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ASSESSMENT OF DEMERSAL FISHING UNITS AT CIKIDANG FISH LANDING BASE (FLB), PANGANDARAN

PENILAIAN UNIT PENANGKAPAN DEMERSAL DI PANGKALAN PENDARATAN IKAN (PPI) CIKIDANG, PANGANDARAN

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ABSTRACT

The development of demersal fishing units requires the selection of appropriate fishing gear so that fishing activities can be conducted efficiently and sustainably. This study aims to describe demersal fishing units, analyze demersal fishing units based on biological, technical, and financial feasibility aspects, and identify the most suitable fishing gear at the Cikidang Fish Landing Base (FLB). The study analyzed five types of bottom fishing gear: set gillnets, trammel nets, Danish seine, bottom longlines, and beach seines. Data collection was conducted using purposive sampling and a census of fishermen who are still actively using these five types of fishing gear. The results indicate that the fixed gillnet has the highest value of excellence (V = 2.25) compared to other fishing gear. This fishing unit used boats ranging from 1–3 GT equipped with a 15 HP outboard motor, a net mesh size of 2–4 inches, and was operated by 3–4 crew members, with the primary catch consisting of economically important demersal fish such as red snapper, threadfin bream, and grouper. Thus, gillnets remain the fishing gear most worthy of prioritization in the development of demersal fisheries at the Cikidang Fish Landing Base.

Keywords: demersal, financial feasibility, Pangandaran, Cikidang FLB

ABSTRAK

Pengembangan unit penangkapan ikan demersal memerlukan pemilihan alat tangkap yang sesuai agar kegiatan penangkapan dapat berlangsung secara efisien dan berkelanjutan. Penelitian ini bertujuan mendeskripsikan unit penangkapan ikan demersal, menganalisis unit penangkapan demersal berdasarkan aspek biologi, teknis, dan kelayakan finansial, serta menentukan alat tangkap unggulan di Pangkalan Pendaratan Ikan (PPI) Cikidang. Penelitian ini menganalisis lima jenis alat tangkap dasar, yaitu jaring insang tetap, *trammel net*, jaring dogol, rawai dasar, dan pukat pantai. Pengumpulan data dilakukan melalui metode *purposive sampling* dan sensus terhadap nelayan yang masih aktif menggunakan kelima alat tangkap tersebut. Hasil penelitian menunjukkan bahwa jaring insang tetap memiliki nilai keunggulan tertinggi (V = 2,25) dibandingkan alat tangkap lainnya. Unit penangkapan ini menggunakan perahu berukuran 1–3 GT dengan mesin tempel 15 PK, konstruksi jaring bermata 2–4 inci, serta dioperasikan oleh 3–4 orang ABK dengan hasil tangkapan utama berupa ikan demersal bernilai ekonomis penting seperti kakap merah, kurisi, dan kerapu. Dengan demikian, jaring insang menjadi alat tangkap yang paling layak diprioritaskan dalam pengembangan perikanan demersal di PPI Cikidang.

Kata kunci: demersal, kelayakan finansial, Pangandaran, PPI Cikidang

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INTRODUCTION

The Cikidang Fish Landing Base/Port (FLB/P) is a type D fishing port that supports fish landing activities. FLB Cikidang is one of nine priority fish landing locations located in Pangandaran District. The vessels at FLB Cikidang range in size from 1 to 16 GT, totaling 729 units (Krisyawensya *et al*. 2023). The primary commodities are the most sought-after fish species, which have a higher economic value than other species due to their high selling price (Ridwan *et al*. 2019).

The fishing units at Cikidang FLB are dominated by small-scale outboard motorboats, so fishermen primarily fish during the east monsoon. The demersal fishing gear frequently used by fishermen at Cikidang FLB includes fixed gillnets, trammel nets, Danish seines, and beach seines (Dewanti *et al*. 2019). The fishermen's fishing grounds are located 1–5 miles from the coast, leading to Cilacap Waters, Pangandaran Bay, and Parigi Bay (Nuryanti *et al*. 2022).

Fish species that live at or near the bottom of the waters are called demersal fish. Demersal fish are the most commonly caught by fishermen at the Cikidang Fish Landing Base (FLB). The main characteristics of demersal fish include low swimming activity and relatively even distribution due to the relatively close movement of fish, which form small groups. The value of demersal fish production at the Cikidang FLB in 2020 reached IDR 9.3 billion, out of a total fishery production value of IDR 11.7 billion (Singkawijaya and Hilman 2021).

