

Analysis of Shipyard to Meet Fish Ship Procurement Plan for The Ministry of Marine and Fisheries

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Abstract—To improve the national fishing vessels and the welfare of fishermen, the government will provide fishing vessels grant through the KKP. The current capacity of fiberglass shipyards is unclear, so the realization of the procurement of fishing vessels is not accordance with the planned targets. This study aims to analyze shipyard capacity to support the plan for the procurement of KKP fishing vessels grant in 2019. First classify fishing vessels based on their respective GT sizes, which are <5 GT (type A), 5-10 GT (type B), and 20-30 GT (type C). Second, make the minimum shipyard criteria in building fishing vessels. Third, count the number of ships that can be built by the shipyard. The results of the shipyard analysis of the minimum criteria found that 43% of shipyards have the ability to build type A vessels, about 38% of shipyards have the ability to build type B vessels, and around 19% of shipyards have the ability to build type C vessels. Which can be built is 1625 units / period. Referring to shipyard capacity, it can be said that the entire shipyard is able to fulfill the plan to procure assistance for KKP fishing vessels in the 2019 budget year.

Keywords—Fishing Vessel, Ships Procurement, Fiberglass Shipyard.

I. INTRODUCTION

INDONESIA'S fisheries resources are one of the largest in the world. Existing fisheries resources are used to improve people's living standards, in utilizing existing resources carried out by fisheries activities. Fisheries activities are carried out by cultivation, processing and fishing [1]. Fishing activity is an activity to obtain fish in waters that are not in a state of being cultivated by any means or means, including activities that use ships to load, transport, store, cool, handle, process and / or preserve them [2]. Capture fisheries cannot be separated from facilities and infrastructures that support to increase catches, such as fishing vessels and all existing equipment. According to RI Law No. 31 Th. 2004, fishing vessels are ships, boats or other floating tools used for fishing, fish processing, fisheries training, and fisheries research or exploration.

Fishing vessels consist of small boats or boats including canoe boats (boats without motors) which are driven by rowing power or sail, outboard motor boats made of wood to large fishing boats made of wood, fiberglass or steel with steel diesel engine drive power. In general, many fishermen in Indonesia still use wooden-based vessels, but nowadays with the increasing difficulty of getting wood as the basic material for shipbuilding, the fishermen switch to using fiberglass materials. Fiberglass material has many advantages over wood, such as its longer service life than wooden ships and little maintenance on wooden

vessels which must be used slightly because it leaks and fiberglass is not eaten by sea worms or sea shells [3]. Another advantage is the use of fiberglass base for shipbuilding, namely ships with fiberglass base material lighter than ships with wood-based materials [4]. The time of making fiberglass boats is relatively shorter and easier and lighter. When compared to steels-based vessels that are also lightweight, fiberglass shipyards do not require large investments, the technology is simple, and does not require a high qualification of labor [5]. The production process of fiberglass vessels generally uses the hand lay up method, where the lamination process is manually [6]. The construction of fiberglass vessels must refer to the standards of use of fiberglass liner materials, shipyard facilities and equipment standards, standard workmanship on fiberglass laminates, and standard environmental conditions in production areas [7].

The types and shapes of fishing vessels different according to the business objectives, the state of the waters, fishing areas (fishing ground), etc., thus causing different vessel sizes [8]. The classification of fishing vessels in terms of size, shape, speed and construction is largely determined by the designation of the fishing vessels. Likewise with fishing vessels, each of which has distinctive characteristics, size, shape, speed and equipment [9].

According to Setianto, the types of fishing vessels include [10]:

A. Purse seine ship

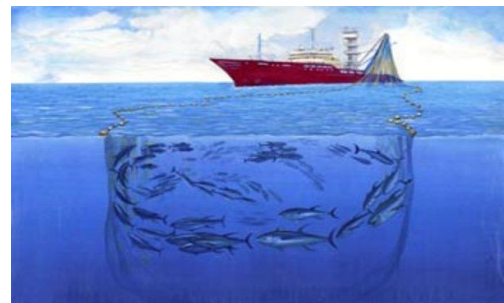


Figure 1. Purse seine ship.

