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Study of Technical and Biological Aspects of Production with SWOT Improving Management of Lero Fish Landing Base (FLB) South Sulawesi Province, Indonesia

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ABSTRACT

Lero Fish Landing Base (FLB) in South Sulawesi, Indonesia, is expected to function as a support for the capture fisheries sub-sector and the realization of fisheries production centers on an efficient economic scale. This study aimed to determine the conditions and examine the use of facilities and infrastructure. Addtionally, it sought to determine management strategies to improve the welfare of the community, especially those engaged in fisheries. This research was conducted from May-November 2023 at Lero FLB. The research methods included observation and interviews. Samples were determined by purposive sampling, and the number of respondents was 48 people. The data were analyzed descriptively, using utilization rate analysis and SWOT analysis. The results show that the condition of Lero FLB facilities and infrastructure is in good to very good condition, and it is necessary to manage its utilization and human resource development. Facility utilization is still below 100%, it can be stated that the level of facility utilization has not reached optimal. Based on the relative index of production value, a value of > 1 was obtained indicating that the production of fishery products landed has experienced a good trade quality for the last three years, namely from 2020-2022. The strategy to improve management and increase fisheries production is the S-O (Strengths-Opportunities) strategy. This involves enhancing the management and utilization of the existing facilities to capture the greatest opportunities. The government, fishermen, and all users of the facilities should collaborate to manage and utilize the available facilities at Lero FLB effectively.

INTRODUCTION

The function of fishing ports is to support the increase in fisheries production **(Parra &Ossa 2022; Velasco *et al.*, 2022)**. Based on Law no. 31 of 2004 concerning fisheries, it is stated that the government is obliged to build fishing port infrastructure.

This mandate has been realized in various regions in Indonesia **(Cortés *et al.*, 2022; Huang *et al.*, 2023)**.

The waters of the Makassar Strait have the potential for abundant fish resources, one of which is a very potential water area, namely the waters of the West Coast of South Sulawesi **(Daris *et al.*, 2021)** which consists of several coastal districts including: Makassar City, Maros Regency, Pangkep, Barru, Parepare, and Pinrang **(Hamzah & Rahmawati, 2022)**.

One of the districts that has considerable fisheries potential is Pinrang Regency **(Wardono *et al.*, 2021)**, with an area of 1,961.77km² and a coastline length of 101km. Production has increased over the last five years from 2017 to 2022, with an average increase of 12.21% per year. This growth occurred in a pond area of 15,026.20 hectares and involved a total fleet of 2,478 ships/boats. Notably, this region has only one fishing port, the Lero Fish Landing Base **(Danial *et al.*, 2020)**.

Currently, Lero FLB has complete facilities and infrastructure, but it is not functioning optimally. A poorly functioning management and utilization system is identified as one of the weaknesses **(Tiyaningsih & Saddhono, 2020)**. It is worth noting that, the absence of a dedicated manager for fish auction places results in auction procedures being handled independently by each investor (Auld *et al*., 2023).

Based on this, it was necessary to study the technical and biological aspects of production with SWOT to improve the management of fishing ports **(Morrow 2019)**. This study aimed to know the conditions and assess the use of Lero Fish Landing Base (FLB) facilities and infrastructure in Pinrang Regency, as well as to determine its management strategy in improving the welfare of the community, especially those engaged in fisheries.

MATERIALS AND METHODS

This research was conducted at Lero FLB, Pinrang Regency, South Sulawesi Province, Indonesia (Fig. 1). The research period was from May to November 2023. Materials and tools used were: Questionnaires, computer, camera, and meter. This study used primary data and secondary data **(Hajizadeh 2019)**. Primary data were obtained from direct observations at the research site, followed by conducting interviews and filling out questionnaires **(Pinto *et al.*, 2023)**.

The determination of respondents was carried out by a purposive sampling method. The number of respondents was 48 people; namely, fishermen, boat owners, traders, related agencies, and community leaders. The data collected were then processed and analyzed based on the following research objectives: a. TheaAnalysis of the condition at Lero FLB facilities and infrastructure was analyzed descriptively. The research measuring tools used questionnaires and interviews using the Likert scale

(Pan, 2022). The measurement level was at intervals where the answer category consisted of 5 levels, then alternative answers were given a value score from 1 to 5.