Developing a fishing unit requires considering not only production factors but also the condition of the target fish resources. Increasing fishing effort each year can put pressure on resources and risk overfishing. Based on trammel net catch data at the Cikidang FLB during the 2019–2021 period, CPUE values fluctuated, with a downward trend in early 2021 to 14.17 kg/trip, although they rebounded during the peak season in September–October. The catch composition is increasingly dominated by whiteleg shrimp, increasing from 50.61% in 2019 to 60.55% in 2021, while non-target species such as sole and cuttlefish have experienced a drastic decline. This indicates that the trend of demersal resources in the Cikidang Fishing Base over the past five years has tended to be unfavorable, necessitating ongoing evaluation and management to prevent overexploitation and maintain fishing effectiveness (Pratama *et al*. 2025).

Based on the description above, it is necessary to develop fishing gear for fishermen to increase fisheries productivity, especially in the Cikidang FLB area. One approach is to identify superior fishing units that are not only financially profitable but also in line with the principles of sustainable fisheries. The purpose of this study is to describe demersal fishing units, analyze demersal fishing units based on biological, technical, and financial feasibility aspects of five types of basic fishing gear, namely fixed gillnets (set gillnets), three-layer gillnets (trammel nets), Danish seines, bottom longlines (set longlines), and beach seines, and determine the superior demersal fishing gear.

METHODS

The research was conducted at the Cikidang Fish Landing Base (FLB), Pangandaran Regency, West Java Province, from October to November 2023. Data collection was conducted through field observations and fisheries statistical data collection for the 2018–2022 period. A map of the research location is presented in Figure 1. The research stages included research preparation, a preliminary survey, respondent selection, field data collection through interviews with fishermen, literature review, data processing, data analysis, and report preparation. Primary data collection was conducted using a structured questionnaire designed to obtain information on the biological, technical, and financial feasibility aspects of demersal fishing units. Interviews were conducted directly with fishermen still actively fishing in the Cikidang FLB area.

Respondents were selected using a purposive sampling method for four types of fishing gear: set gillnets, trammel nets, Danish seines, and set longlines. A census method was used for beach seines due to the relatively small number of units. The criteria for selecting respondents were fishermen who were still actively fishing using the five types of fishing gear. The population of fishermen using each type of fishing gear consisted of 41 fixed gillnet fishermen, 86 trammel net fishermen, 45 Danish seine fishermen, 45 bottom longline fishermen, and 10 beach seine fishermen. Based on this population, the sample size used in this study was 9 fixed gillnet fishermen, 18 trammel net fishermen, 9 Danish seine net fishermen, 9 bottom longline fishermen, and 10 beach seine fishermen.

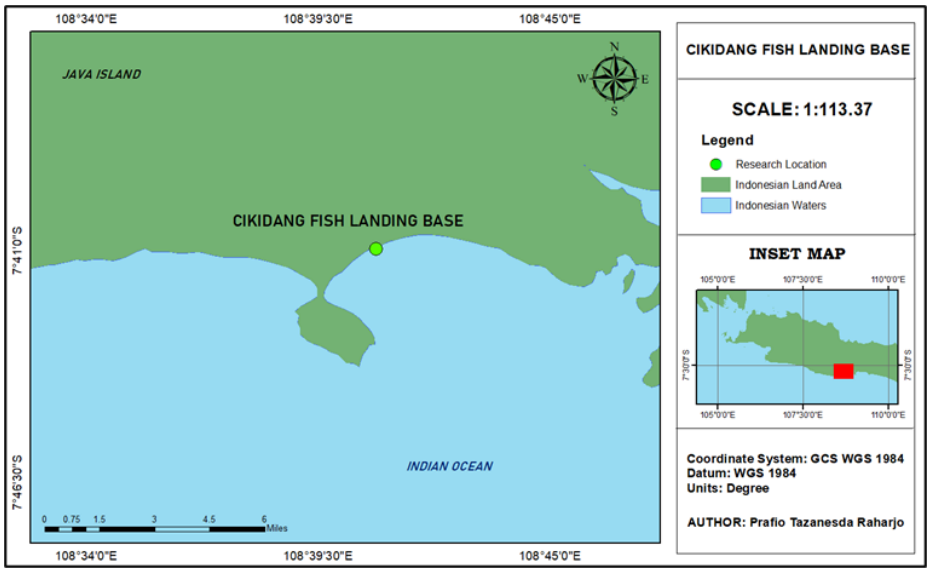


Figure 1. Map of research location at Cikidang Fish Landing Base (FLB), Pangandaran Regency.