The ships specifically designed to be used to catch fish with purse seine or often called ring trawlers, these vessels are also used to store, cool and transport catches, as shown in Figure 1, the fish staging system on purse seine vessels.

B. Longline ships

The Ships specifically designed to catch fish with a long line type of fishing gear or often also called longline and at the same time to store, cool and transport catches to the port. In Figure 2 we can see the fishing process using Longline type vessels, which use longline.

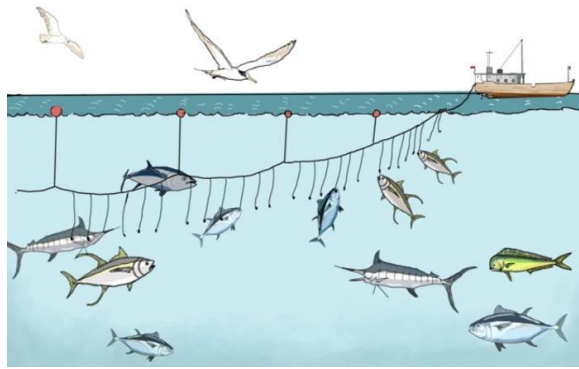


Figure 2. Longline ship system.

C. Trawl Ships

The ships that are specifically threatened and built to catch fish using trawls or often called tiger trawlers, as shown in Figure 3, Trawl type fishing vessels are carrying out fishing. The main purpose of catching is shrimp with a by-product of demersal fish, so it is often called shrimp trawl.



Figure 3. Trawl ship.

D. Pole and liner vessels

The fishing vessels built specifically are used to catch fish with pole and line types or often called huhate. The main purpose of fishing from pole and line vessels measuring 30-100 GT is the type of skipjack (skipjack), and yellow fin tuna species, so that ships are often referred to as pole and line skipjack boats. Seen in Figure 4, fishermen who are carrying out fishing or fishing at the front of the ship with pole and liner type vessels.



Figure 4. Pole and liner vessel.

Fishing vessels have special characteristics in their design and construction, because fishing boats are not only used for catching, but also must be able to transport and store for a certain time. Gulbrandsen suggested that the "best" fishing vessel is a ship that can provide the maximum benefit throughout the life of the fishing vessel, both for shipowners and ship crew [11]. In the design process of fishing vessels, it is necessary to pay attention to several things such as ship stability, seaworthy ships in various conditions, the implementation of adequate equipment, and good accommodation [12]. Therefore, before determining the design of a fishing vessel, it should be considered economically in addition to its technical calculations. In this case what needs to be considered is the amount of capital and ship operating costs and expected catch results estimates.

To realize the welfare mission, the Government through the Ministry of Marine and Fisheries took the initiative to offer fishing boat assistance programs to fishermen. Aid for fishing facilities is intended to strengthen the national capture fishing fleet and improve the welfare of the marine and fisheries community, especially fishermen in order to achieve fisheries production targets.

The plan to procure aid fishing boats to fishermen in Indonesia in 2019 must be supported by the ability and selection of the right shipyard. While currently information related to the ability and capacity of fishing vessels in Indonesia is unclear, causing the realization of the procurement of fishing boats in previous years did not meet the planned targets. Therefore, this study will analyze the capacity of fish shipyards in Indonesia to meet the plan to procure fishing vessels assisted by the Ministry of Marine and Fisheries.

II. METHOD

This research was conducted with a series of activities which included literature review, field review, data collection, data processing, and data analysis. The literature review includes the types of fishing vessels and characteristics of fishing vessels. The field review was carried out in several fiber shipyards in Indonesia and in the offices of the Dirjen Perikanan Tangkap, Ministry of Marine and Fisheries. This field review aims to determine the condition of existing fiber shipyards and obtain information related to the procurement of aid fishing vessels by the Ministry of Marine and Fisheries.

Data and information were collected through interviews and direct observation with several shipyards and the Ministry of Marine and Fisheries. Data collected includes data on types and sizes of aid fishing vessels, plans to procure aid fishing vessels in 2019, and shipyard data along with all production factors.

