Business Profile of Boat Lift Net and Stationary Lift Net Fishing Gear in Morodemak Waters Central Java

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Abstract. Lift net is one of the fishing gears that is used widely in the Morodemak coastal fishing port (PPP) for catching pelagic fish. The yield of fish captured by these fishing gear has high economic value, such as fish belt (Trichiurus sp), squids (Loligo sp) and anchovies (Stelophorus sp). The aims of this research were to determine the technical aspects of boat lift net and stationary lift net fishing gear in Morodemak Waters Demak Regency; to find out the financial aspect of those fishing gears and to analyze the financial feasibility by counting PP, NPV, IRR, and B/C ratio criteria. This research used case study method with descriptive analysis. The sampling method was purposive sampling with 22 fishermen as respondents. The result of the research showed that the average of boat lift net acceptance was Rp 388,580,000. The financial analysis of fisheries boat lift net with the result of NPV Rp 836,149,272, PP 2.44 years, IRR value 54%, and B/C ratio 1.73. The average of stationary lift net acceptance was Rp 27,750,000. The financial analysis lift net with the result of NPV Rp 37,937,601; PP 1.96 years, IRR value 86%, and B/C ratio 1.32. This research had a positive NPV value, B/C ratio >1, and IRR > discount rate (12 %). This study concluded that the fishery business of boat lift net and stationary lift net in Morodemak coastal fishing port (PPP) was worth running.

1. Introduction

Lift net is one kind of fishing gear, which is quite widely used in Indonesia. The large number of lift net usage cannot be separated from regional development, technological ease, low investment level, and one day fishing method of catching. In addition to these technical matters, the high use of the lift net also includes the importance of the catching unit of the lift net for the pelagic fish.

According to the decision of the Minister of Marine and Fisheries of Republic of Indonesia No. 06/MEN/2010 lift net is fishing tool group made of rectangular-shaped nets fitted frame bamboo or other materials as order, operated in a way to be immersed in the waters while setting and lifted to the surface while hauling which is equipped with or without a light-collecting fish, to catch pelagic fish (SNI 7277.9:2008). The fishing operation was limited by lunar cycle [1]. The FAO stated that lift nets are active a few meters below the surface; when light attraction is used, the active depth depends on the attraction power of the light [2]. The light functioned as attractant to various types of plankton-eating organisms [3].

The boat lift nets are fishing gear operated by means of descending into the water column and being lifted back after many fish on it, in operation using a boat to move to locations that are predicted many fish. This boat lift net consists of two boats on the front of the back linked with two bamboo stems so that the square as a place to hang the lift net’s nets. In addition there is still a boat lift net that uses only one boat only.

Stationary lift net is a lift net mounted by placing the body frame into the water, so the position of the lift net can be planted only once and can’t moving during the fishing season. Fishing operation of the stationary lift net is done at night. Most use light coming from petromax lamp, although some use electric lights.

Boat lift net and stationary lift net are fishing equipment that are mainly caught pelagic fish and quite plenty observed in Morodemak waters. Based on survey results, there are 180 units of fishing
gear lift net, which consist of 69 units of boat lift net and 111 units of stationary lift net. It is necessary to observe the income from each fishing business, given the investments incurred for the two different types of fishing gear, despite having the same fishing target. The result of financial aspect analysis will results in feasibility of catching business in the future so that it can be cultivated in a sustainable manner with good planning.

The objectives of this study were to evaluate the technical tools of boat lift net and stationary lift net in Morodemak Waters; to analyze the amount of capital, income, and profits from boat lift net and stationary lift net; and to analyze the financial feasibility of fishing effort by boat lift net and stationary lift net.

2. Materials and Methods

The research method used in this research is case study method with descriptive analysis. The subjects studied in this research are technical aspect and financial aspect from fishing effort by using fishing gear of boat lift net and stationary lift net in Morodemak waters of Demak Regency. Sampling method used in this research is purposive sampling. The population used for this sampling is the fisheries business unit of the boat lift net and stationary lift net in Morodemak waters of Demak Regency.

The number of respondents used in this study can be calculated using the cross sectional formula. The population size of boat lift net fisheries business unit in Morodemak waters of Demak Regency is 69 units. Fishing gear of boat lift net can be taken sample was 11 respondents. The population size from fisheries business unit of stationary lift net in Morodemak waters of Demak Regency is 111 units. The fishing gear can be sampled by the formula was 11 samples of respondents.