Data processing was conducted using three analytical approaches: biological, technical, and financial feasibility. Biological analysis was conducted to determine the selectivity of the fishing gear used for the sustainability of fish resources. Fishing gear includes any equipment that could disrupt or damage marine fisheries' biological resources. The aspects examined were the duration of the fishing season (months), the duration of fishing operations (months), and the selectivity of the fishing gear. The assessment intervals for the technical aspects of fishing gear operation are presented in Table 1.

A technical analysis was conducted to evaluate the operational effectiveness of each fishing gear. The parameters analyzed included the fishing gear operating method (score), the fishing ground range (miles), and the influence of physical environmental conditions on the fishing ground (score). The gear selectivity assessment intervals are presented in Table 2, while the assessment intervals for the influence of the physical environment on the fishing ground are presented in Table 3. A financial feasibility analysis was conducted to assess the profitability of the fishing business run by fishermen. The parameters analyzed included annual income, income per trip, income per worker, and income relative to investment costs.

Table 1. Criteria for assessing technical aspects of fishing gear operation based on value intervals.

Value Intervals	Categories	Descriptions
1–2	Difficult	The fishing gear used can result in death, making it difficult for fishermen to operate their gear.
3–4	Quite difficult	The fishing gear used can cause temporary health problems, making it difficult for fishermen to operate the gear.
5–6	Easy	The fishing gear used is safe for fishermen, ensuring they are skilled and capable of operating it.

Table 2. Selectivity assessment interval of fishing gear based on HTU value (%).

Value Intervals	Indicators	Descriptions
1–2	HTU = 10%–29%	Not selective
3–4	HTU = 30%–49%	Less selective
5–6	HTU = 50%–69%	Moderately selective
7–8	HTU = 70%–89%	Selective
9–10	HTU = 90%–100%	Very selective

Note: HTU = Main catch

Table 3. Criteria for assessing the influence of the physical environment on fishing areas.

Value Intervals	Descriptions	Categories
1–2	Influential	Currents and waves are obstacles
3–4	Moderately influential	Currents and waves are obstacles, but fishermen can still overcome them
5–6	Not influential	Currents and waves were not found

This analysis is important because each fishing unit has a different investment value, including vessels, engines, and fishing gear, as well as operational costs such as diesel, ice, and rations (Nababan *et al.* 2025). These differences can be influenced by several factors, including the year the fishing gear was purchased and the condition of the fishing unit, whether new or used. These ultimately determine the amount of net income and the level of welfare of the fishermen themselves.

A financial feasibility analysis was conducted to assess the feasibility of a demersal fishing business operated by fishermen at the Cikidang Fishing Base (FLB). This analysis is based on calculations of business costs and revenues to determine the profitability and efficiency of the fishing business. Several indicators used in this analysis include business profits, the ratio of total revenue to total costs (revenue cost ratio), and the payback period for initial investment. According to Kewilaa (2025), the profitability of a fishing business can be calculated using the following equation:

$$f = TR - TC$$

Description:
f = Profit (total revenue – total costs)
TR = Total revenue
TC = Total cost

A measure used to calculate the ratio of revenue to production costs incurred in a financial feasibility analysis is commonly referred to as the R/C ratio (Hafifah *et al.* 2024). A business will generate profits and can be continued if revenue is greater than operating costs (Nugroho and Mas'ud 2021). There are three possible outcomes from this calculation: R/C = 1; R/C > 1; and R/C < 1. The break-even point is achieved when the value equals one. The formula for the R/C ratio is as follows:

$$R/C = TR/TC$$

Description:
R/C = Revenue cost ratio (ratio of revenue to total costs)
TR = Total Revenue
TC = Total Cost

The payback period is an indicator used to determine the time required to recoup a business's initial investment. The payback period is influenced by the investment size and net cash flow generated during the business's operations. A fishing business is considered feasible if the payback period does not exceed the project's planned lifespan. The shorter the payback period, the more attractive the business is considered to be for development. Conversely, a business is considered unfeasible if the payback period is greater than the target return on investment (Hendrik *et al.* 2025). Mathematically, the calculation can be done using the following formula:

$$Payback\ Period = \frac{Total\ investment\ (value)}{Net\ cash\ in\ flow} \times 1\ year$$