From the results of data collection, data processing is then carried out. First, classify aid fishing vessels based on gross tonnage values. The second divides the area of construction of fishing vessels based on the State Fisheries Management Region of the Republic of Indonesia (WPPN-RI). The third makes the minimum criteria for fiber shipyards in building aid vessels based on the area of closed roof production, production equipment, labor,

management history, legality of the shipyard, and shipyard experience in building fiberglass fishing vessels.

Furthermore, fiberglass shipyard analysis is carried out against the minimum criteria for shipbuilding builders that have been made, so that any shipyards that meet the minimum criteria can be known based on the type of fishing vessel to be made. The calculation of the number of fishing boats can be built by each shipyard. Then an analysis of the planned procurement of fishing vessels in the 2019 budget year by the CTF. From the results of the analysis, it will be known that shipyard capability in meeting the plan for the need for fishing vessel assistance is provided by the KKP in the 2019 budget year.

III. RESULTS AND DISCUSSION

A. Classification of Aid Fish Ships

Based on gross tonnage and main ship size, the aid fishing vessels can be divided into three types, namely Type A vessels are gross tonnage <5GT with a maximum vessel length of 11m and maximum ship width is 1.25m, type B vessels have gross tonnage between 5–10GT with a maximum vessel length of 14.25m and a maximum vessel width of 2.8m, and type C vessels are vessels with a gross tonnage of 20-30GT with a maximum vessel length of 21.2m and a maximum vessel width of 4.3m. The main size of the ship can be used as the basis for calculating the shipyard production area.

B. Distribution of Fish Shipyard Areas

Given the composition of the size, number and type of fishing vessels that have been carried out by the Ministry of Marine and Fisheries is very diverse and numerous, the selection of aid vessels for shipbuilding builders is grouped according to the Republic of Indonesia Fisheries Management Region (WPPN-RI). One of the advantages of this division of land is the ship's production site near the ship's operating location. Based on the division of WPPN-RI, it is identified the distribution of shipyards in each WPPN-RI which can be seen in Figure 5. as follows:

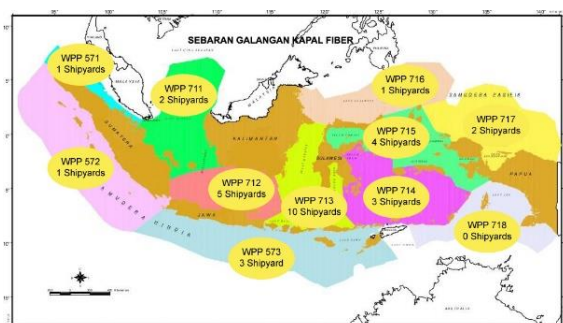


Figure 5. Distribution of fiberglass shipyard.

From Figure 5. it can be seen that the majority of shipyards are in WPPN-RI 713, and in WPPN-RI 718 there are no fiber shipyards yet.

C. Criteria for Minimum Fish Fiber Shipyard

Referring to the technical guidelines for fishing facilities assistance at the Dirjen Perikanan Tangkap number: B.6281 / DJPT / PI.220S2 / VII / 2016, it is known that there are six factors in determining shipyard minimum criteria, namely:

1. Workshop area

In determining the area of workshops for fishing boats assistance is based on the production stages in building fiber vessels. The main size of each type of vessel is used as a reference in planning the layout and area of the workshop needed. The workshop area is a closed roof production area consisting of wood and laminate workshops, assembly workshops, and painting workshops. The minimum area of the workshop that must be owned is shown on Table 1.

Table 1.
Workshop area

Ship Type	Wood and laminate (m)	Assembly (m)	Coating (m)	workshop (m ²)
Type A	14x7	14x7	14x7	294
Type B	18x14	17x14	17x14	728
Type C	25x16	24x16	24x16	1.168

The Type A workshop area consists of wood workshops and laminates measuring 14 m x 7 m, assembly workshops measuring 14 m x 7 m, and painting workshops measuring 14 m x 7 m, totaling 294 m².

The Type B workshop area consists of wood workshops and laminates measuring 18 m x 14 m, assembly workshops measuring 17 m x 14 m, and painting workshops measuring 17 m x 14 m, a total area of 728 m².

The type C workshop area consists of wood workshops and laminates measuring 25 m x 16 m, assembly workshops measuring 24 m x 16 m, and painting workshops measuring 24 m x 10 m, totaling 1,168 m².