Analysis of the feasibility of lift net fisheries business in Morodemak waters of Demak Regency, used some of the financial approach that includes: NPV (Net Present Value), B / C Ratio (Benefit Cost Ratio), IRR (Internal Rate of Return), and return period analysis Capital (Payback Period).

1. NPV (Net Present Value)

NPV is the difference between the Present Value of the investment and the present value of net cash receipts (cash flow operations and cash flow terminals) in the future. To calculate the present value it is necessary to determine the relevant interest rate. NPV analysis can be known by the formula [4]:

\[ NPV = \sum_{t=0}^{n} \frac{C_{ft}}{(1+i)^t} - C_{0} \]

- \( C_{ft} \): cash flow per year in period t
- \( C_{0} \): initial investment in year 0
- \( i \): interest rate (discount factor)
- \( t \): year to-
- \( n \): number of years

If:
- \( NPV > 1 \); the business is feasible
- \( NPV = 0 \); the business can be feasible
- \( NPV < 1 \); the business is not feasible.

2. B/C Ratio (Benefit Cost Ratio)

\[
\text{B/C Ratio} = \frac{\text{total revenue}}{\text{total cost}}
\]

The criteria used are:
- \( \text{B/C Ratio} > 1 \); the business generates profits so feasible to continue.
- \( \text{B/C Ratio} = 1 \); the business is not profit and no loss (break even)
- \( \text{B/C Ratio} < 1 \); the business suffered losses so it is not feasible to continue [5].
3. IRR (Internal Rate of Return) [6]

\[ IRR = \frac{i_1 + (i_2 - i_1)}{1} \]

\( i_1 \) : The 1st interest rate
\( i_2 \) : The 2nd interest rate
NPV1 : NPV at the 1st interest rate
NPV2 : NPV at the 2nd interest rate

4. Analysis of Capital Return Period (Payback Period)

Payback period in capital budgeting refers to the period of time required to recoup the funds expended in an investment, or to reach the break-even point [7]. It is used to know the duration of investment capital rotation used in doing business or in other words to know the time that can be used to recoup the investment expenditure by using the profit as comparison.

3. Results and Discussion

3.1. Technical Aspects of Boat Lift Net

The construction of a boat lift net in Morodemak waters of Demak Regency consists of wooden frames, nets, motorized boats as a means of transportation at sea, as well as tools to ease the operation of this boat lift net that is the spade, lamp and roller that serves to lower or lift the net. Boats used in this boat lift net only use one boat only. The position of the boat is in the midst of the construction of the lift net framework. The boat is 9 GT, the length of the boat L is 23 m, its keel size is 15 m, the width (B) of the boat is 3 m, and the inner size (D) of the boat is 2.5 m.

The material of the boat lift net framework is made of bamboo. The length of deck in the boat lift net (P X L) is 22.5 m x 22.5 m. The amount of material on the boat lift net construction is 200 bamboos. In the center of boat lift net there is a house with size (P x L x T) is 6 m x 2.2 m x 2.4 m which serves as a resting place, where electric generators, fuel and other fishing equipment.

The net material on the boat lift net is made from polyethylene. The size of the net (P X L) is 45 m x 45 m. The net is square with mesh size of 0.6 - 1 cm. The net is strung one by one to form a large square. The length of the towing rope is 60 m for one part, with a diameter of 1.8 cm made from polyethylene. Its rotator made from wood with a length of 1 cm. The nets vary in depth from 18 – 30 meters.

The type of lamp used by the boat lift net as fish attractor is a mercury lamp with a 400 watt and the brand is Philips. The number of lamps used ranged from 40 to 70 pieces. In addition to the lights, the boat lift net uses a rip and roller to pick up the catch.

The fishermen of boat lift net usually leave in the afternoon at around 5 p.m. to go to the fishing ground or the location of the boat lift net and to reach the location of the boat lift net about 2.5 hours or about 6 miles. Appointment of nets in one operation of fishing gear usually fisherman do every 3 hours once and finish at 4 a.m. High average catches before midnight might be generally caused by the domination of positive phototaxis fish caught that came to lighting area because the fish likes approaching the light, not for searching food [8].