The values obtained from the results of data processing using the scoring method on biological, technical, and financial feasibility aspects are then analyzed using the Multi-Criteria Analysis (MCA) model, which is standardized with the following value function:

$$V_{(x)} = \frac{X - X_0}{X_1 - X_0}, V_{(A)} = \sum_{i=1}^{n} V_i(X_i)$$

Description:
$V_{(x)}$ = The value function of the variable x
$V_{(A)}$ = The value function of alternative A
X_0 = The lowest value of the criterion x
X_1 = The highest value of criterion x
$V_i\ (X_i)$ = The value function of the alternative on the i-th criterion
X_i = Criterion i

A comprehensive assessment of fishing units needs to be conducted, taking into account various aspects related to the sustainability of fisheries resources and the financial viability of the fishery. Biological aspects are crucial for analyzing the suitability of fishing gear to the characteristics of fish resources and their impact on the sustainability of fish stocks. Technical aspects are needed to assess the effectiveness and ease of operation of fishing gear, including its suitability to aquatic environmental conditions and the ability of fishermen to operate it. Meanwhile, financial

feasibility is used to assess the financial viability of fishing in terms of profitability and economic efficiency. An approach that integrates these three aspects is considered crucial in determining the most feasible and sustainable fishing unit for development.

RESULTS AND DISCUSSION

Demersal commodities at the Cikidang Fish Landing Base

Demersal fish are a group of fish that live and move around the bottom of the waters and can adapt to benthic environmental conditions. Ecologically, demersal fish generally have relatively low mobility and more limited movement space compared to pelagic fish. Furthermore, demersal fish tend to form smaller groups and associate with the bottom substrate as their primary habitat. The total catch of demersal commodities at the Cikidang Fish Landing Base is shown in Figure 2.

Boats

The fishing fleet at the Cikidang Fish Landing Base (FLB) is dominated by small-scale fishing vessels measuring around 1 GT, which generally use simple fishing technology with relatively low operating intensity, thus tending to be more environmentally friendly (Axelius *et al.* 2022). Based on research observations and data from the fishing fleet at the Cikidang Fish Landing Base (FLB), operating vessels vary in size from 1 GT to 20 GT. Two vessels with a 16 GT capacity were recorded, two with a 10 GT capacity, 17 with a 6 GT capacity, and three with a 5 GT capacity. Meanwhile, vessels with a 1 GT capacity constitute the most dominant fleet, with over 600 operating in the area (Cikidang FLB 2023).

Fishing vessels generally use inboard or outboard engines for propulsion during fishing activities (Krisyawensya *et al.* 2023). Fiberglass boats have advantages over wooden boats because they are stronger, more durable, and require relatively easier maintenance (Noor 2025). Based on field observations at the Cikidang Fishing Base, the boats used by fishermen generally have dimensions of 9–12 m in length, 1.20 m in width, and 0.90 m in height, and are equipped with approximately 3 m long outriggers on both sides to maintain balance. The boats use 15 HP engines with a cruising speed of around 7–9 knots, a fishing operation time of 6–8 hours, and fuel consumption of around 20–25 liters per trip.

Demersal fishing gear

Demersal fishing gear is equipment used to catch fish and marine organisms that live on or near the bottom of the water. Selecting the right fishing gear requires consideration of resource sustainability, ease of operation, and economic efficiency (Alatas *et al.* 2022). One such gear is the set-bottom gillnet, made of monofilament nylon with a single-mesh construction and installed on the bottom. Fishing using this gear is generally carried out in the afternoon to early morning because demersal fish activity is greater at night (around 45–81% of the time), compared to 19–55% during the day (Ma'mun *et al.* 2021).

Trammel nets and bottom longlines are demersal fishing gear that differ in construction, materials, and operating techniques, but both are used to catch organisms that live near the bottom. Trammel nets have a three-layer net construction consisting of two outer layers with larger mesh sizes, sandwiching an inner layer with a smaller mesh size (FAO 2021), with the nets generally made of polyethylene (PE). Meanwhile, bottom longlines are fishing gear consisting of a main line installed lengthwise along the water's bottom and equipped with several branch lines with hooks. Both types of fishing gear generally produce catches of demersal organisms such as white shrimp, tiger shrimp, and several other demersal fish species.

