikanan 13 65-74

Hermanto F 1998 Ilmu Usaha Tani (Jakarta: Penebar Swadaya)

Jungjunan A G 2016 Pola Pengembangan Usaha Perikanan Layur di Kabupaten Cilacap Jawa Tengah [Undergraduate Thesis]. (Bogor: Institut Pertanian Bogor)
Pelabuhan Perikanan Pantai Tawang 2016 Laporan Tahunan Pelabuhan Perikanan Pantai Tawang Tahun 2016
Mangkusubroto K and Trisnadi C L 1985 Analisis Keputusan Pendekatan Sistem Manajemen Usaha dan Proyek (Bandung: Ganesa Exacta)
Metusalach, Kasmiati, Fahrul and Ilham J 2014 Pengaruh cara penangkapan, fasilitas penanganan dan cara penanganan ikan terhadap kualitas ikan yang dihasilkan Jurnal Ipteks Psp 1 40-52
Sugiyono 2002 Metode Penelitian Administrasi (Bandung: CV Alfabeta)
Sugiyono 2012 Metode Penelitian Kuantitatif, Kualitatif dan R&D (Bandung: Alfabeta)
Tempat Pelelangan Ikan Tawang 2017 Laporan Keuangan Tempat Pelelangan Ikan Tawang Tahun 2017
Umar H. 2003 Studi Kelayakan dalam Bisnis Jasa (Jakarta: Gramedia Pustaka Utama)
Widodo J 1997 Review Of The Small Pelagic Fisheries Of Indonesia Proceedings of the APFIC Working Party on Marine Fisheries