![Figure 1. Boat lift-net in Morodemak waters](image-url)
3.2. Technical Aspects of Stationary Lift Net

The construction of the stationary lift net in Morodemak waters of Demak Regency consists of nets, building, spade, roller and lamps. Frame of stationary lift net made from bamboo with the size is 9 m x 9 m. The height of the stationary lift net from the sea surface is about 3.5 meters. Then the house is located on the floor of the stationary lift net that serves as a place for catching activities and to observe the movement of fish gathered around the lights, inside the house there are fisherman's supplies. The house at the stationary lift net is about 1 x 2 m.

Other construction is net’s stationary lift net made from polyethylene (PE). Nets has a mesh size of 0.5 - 1 cm and the length of the nets is 8.5 m x 8.5 m. The depth of the nets is about 4.8 meters, while in Muncar waters Banyuwang (East Java) and Karangantu waters Banten (West Java), lift-net operated at 11m – 13m depth [9,10] and in Muncar waters (Pang pang strait) to obtain optimal catch results then suggested water depth is ≥ 17 m [11].

Stationary lift net using lights as a tool to stimulate or attract the attention of fish to gather in the light of the lamp. The type of lamp used is petromax lamp. The number of lamps used ranged from 2 to 3 pieces. In addition to the lights, the stationary lift net using a spade and roller or pulling tool used is made from strappy bamboo. There are two ropes that are used that is a small rope to install the lights and a large rope to towing nets with a diameter of 1.24 cm.

The fishermen of stationary lift net usually leave in the afternoon at around 5 p.m. to go to fishing ground or location of the stationary lift net, the fisherman use fishing boat to reach the location of the stationary lift net, it takes about 30 minutes to 1 hour or about 1.5 miles.

![Figure 2. Stationary lift-net in Morodemak waters](image_url)

Catch Composition of Lift Net

Catch composition of lift net in Morodemak waters was dominated by small-pelagic fishes such as greenback mullet (*Mugil dussumieri*), white shrimp (*Litopenaeus vannamei*), indian squid (*Loligo duvaucelli*), mud crab (*Scylla serrata*), anchovy (*Stolephorus spp.*), goldstripe sardinella (*Sardinella gibbosa*), short-bodied mackerel (*Rastrelliger negletus*) and yellowstripe scad (*Selaroides leptolepis*). From the catch composition, it is known in the catchment boat lift-net that is dominated by anchovy, where the fish does not exist on the catch of stationary lift-net. The type of anchovy (*Stolephorus sp.*) obtained by boat lift-net fishing gears is the type of *Stolephorus indicus* and *Stolephorus commersonnii* where many obtain at a depth of 25-30 meters. The appropriate mesh size for selective catching of relatively adult anchovy was 16 mm mesh size [12].
3.3. Capital Investment of Lift Net

Capital needed in a fishing business is the total amount of capital invested in the form of lift net, nets, lamps, boats and other fishing equipment. Based on the research results obtained data on the average capital size of fishing business using lift net in Morodemak waters of Demak Regency can be seen in table 1.

| Number | Description | Boat Lift Net (IDR) | Stationary Lift Net (IDR) |
|--------|-------------|---------------------|---------------------------|
| 1.     | Minimal     | 234,500,000         | 6,560,000                 |
| 2.     | Maximal     | 264,500,000         | 7,180,000                 |
|        | Average     | 251,027,273         | 6,781,818                 |

Based on Table 1 it is known that the boat lift net requires more capital than the stationary lift net because the capital required of each fishing gear is also different. Capital required in the boat lift net includes boat, main engine, lift net, lights, nets, and generator, while the capital on the stationary lift net includes lift net, nets, and lights.

Based on the interview, the price of boat propulsion machine varies according to the brand, the year of purchase, and the condition of the purchase. The price of the machine ranges from 17,040,000 IDR until 18,600,000 IDR. Generator’s price on the boat lift net ranges from 18,000,000 IDR until 22,000,000 IDR. Boat’s price ranges from 50,000,000 IDR until 75,000,000 IDR. While the net’s price used in the boat lift net ranges from 10,000,000 IDR until 14,500,000 IDR. The net’s price used in the stationary lift net ranges from 1,000,000 IDR until 1,300,000 IDR.