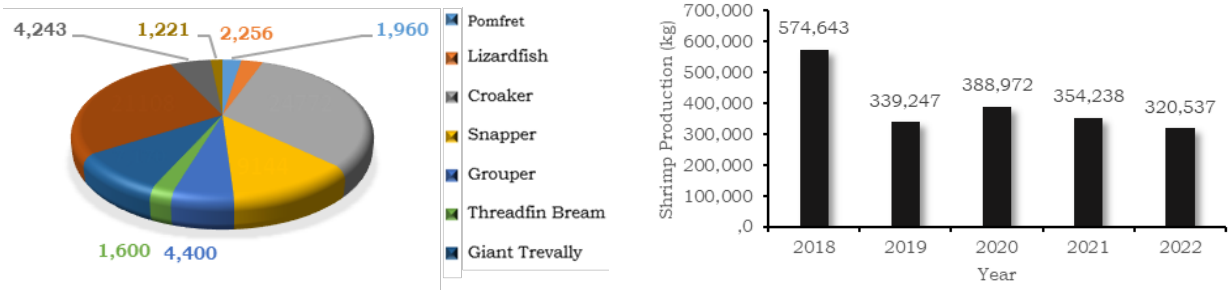


Figure 2. Total catch (kg) of demersal fish commodities at Cikidang FLB in 2022 (source: Cikidang FLB 2023).

Danish seine nets and bottom longlines are demersal fishing gear constructed primarily of a net and a main line, complete with supporting components. Danish seine nets are made of polyethylene (PE) material that stretches from the wings to the body, with a mesh size of 42 mm on the wings and 4.5 cm on the codend. Bycatch from Danish seine nets includes various fish species, such as ribbon head, barracuda, and other pelagic fish (Subehi *et al.* 2017). This gear is equipped with a long main line that stretches along the bottom of the water as the main frame, with approximately 800 branch lines connected to it.

Beach seine nets are constructed of polyethylene nets equipped with wings, a body, and a codend. The gear is operated 6–8 times per day between 6:00 AM and 4:00 PM. Some fishermen use seines to facilitate codends and reduce the number of crew members. However, the use of beach seines and Danish seine nets has the potential to damage the aquatic bottom ecosystem and has a low level of selectivity (Ginanjar *et al.* 2022).

Biological aspects

The assessment of the five fishing gear types in Cikidang involved several criteria, namely the length of the fish abundance season, the duration of fishing operations, and the level of gear selectivity. The fishing season is used as a biological indicator because it reflects the availability and dynamics of fish populations in the waters, which are influenced by environmental factors and the fish reproductive cycle. Selectivity was analyzed based on the composition of retained catch and discarded catch. The composition of the demersal catch per fishing gear (API) in 2023 can be seen in Figure 3. This analysis aims to determine whether the fishing gear used has the potential to disrupt or damage marine fisheries' biological resources. The biological assessment is detailed in Table 4.

The results indicate that the gillnet fishing unit still has a seasonal abundance period of approximately 6 months (April–October), with the main catch consisting of white pomfret, yellowtail, trevally, and shrimp, as well as bycatch consisting of hairtail fish and small fish. Meanwhile, trammel nets have a relatively longer abundance season, lasting around 7 months (August–February), with shrimp as the primary catch. The predominance of shrimp as the target catch in trammel nets indicates that fluctuations in the shrimp fishing season can affect the catch quantity, which in turn impacts fishermen's income (Nugraha *et al.* 2020). The results of the biological assessment, normalized using the value function, are presented in Table 5.

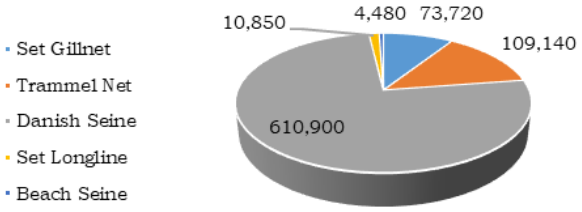


Figure 3. Composition of demersal fish catch (kg) per fishing gear at Cikidang FLB in 2023 (source: KKP 2023).