2. Production Equipment

Determination of production equipment requirements takes into account the stages of the fiber ship construction process. The stages of this process affect the flow of development and placement of production facilities and equipment. The production equipment required is equipment that has an important role from each production workshop. A recapitulation of the needs of the production equipment that must be owned by the shipyard is shown Table 2.

Table 2.
Production facility criteria

Production facility	Tipe Kapal		
	Tipe A	Tipe B	Tipe C
Circular Saw	2	2	3
Jigsaw	2	2	3
Sander	2	2	3
Kompresor	1	1	1
Genset	-	1	1
Mesin Las	-	1	2
Chain Block	2	3	4
Crane	-	1	1

In Table 2 it is known that to build fiber fishing vessels, the shipyard must have a minimum of equipment that has an important role from each production workshop, namely 2 units of circular saw, 2 jigsaw units, 2 sander units, 1 compressor unit, and 2 unit chains block capacity of 1 ton.

3. Labor

Based on the description of the shipyard organizational structure and the criteria for production equipment, the amount of direct power and minimum indirect energy needed for each type of vessel can be calculated. Following is the recapitulation:

Table 3.
Minimum labour

Ship Type	Organic Labour (Man)	Outsourcing Labour (Man)	Total (Man)
Type A	8	2	10
Type B	12	3	15
Type C	16	3	19

In Table 3. the number of workers needed is 10 people for type A ships, 15 people for type B vessels, and 19 people for type C vessels.

4. Experience

The experience of building fishing boats by shipyards is a very influential assessment factor. There are several experience factors which are the assessment criteria for constructing fishing boats, namely:

- a. Ever built a fiber fishing boat
- b. Ever built a bigger ship
- c. actively build ships for the past five years
- d. Ontime delivery experience

5. Management

A good company is a company that has good organization and management. A ship owner will not give a ship building project to a company that has poor management, because it will affect the work they do. Several factors that become assessment criteria related to shipyard management include:

- a. Not in court proceedings
- b. One of the management and business entities is not blacklisted

6. Legality of shipyard

The legality of shipyards in the construction of fishing vessels is an important factor for assessing a shipyard. Companies that have legal legality that will certainly be able to do their jobs well and smoothly. There are several legality requirements that must be fulfilled by shipyards that want to build aid fishing vessels, namely:

- a. Has an Industrial Business License / Production / Production in the shipbuilding and boat industry (KBLI: 301) or similar types that are still valid
- b. Has a valid Company Registration Certificate (TDP)
- c. Has a valid Business Place License (SITU)

D. Minimum Criteria Analysis of Shipyard Analysis

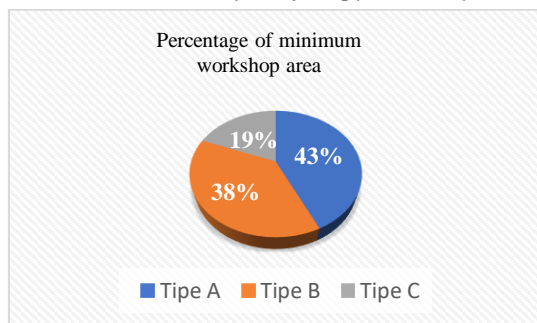


Figure 6. Percentage of minimum workshop area.

From the results of the shipyard analysis of the production area there are 14 shipyard units having a production area capable of building type A ships, 12 shipyard units having a production area capable of building type B vessels, and 6 shipyard units having a capable production area build type C ships. The ability of shipyards to build fishing vessels based on production area can be seen in Figure 6.

Based on the graph of the percentage of production area, it can be seen that most shipyards have a production area capable of building vessels with a capacity of <5GT, because type A vessels have a range of gross tonnage values.

From the results of shipyard analysis of production equipment, it was found that there was a shipyard that did not meet the minimum criteria set. One criterion that is not fulfilled is that the shipyard does not have compressor equipment.