Based on the data obtained, it is known that the capital or purchase price of each fisheries business unit of lift net in Morodemak waters there is a difference. The price difference is caused by several factors, including the year of purchase. Years of purchasing of boats, nets, and machines of each business unit are not the same. A business unit with a longer year of purchase has a cheaper price than a starting business unit. It is also due to the purchase conditions of both boats and engines. Boats and machines that buy in a new circumstance must have a much higher price than ships or machines that buy in used conditions.

3.4. Production Cost of Lift Net Fishing Business

Production cost consist of fixed cost or the amount of cost incurred in a fixed amount for one year and variable costs is the amounts that changed each time do the fishing operation. Costs that are not dependent on production activities are fixed costs. It will always be calculated as long as the business is still conducted so that no matter how much the amount of the production does not give any...
influence toward the fixed cost [13]. Because the cost is unavoidable as long as the business is still running. Fixed costs consist of depreciation cost, maintenance cost, licensing cost, and sea alms cost.

Table 2. Average of the Fixed Cost of Fishing Business Using Lift Net  

| Number | Description       | Boat Lift Net (Rp/year) | Stationary Lift Net (Rp/year) |
|--------|------------------|-------------------------|------------------------------|
| 1.     | Depreciation Cost| 53,932,424              | 5,252,364                    |
| 2.     | Maintenance Cost | 39,327,273              | 12,375,364                   |
| 3.     | Licensing Cost   | 2,200,000               | -                            |
| 4.     | Sea Alms Cost    | 100,000                 | -                            |
|        | **Total**        | **95,559,697**          | **17,627,728**               |

Variable costs include retribution cost, operational cost, and labor cost. Operational costs of fishing business using lift net in Morodemak waters include costs incurred for the purchase of diesel fuel, and supplies (food, beverages, ice cubes). Based on the results of interviews with fisherman in Morodemak waters the amount of operational costs are different on each fishing gear. Fuel requirements of each fisherman is different depending on the distance to fishing ground.

Table 3. Average of the Variable Cost of Fishing Business Using Lift Net

| Number | Description       | Boat Lift Net (Rp/year) | Stationary Lift Net (Rp/year) |
|--------|------------------|-------------------------|------------------------------|
| 1.     | Operational Cost | 151,763,545             | 8,654,545                    |
| 2.     | Labor Cost       | 20,736,634              | -                            |
| 3.     | Auction Cost     | 12,644,127              | -                            |
|        | **Total**        | **185,144,306**         | **8,654,545**                |

Overall fisherman of boat lift net in Morodemak waters are average spend diesel cost per year 88,125,000 IDR, where every fishing trip requires 120 liters of diesel. The annual cost of supplies is 61,860,000 IDR, while the cost of ice cubes is 1,316,182 IDR. Fisherman of stationary lift net are average spend diesel cost 1,348,500 IDR each year and 2 liters each trip. Diesel cost each year is 4,021,136 IDR and 4 liters each trip. The supplies cost each year is 2,840,000, while the cost of ice cubes is 393,727 IDR.

Labor cost represents the expense that fisherman must pay to the crew as a consideration in carrying out catching operation at sea to get the catch with a certain amount. The average cost of the fisherman of boat lift-net operated in Morodemak waters is Rp 20,736,634 per year. Labor costs obtained by the cost of revenue minus operational costs in a year later divided equally on each crew.

The number of crew involved in the fishing operation is around 7 - 9 people. In the stationary lift net in Morodemak Waters there is no division of labor costs because only 1 fisherman on the stationary lift net. The total cost is the overall cost of a business unit. Total cost is derived from the sum of fixed costs and non-fixed costs. The total cost per year of boat lift net average 278,419,003 IDR each year or 2,032,225 IDR each operation, while for the stationary lift net 21,029,909 IDR each year or 148,098 IDR each operation.