Table 4. Assessment of biological aspects of fishing gear based on several criteria and priority order at Cikidang FLB.

Fishing Units	Criteria					
	X1 (months)	UP1	X2 (months)	UP2	X3 (individuals)	UP3
Fixed gill net	6	2	12	1	5	4
Trammel net	7	1	12	1	9	1
Danish seine	5	3	12	1	7	2
Bottom longline	5	3	9	2	9	1
Beach seine	6	2	12	1	6	3

Description: X1 = Length of fish abundance season (months), X2 = Length of fishing operation time (months), X3 = Selectivity of fishing gear (score), UP = Priority order.

Table 5. Assessment of biological aspects of fishing gear that have been standardized using the value function at Cikidang FLB.

Fishing Units	Criteria			Number	UP
	V(X1)	V(X2)	V(X3)		
Fixed gill net	0.50	1.00	0.00	1.50	3
Trammel net	1.00	1.00	1.00	3.00	1
Danish seine	0.00	1.00	0.50	1.50	3
Bottom longline	0.00	0.00	1.00	1.00	4
Beach seine	0.50	1.00	0.25	1.75	2

Description: V(X1) = Standardized value of the length of the fish abundance season, V(X2) = Standardized value of the length of fishing operation time, V(X3) = Standardized value of fishing gear selectivity, UP = Priority order.

Technical aspects

Technical aspects were assessed based on the fishing gear operating method, the operational area coverage, and the influence of physical environmental conditions in the fishing grounds. These three indicators were chosen because they reflect the ease of operation of the fishing gear, its ability to reach the fishing area, and its effectiveness in different aquatic environments. The assessment results showed that fixed gillnets received the highest score (5), indicating that this fishing gear is relatively easy for fishermen to operate. Details of the technical aspect assessment are presented in Table 6.

The assessment of fishing gear operating methods showed that fixed gillnets were the priority because they were considered the easiest for fishermen to operate, followed by trammel nets and Danish seine nets in second place, and bottom longlines and beach seines in third place. Meanwhile, based on the operational area coverage criterion, bottom longlines were the priority because they have a wider operating range than other fishing gear. Next in order were fixed gillnets, then trammel nets and Danish seine nets, and beach seines in last place. The results of the technical aspect assessment based on these three criteria are presented in detail in Table 7.

Physical environmental factors in fishing areas also influence the effectiveness of fishing gear operations. In fixed gillnets and trammel nets, environmental conditions such as water currents can affect the net's ability to stretch optimally to block the movement of migratory fish, potentially affecting the catch. Excessively strong currents can cause the net to become unstable, thus reducing fishing effectiveness. Meanwhile, physical environmental conditions such as waves also affect the operation of Danish seine nets and beach seines, as large waves can slow the vessel's speed when encircling schools of fish and increase the likelihood of fish escaping the net.

Financial feasibility aspects

The financial feasibility evaluation was conducted by considering several parameters, such as fishing time, frequency of fishing trips, catch, income, and operational costs. Variations in fishermen's income are also influenced by the fishing season because they are related to changes in catch and its economic value. Total income during the peak season was reported to be higher than during the transition season, indicating that the type of fish caught and its selling price influence the total income received (Imron *et al.* 2024). Details of the financial feasibility analysis results for the fishing unit at the Cikidang FLB are presented in Tables 8–12.

Financial analysis considers routine operational costs, including fuel, crew wages, maintenance costs, and other expenses related to fishing activities. Projected revenue from the total catch and the market price of the fish must be taken into account. This allows fishermen to make informed decisions about allocating resources and selecting appropriate fishing gear for the fishing season.

According to Waileruny *et al.* (2025), fishing costs are a crucial element in fisheries activities because they influence profit levels, business efficiency, and financial viability. These costs are divided into two main categories: fixed costs and variable costs. Fixed costs are costs that remain relatively unchanged regardless of catch or production volume, while variable costs fluctuate in line with changes in catch or production volume.

Table 6. Assessment of technical aspects and priority order of demersal fishing units at Cikidang FLB.

Fishing Units	Criteria					
	X1 (individuals)	UP1	X2 (miles)	UP2	X3 (individuals)	UP3
Fixed gill net	5	1	4	2	6	1
Trammel net	4	2	3	3	4	3
Danish seine	4	2	3	3	3	4
Bottom longline	3	3	6	1	5	2
Beach seine	3	3	1	4	5	2

Description: X1 = Method of operation of the tool (score), X2 = Operating range (miles), X3 = Influence of the physical environment of the fishing area (score), UP = Priority order.