Fig. 1. Map of research location at Lero Fish Landing Bases (FLB)

a. Analysis of the utilization of Lero FLB facilities and infrastructure

(1) The required dock length was calculated using the formula proposed by the Directorate General of Fisheries (1980), as cited in **Danial *et al.* (2020)** as follows:

$$L = \frac{(1+S)xnxaxh}{u\ x\ d}$$

Exp: L: dock length
l : Ship width (m)
n: Number of vessels using the dock
H: length of ship at dock (hours)
a: Ship weight (ton)
s: Distance between vessels (m)
u: Production per day (ton)
d: Length of fishing trip (hours)

(2) The area of the port pond was calculated using a formula proposed by the Directorate General of Fisheries (1980), as cited in **Danial *et al.* (2020)** as follows:

L = Lt + (3 x n x l x b):

Where Lt = πl^2

Exp: L : Port pool area (m^2) πl : 3,14

Lt : Wide to rotate the ship (m^2) b : Ship Width (m)
L : The lagets length of the ship (m) n : Maximum number of ships docked

b. Analysis of the utilization rate of fishing port facilities

According to **Danial *et al.* (2020)**, the analysis of the utilization rate of fishing port facilities was carried out by comparing the use of facilities with the capacity of facilities, as for the following facility formula:

Users utilization rate = Facility capacity x 100%

If the calculation's results were as follows: Utilization percentage > 100%, it indicated that the utilization rate of the facility exceeded optimal conditions; Utilization percentage = 100%, the facility utilization rate reached optimal condition; Utilization percentage < 100%, indicating that the utilization rate of facilities did not reach optimal levels.

c. Production biology analysis

Analysis of fisheries production landed at Lero FLB can be seen through the development of the relative production value index (RPVI). This index can develop the relative value of production in fishing port against the production value at the Provincial / National level. The formula used was as follows:

$$\text{RPVI} = \frac{Np\ x\ 100/Nn}{\text{Qp x } 100/\text{Qn}}$$

Ket: RPVI : Relative Production Value Index
Np : The value of fishery production in a port (Lero FLB)
Nn : Provincial/national fisheries production value
Qp : The quality of fishery production in a port (Lero FLB)
Qn : Quality of provincial/national fisheries production

d. **The management strategy for the Lero Fish Landing Base (FLB)**

The management strategy for the Lero Fish Landing Base (FLB) in the future involved conducting a SWOT analysis using IFAS and EFAS approaches to formulate policy strategies.

RESULTS

Aspects of biology

Analysis of biological aspects based on fisheries production landed at Lero FLB can be seen through the development of the relative production value index (RPVI). This index was calculated by comparing the volume of fisheries production in Lero

FLB with the volume of fisheries production in South Sulawesi Province. More details can be seen in Table (1).

Table 1. Percentage of fisheries production volume and percentage of catch value

Year	Percentage of fisheries Production volume	Catch value percentage
2013	4.13	3.97
2014	4.34	3.37
2015	4.26	3.72
2016	4.30	5.17
2017	3.81	5.80
2018	3.84	4.27
2019	3.58	3.75
2020	3.92	3.75
2021	3.66	3.35
2022	3.50	3.17

Based on the results of data analysis using RPVI in Lero FLB, it scored values >1 from 2013 to 2015 and also from 2020 to 2022, however it scored values <1 from 2016 to 2019. This shows that the RPVI value >1 means that the relative value of Lero FLB production is greater than the average value of provincial production. If the value is <1, it means that the relative value of Lero FLB production is less than the average value of provincial production. This shows that the production of fishery products landed at Lero FLB has a good trade quality for the last three years, namely from 2020 to 2022 (Fig. 2).

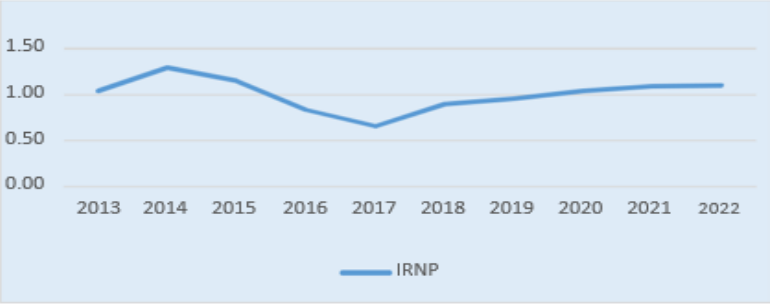

Fig. 2. Relative production value index (RPVI) at Lero FLB

Lero's FLB management strategy

Lero's FLB management strategy used SWOT analysis by identifying and comparing internal factors (strengths and weaknesses) with external factors (opportunities and threats) **(Guangul, 2019; Alfianto, 2023)**. Furthermore, scoring was carried out after identifying and determining the appropriate internal and external factors. Weighing and rating each factor was conducted to determine their scores based on the data obtained, as exhibited in Table (2).