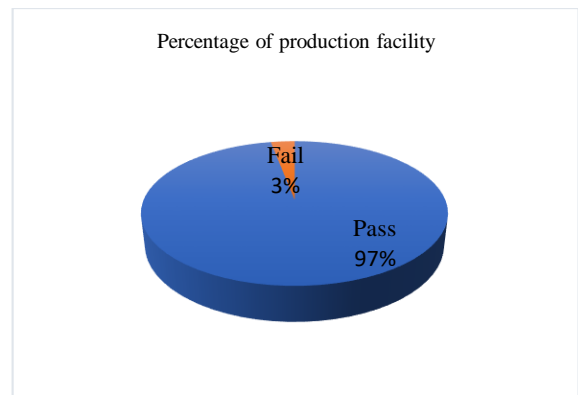


Figure 7. Percentage of production facility.

In Figure 7, it is explained that there are around 3% of shipyards that do not meet the criteria for production equipment, and 97% have met the minimum criteria.

From shipyard analysis to minimum shipyard experience criteria, namely experience in building fiber fishing vessels, experience building ships over 30GT, ontime delivery or never being late in building ships, and being active in building ships for the past 5 years. As a result, all of the shipyards studied have built fiberglass fishing boats and have been actively building ships for the past 5 years. There are 3 shipyards that have built ships above 30GT, namely PT. Bitung Sarana Mulia, PT. Siagan Boats, and CV. Cisanggarung Putra Mandiri. Of the 32 shipyards studied, there were 6 shipyards that had overtime delivery or exceeded the deadline for the construction of a predetermined ship, the shipyard was CV. Mah Maeh, CV. Wahana, PT. Galaxy Ocean Shipyard, CV. Rizal Shell, PT. Wahana Karya Timur, and CV. Andrian Muda Mandiri.

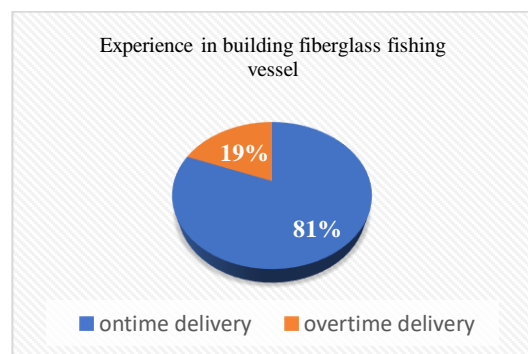


Figure 8. Percentage of experience in building fiberglass fishing vessels.

Figure 8 explains that of the 32 shipyards that all have experience in building fiberglass fishing vessels, there are around 19% of shipyards that are not overtime in building fishing boats, and 81% of ontime delivery in building fishing vessels fiberglass.

Whereas for shipyard analysis, management history, and legality documents, the entire shipyard has met the specified criteria.

E. Shipyard Capability Analysis

Analysis of shipyard capabilities by calculating the number of ships that can be built by the shipyard being studied. Furthermore, the results of these calculations are analyzed against the plan for the need for fishing vessel assistance by the Ministry of Marine and Fisheries in the 2019 budget year.

As is known, that in the 2019 budget year the Ministry of Maritime Affairs and Fisheries plans to hold assistance for <5GT capacity fishing vessels of 300 units, then the number of vessels that can be built by shipyards in one period will be calculated. Based on the results of fiber shipyard assessment, it is known that around 44% of shipyards have the ability to build type A vessels with gross tonnage <5GT, around 38% of shipyards have the ability to build type B vessels with gross tonnage of 5GT-10GT, and around 19% of shipyards have the ability build type C vessels with gross tonnage of 20GT-30GT. From these results, it can be said that the entire shipyard studied has the ability to build fishing vessels of capacity <5GT.

In a previous study, it was found that to build fiberglass construction 3GT capacity fishing vessels using the hand lay up method with a weight of 776.76 tons, 511 (JO) hours were needed to complete the ship construction [13]. After obtaining the work weight and hours of people's needs to complete it, then determine the number of hours of people with the following assumptions:

Effective hours of 80% of normal JO (normal JO = 8 hours per day) [14].

$$\begin{aligned} \text{so 1 JO is effective} &= 80\% \times \text{JO normal} \\ &= 6.4 \text{ hours per day} \end{aligned}$$

The length of work for the ship is 6 months, starting from 1 July to 31 December (assuming 6 months due to the cut of the auction period for the procurement of ships until the contract is signed)