Table 7. Assessment of technical aspects of demersal fishing units that have been standardized using the value function at Cikidang FLB.

Fishing Units	Criteria			Number	UP
	V(X1)	V(X2)	V(X3)		
Fixed gill net	1.00	0.60	1.00	2.60	1
Trammel net	0.50	0.40	0.33	1.23	3
Danish seine	0.50	0.40	0.00	0.90	4
Bottom longline	0.00	1.00	0.67	1.67	2
Beach seine	0.00	0.00	0.67	0.67	5

Description: V(X1) = Standardization value of the tool operating method, V(X2) = Standardization value of the operating range, V(X3) = Standardization value of the influence of the physical environment of the fishing area, UP = Priority order.

Table 8. Results of the financial feasibility analysis of the fixed gillnet fishing unit at Cikidang FLB.

Component	Values
Total investment costs	IDR 48,156,061.00
Total fixed costs	IDR 16,139,847.00
Total variable costs	IDR 181,944,000.00
Total variable costs + fixed costs	IDR 198,083,847.00
Gross revenue	IDR 226,800,000.00
Profit	IDR 28,716,153.00
Revenue Cost Ratio (R/C)	1.144
Payback period (year)	1.677

Table 9. Results of the financial feasibility analysis of the trammel net fishing unit at Cikidang FLB.

Component	Values
Total investment costs	IDR 44,550,000.00
Total fixed costs	IDR 23,885,000.00
Total variable costs	IDR 207,400,000.00
Total variable costs + fixed costs	IDR 231,285,000.00
Gross revenue	IDR 260,000,000.00
Profit	IDR 28,715,000.00
Revenue Cost Ratio (R/C)	1.124
Payback period (year)	1.551

Table 10. Results of the financial feasibility analysis of the Danish seine fishing unit at Cikidang FLB.

Component	Values
Total investment costs	IDR 51,950,000.00
Total fixed costs	IDR 10,455,333.00
Total variable costs	IDR 180,740,000.00
Total variable costs + fixed costs	IDR 191,195,333.00
Gross revenue	IDR 238,000,000.00
Profit	IDR 46,804,667.00
Revenue Cost Ratio (R/C)	1.244
Payback period (year)	1.109

Table 11. Results of the financial feasibility analysis of the bottom longline fishing unit at Cikidang FLB.

Component	Values
Total investment costs	IDR 45,113,000.00
Total fixed costs	IDR 56,862,000.00
Total variable costs	IDR 198,050,000.00
Total variable costs + fixed costs	IDR 254,912,000.00
Gross revenue	IDR 268,750,000.00
Profit	IDR 13,838,000.00
Revenue Cost Ratio (R/C)	1.054
Payback period (year)	3.260

Table 12. Results of the financial feasibility analysis of the beach seine fishing unit at Cikidang FLB.

Component	Values
Total investment costs	IDR 57,500,000.00
Total fixed costs	IDR 14,128,000.00
Total variable costs	IDR 182,064,000.00
Total variable costs + fixed costs	IDR 196,192,000.00
Gross revenue	IDR 213,360,000.00
Profit	IDR 17,168,000.00
Revenue Cost Ratio (R/C)	1.087
Payback period (year)	3.349

Based on the R/C ratio analysis, the fishing business in the Cikidang FLB is considered feasible and profitable because all fishing units have an R/C ratio value greater than one. The R/C ratio value of each fishing gear, namely fixed gillnets, is 1.14, trammel nets 1.12, Danish seine nets 1.24, bottom longlines 1.05, and beach seines 1.09. The payback period analysis shows that Danish seine nets have the fastest return on investment, namely 1.10 (approximately 1 year 1 month), followed by trammel nets 1.55 (1 year 7 months), fixed gillnets 1.67 (1 year 8 months), bottom longlines 3.26 (3 years 3 months), and beach seines 3.34 (3 years 4 months). These results indicate that all fishing units are still economically viable, with details of the analysis presented in Table 13.

Gillnets remain the top priority across several criteria (revenue per fishing effort and income per worker). This is due to the high revenue per trip and the small number of crew members, making it the preferred fishing gear in this area. Bottom longline gear ranks first in terms of annual revenue and income per operating hour, while Danish seine nets rank first in terms of income per investment cost, due to the significant ratio of revenue generated to investment costs. The standardized value of each criterion is explained in Table 14.