Table 2. Internal factor scoring analysis

Internal strategy factors	Weight	Rating	Score
Strength			
S1 The facilities owned are quite adequate	0,15	4	0,60
S2 The potential of fish empowerment is quite large	0,14	4	0,56
S3 Lero FLB is location strategic	0,13	4	0,39
S4 The number of fishermen is large	0,15	4	0,6
Sum			2,15
Weakness			
W1 There is no auction process yet	0,12	3	0,36
W2 Some fishermen sell their catch elsewhere	1,00	2	0,20
W3 No breakwater and fuel oil pump	0,09	1	0,09
W4 The quality of human resources is still low	0,12	3	0,36
Sum	1,33	9,00	1,01
Strength- Weakness			1,14

Based on IFAS analysis, the strength factor (S) had a value of 2.15, while weakness (W) was 1.01. This shows that the strengths possessed can maximize the existing strength factors to minimize the weakness factors **(Agyekum, 2020)**. Based on the scoring calculation, an internal factor score value of 1.14 was obtained.

The results of the EFAS analysis showed that the opportunity factor (O) had a value of 1.98, while the threat (T) was 0.90. This shows that the opportunities they have can take advantage of the existing opportunity factors to overcome threat factors **(Büyüközkan, 2021)**. Based on the scoring calculation, an external factor score value of 1.08 was obtained, as seen in Table (3).

Table 3. External factor scoring analysis

External strategy factors	Weight	Rating	Score
Opportunities			
Q1 The government is very supportive	0.15	4	0,60
Q2 The demand for fish is increasing along with the development of tourist attractions	0,13	3	0,39
Q3 Market demand for fishery products is increasing	0,13	3	0,39
Q4 Private sector support is increasing	0,15	4	1,98
Total			1,99
Threats			
T1 Weather factors and safety of work at sea	0,11	2	0,22
T2 Law No. 23 of 2014 concerning local government	0,11	2	0,22
T3 The location of the fishing port is close to other ports	0,10	1	0,10
T4 Environmental cleanliness has not been implemented	0,12	3	0,36
Total			0,90
Opportunities- Threats			1,08

Qualitative results comparing internal and external factors were depicted on the SWOT diagram to indicate their respective quadrant locations. This was achieved by plotting the total scores of internal and external factors on the matrix, as illustrated in Fig. (3).

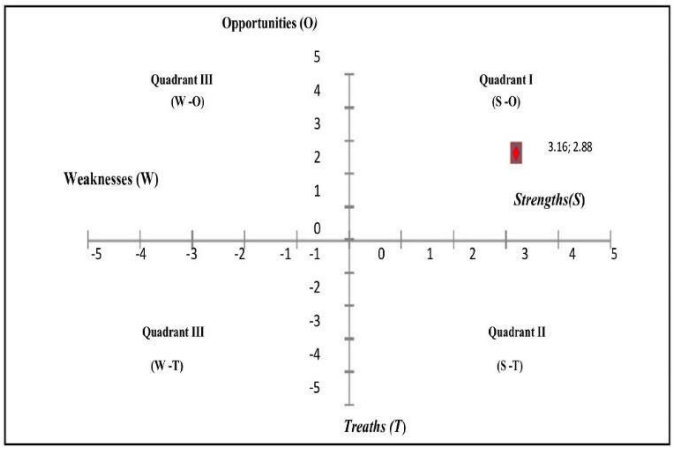

Fig. 3. SWOT strategy position matrix

Fig. (3) shows the position of Lero FLB management strategy in quadrant I, namely the S-O (Strength-Opportunities) strategy. Improving the management and utilization of Lero FLB infrastructure can be optimized to capture the greatest opportunity.