In 1 month the process is only 25 days effective

Within 1 week of work 6 working days

From the results of the assumptions of the above variables, it can be seen the formula for calculating the total hours of people available and the output that can be produced by the shipyard with the following formula:

$$\begin{aligned} \text{Total JO} &= 6 \text{ months} \times 25 \text{ days} \times \text{jml worker} \times 6.4 \text{ hours} \\ \text{Output} &= (\text{Total JO}) / (\text{JO per ship}) \end{aligned}$$

Where :

Output = Number of ships produced (units)

Total JO = Number of hours the person is available at shipyard (hour)

JO per ship = JO need to complete

1 unit of ship (hour)

Based on the above formula, it can be calculated the shipyard's ability to build FRP fishing vessels capacity <5 GT which can be seen in Table 4.

From Table 4. it can be seen that shipyards have the ability to build fishing vessels of <5 GT capacity of 1,625 units in 1 period.

Based on the data, the Ministry of Marine and Fisheries will plan to build a 300-size <5GT fishing vessel in the 2019 budget year. The plan to procure fishing vessels is in the 712 WPPN-RI, the Java Sea waters. Then the shipyard capability analysis will be carried out in the WPPN-RI 712.

Table 4.
Total fishing vessels under 5 GT

No	Shipyards	Total (unit)
1	PT. Jelajah Samudera Internasional	135
2	CV. Cisanggarung Putra Mandiri	28
3	PT. Anang Craftindo Group	56
4	PT. Kairos Anugerah Marina	28
5	PT. Kurnia Marina	113
6	PT. Madura Bangun Raya	70
7	CV. Berkah Laut	47
8	CV. Putra Khalid	38
9	PT. Galaxy Ocean Shipyard	28
10	PT. Era Global Konservasi	152
11	CV. Gemilang Mitra Bahari	28
12	CV. Fajar Bahari Maritim	41
13	CV. Indomalut Fiberboat Tabamarine	34
14	PT. Bitung Sarana Mulia	51
15	PT. Sarana Samudera Pacific	38
16	PT. Restu Jaya Wisesa	19
17	CV. Mah Maeh	23
18	CV. Rizal Shell	28
19	CV. Ramah Putra	32
20	PT. Dokindo Aimas Papua	30
21	PT. Wahana Karya Timur	36
22	CV. Fajar Raya Maros	47
23	PT. Siagan Boats	188
24	CV. Andrian Muda Mandiri	28
25	CV. Fajar Indah Pratama	19
26	CV. JJ Jumadi	36
27	CV. Mandiri Jaya	45
28	CV. Sumber Pratama	101
29	CV. Wahana	28
30	CV. Zihhaf Bangun Cipta Mandiri	30
31	PT. Alam Raya Pratama	30
32	PT. Wahana Abadi Pratama	19

The shipyard in WPPN-712 has the ability to build fishing vessels with capacity of <5 GT as many as 374 units, while the plan to procure size <5GT fishing vessels is 300 units in the 2019 budget year. units, the number of vessels that can be fulfilled is more than 25%.

Referring to shipyard productivity, it can be said that the shipyard is able to build the overall plan for procurement of fishing vessels with <5GT capacity by the Ministry of Marine and Fisheries in the 2019 budget year

IV. CONCLUSION

The minimum criteria for shipbuilding in constructing fishing boats consists of five factors, namely the area of closed roof production, fiber ship production equipment, skilled laborers working, shipyard experience in building fiber vessels, management and management never involved in legal cases, and shipyard legality documents.

From the results of the shipyard analysis of the minimum criteria, around 43% of shipyards have the ability to build Type A vessels, around 38% of shipyards have the ability to build Type A vessels and Type B vessels, and around 19% of shipyards have the ability to build all types of vessels.

On the calculation of productivity in building a fishing boat <5GT using the hand lay up method for hours of people (JO) for 6 months in one construction period, it is known that the shipyard studied has the capacity to build <5GT capacity fishing vessels is 1625 units of ships in 1 period.

Referring to shipyard productivity, it can be said that the shipyard is able to build the overall plan for procurement of fishing vessels with <5GT capacity by the Ministry of Marine and Fisheries in the 2019 budget year.

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