Table 4. Average of the Total Cost of Fishing Business Using Lift Net

| Number | Description | Boat Lift Net (Rp/year) | Stationary Lift Net (Rp/year) |
|--------|-------------|-------------------------|------------------------------|
| 1.     | Minimal     | 271,018,375             | 19,054,500                   |
| 2.     | Maximal     | 286,681,238             | 22,779,000                   |
|        | **Average** | **280,698,003**         | **21,029,909**               |
3.5. *Revenue and Profit of Lift Net Fishing Business*

Revenue on fishing business of the lift net in Morodemak waters is obtained from the sale of fish catching. The average revenue of fishing business of the boat lift net in the Morodemak waters each year is 388,580,000 IDR. Where the results are obtained by using the average operation each year, that is 137 operations each year, consisting of 40 operations when harvest season, 75 operations when regular season, and 20 operations when famine season. Revenue of fishing business of the stationary lift net each year is 27,750,000 IDR. The result is obtained by assuming the average operation of fisherman each year is 142 operations each year, consist of 50 operations when harvest season, 72 operations when regular season, and 20 operations when famine season.

| Number | Description          | Value (Rp/year) |
|--------|----------------------|-----------------|
| 1.     | Revenue in Harvest Season | 142,054,545     | 14,306,364     |
| 2.     | Revenue in Regular Season | 233,065,455     | 11,567,273     |
| 3.     | Revenue in Famine Season | 13,460,000      | 1,876,364      |
|        | Average of the Revenue | 388,580,000     | 27,750,000     |

The profits are derived after receipt of the sale of the production of the catch is reduced by the total cost. Assuming if the result is high then the acceptance will be high and so will the higher profit. The boat owner's profit is 737,773 IDR each operation, while ABK gets 149,825 IDR each person (fisherman of boat lift net consists of 7-9 people), then for the stationary lift net the profit each operation of 47,776 IDR, which on the stationary lift net not use more than fisherman because it can operated alone.

3.6. *Financial Analysis*

The financial aspect is a key aspect of a feasibility study. It is said that, because even if other aspects are considered feasible, if the financial aspect studies give unfeasible results, then the proposed project will be rejected because it will not provide economic benefits.

| Number | Description          | Value (Rp) |
|--------|----------------------|------------|
| 1.     | NPV                  | 836,149,272 IDR | 37,973,601 IDR |
| 2.     | IRR                  | 54 %       | 86 %         |
| 3.     | B/C Ratio            | 1.73       | 1.32         |
| 4.     | PP                   | 2.44       | 1.96         |

Based on the results of the research, financial analysis on the boat lift net and stationary lift net in Morodemak waters has a positive NPV value, B / C Ratio> 1, and IRR> discount rate (discount rate used in this research is 12% using local bank’s interest rate). The rate of return on the two fishing gear is categorized as fast because the PP value is less than 3 years. Based on the investment criteria used, the fishing business with the boat lift net and stationary lift net is feasible and efficient to do.
4. Conclusion and Recommendation

4.1. Conclusion
Based on the results, it can be taken some conclusions, among others:
1. The method of operation of the boat lift net and stationary lift net are ranging from setting, immersing, and lifting. Fishermen usually leave in the afternoon at around 5 p.m., with a distance of about 6 miles for the boat life net and 1.5 miles for the stationary lift net. Upon arrival at the fishing ground and the day before night, the lights are turned on and immediately lower the net. Lifting of nets in one operation of boat lift net is usually done by fisherman once every 3 hours, whereas for stationary lift net usually lifting is done after 30 minutes of immersion.
2. Investment cost of the boat lift net was Rp 251,027,273 and and stationary lift net was Rp 6,781,818. Revenue from the boat lift net was Rp 388,580,000 each year and stationary lift net was Rp 27,750,000 each year. The profit from the boat lift net was Rp 110,160,997 each year and the stationary lift net was Rp 6,720,091 each year.
3. Based on the financial analysis, it is known that the fishing business of boat lift net and stationary lift net in Morodemak Waters is feasible and efficient to proceed. However, it was more profitable the stationary lift net than the boat lift net because a higher IRR and lower payback period.

4.2. Recommendation
Based on the results obtained from the research that has been done, fisherman of stationary lift net step on the long term need to enlarge the scale of business considering the large B/C ratio slightly larger than one. Furthermore, there needs to be research about the efficiency of the use of fishing gear for the boat lift net and stationary lift net so that it can optimize the use of production factors in order to improve the fisherman's welfare of catch fishery of the lift net. In Banten Bay [14], application LED lamps in fixed lift net had significant effect to reduce fuel consumption with mean saving energy up to 35%, and in Sulawesi waters, light from White LED lamp used in bagan lift-net could penetrate to deeper water and caught more white anchovy (Stolephorus indicus) than mercury lamps [15].

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