DISCUSSION

The facilities and infrastructure at Lero FLB are categorized as follows: 1. Basic facilities are essential components that ensure the safety of ships during operations and include docks, harbor basins, roads, drainage systems, and harbor land, all of which are in good condition; 2. Functional facilities that enhance the utility of basic infrastructure by providing services that support port activities. These include fish auction sites, ice factories, electrical installations, cold storage units, workshops, net repair buildings, canteens, kiosks, administrative offices, and parking lots, all of which are in good condition, and 3. Supporting facilities that indirectly contribute to the effectiveness of the fishing port. They include fences, guard posts, places of worship, toilets, water reservoirs, and fishermen's shops, all of which are in a good condition **(N'Souvi & Rivero, 2023)**. In general, the condition of the facilities at Lero FLB is in a good to very good condition.

The dock serves as a place to load and unload goods for ships that lean **(Alfianto, 2023)**. Based on the results of the analysis, the length of the pier used is 112m; moreover, the length of the available pier is 171m, hence the untapped one is 59m. Additionally, the length of the PPI Lero pier has met the technical criteria of the fishing port based on the Regulation of the Minister of Marine Affairs and Fisheries No. 8 of 2012, namely the length of the pier is at least 50m. Based on the analysis of the utilization rate of Lero FLB's dock facilities, which stands at 65.5%, it indicates that the dock utilization is not yet optimal. **Zhao *et al.* (2023)** assert that a utilization rate below 100% signifies that the facility's capacity has not been fully reached, and thus, optimal utilization has not been achieved.

The fishing port pool serves to accommodate ships in mooring, so that ships can carry out loading and unloading without being disturbed by waves, therefore the port pool should be in a protected area **(Ramos Velasco *et al.*, 2022)**. The area of Lero FLB pond is 10,000m^2. Based on the analysis of the utilization of the pool area, which covers 7,521m^2, and has been utilized at 75.21%, it is evident that the utilization of port ponds is still suboptimal. According to **Jessen and Hollander (2021)**, a utilization rate below 100% indicates that the facilities' capacity has not been fully utilized, thereby falling short of achieving optimal usage.

The auction building is a functional facility that is very important in its existence in a fishing port which is a place for fishermen to carry out the process of buying and selling caught fish **(Girard & Jribi, 2023)**. The smooth process of fish auctions can run optimally if supported by standard auction room facilities. The area of Fish Auction Place Lero auction building is 257.5m^2. Based on the analysis of the Fish Auction Site area, which has been utilized by 157m^2 to accommodate 2.5 tons of fish per day, it is evident that the fish auction building is suitable for accommodating fishermen's catches. Lero FLB meets the standard criteria for fish auctions set for class

D fishing ports, which is 150m² **(Hamzah & Rahmawati, 2022)**. However, the analysis of the utilization rate of the fish auction site at Lero FLB shows 0%, indicating that there has been no auction activity in fish marketing.

The ice factory in Lero FLB has an area of 124.7m^2, which is a functional facility managed by private parties by renting buildings according to the cooperation contract (MoU) between the Regional Government of Pinrang Regency. This ice factory serves to meet the needs of fishermen in fish handling activities with a capacity of 15 tons per day, but currently the needs of fishermen per day are around 58.1 tons per day. For this reason, the government should immediately strive to meet these needs. Ice is one of the main components in handling fish caught at a fishing port or the fishing vessel that carries out fishing operations at sea **(Louhichi *et al.*, 2023; Mehanna *et al.*, 2023)**.

The strategy that must be applied in this condition is to support an aggressive growth policy (growth oriented strategy). This is a very favorable situation to obtain strategies in the management and development of PPI Lero. Furthermore, it can formulate the management of Lero FLB and determine the direction of its policy, with the priority order of alternative strategies. The priority order of alternative strategies is as follows: Strategy SOas priority I, Strategy ST as priority II, Strategy WO as priority III, and finally Strategy WT **(Wang, 2020)**.

CONCLUSION

Based on the results of the study, the following conclusions were obtained: 1) The condition of Lero FLB facility is in a good condition, it is necessary to manage and develop human resources so that they can run in accordance with their functions. 2) The utilization of Lero FLB facilities is still below 100%, it can be stated that the level of facility utilization has not reached optimal levels. 3) Based on the relative index of production value in Lero FLB, a value >1 is obtained, this means that the production of landed fishery products has good trade quality for the last three years, namely from 2020- 2022. 4). The strategy to enhance management and increase fisheries production at Lero FLB is the S-O strategy, which involves optimizing the utilization of existing strengths to capitalize on the greatest opportunities.

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