Table 13. Assessment of financial feasibility criteria and priority order of fishing units at Cikidang FLB.

Fishing Units	Criteria									
	X1	UP1	X2	UP2	X3	UP3	X4	UP4	X5	UP5
Fixed gill net	226.8	4	1.35	1	192.8	2	450	1	1.14	2
Trammel net	260	2	0.87	3	173.3	3	288.9	3	1.12	3
Danish seine	238	3	0.79	4	99.1	4	198.3	4	1.24	1
Bottom longline	268.75	1	0.89	2	223.9	1	298	2	1.05	5
Beach seine	213.36	5	0.71	5	71.1	5	35.5	5	1.09	4

Description: X1 = Income per year (million IDR), X2 = Income per fishing effort (million IDR), X3 = Income per hour of operation (thousand IDR), X4 = Income per worker (thousand IDR/month), X5 = Income per investment cost (IDR), UP = Priority order.

Table 14. Standard values of financial feasibility aspects and priority order of fishing units at Cikidang FLB.

Fishing Units	Criteria					Number	UP
	V(X1)	V(X2)	V(X3)	V(X4)	V(X5)		
Fixed gill net	0.24	1.00	0.80	1.00	0.48	3.52	1
Trammel net	0.84	0.24	0.67	0.61	0.37	2.73	3
Danish seine	0.44	0.13	0.18	0.39	1.00	2.15	4
Bottom longline	1.00	0.29	1.00	0.63	0.00	2.92	2
Beach seine	0.00	0.00	0.00	0.00	0.17	0.17	5

Description: V(X1) = Standard value of income per year (million IDR), V(X2) = Standard value of income per fishing effort, V(X3) = Standard value of income per hour of operation, V(X4) = Standard value of income per worker, V(X5) = Standard value of income per investment cost, UP = Priority order.

Combined aspects

A combined analysis was conducted by integrating the assessment results from three main aspects: biological, technical, and financial feasibility, to obtain final criteria for determining fishing unit priorities. The analysis results indicate that gillnets retain their advantages over other fishing gear, particularly in technical aspects. A standardization process using a value function was applied to all fishing units to obtain objectively comparable values. The results of the combined analysis assessment of fishing units are presented in Table 15, and the results of the value function standardization in Table 16.

Based on the combined analysis, fixed gillnets received the highest score and were therefore prioritized as the most feasible fishing unit for development at the Cikidang FLB. This fishing gear is considered more operationally and economically efficient and has the potential to support resource sustainability due to its relatively high selectivity and lower impact on bottom habitats. Therefore, demersal fisheries development at the Cikidang FLB can be directed towards the use of fixed gillnets while still paying attention to regulating fishing effort to ensure it does not exceed resource capacity.

Table 15. Combined assessment of biological, technical, and financial feasibility aspects and priority order of fishing gear at Cikidang FLB.

Fishing Units	Criteria					
	X1	UP1	X2	UP2	X3	UP3
Fixed gill net	1.5	3	2.6	1	3.52	1
Trammel net	3	1	1.23	3	2.73	3
Danish seine	1.5	3	0.9	4	2.15	4
Bottom longline	1	4	1.67	2	2.92	2
Beach seine	1.75	2	0.67	5	0.17	5

Description: X1 = Biological aspect, X2 = Technical aspect, X3 = Financial feasibility aspect, PO = Priority order.

Table 16. Final scores from the integration of biological, technical, and financial aspects and the priority order of fishing gear at Cikidang FLB.

Fishing Units	Criteria			Number	UP
	V(X1)	V(X2)	V(X3)		
Fixed gill net	0.25	1.00	1.00	2.25	1
Trammel net	1.00	0.29	0.77	2.06	2
Danish seine	0.25	0.12	0.59	0.96	4
Bottom longline	0.00	0.52	0.82	1.34	3
Beach seine	0.38	0.00	0.00	0.38	5

Description: V(X1) = Standard value of biological aspect, V(X2) = Standard value of technical aspect, V(X3) = Standard value of financial feasibility aspect, UP = Priority order.

CONCLUSION

The demersal fishing unit at the Cikidang FLB is dominated by small-scale fisheries using several types of fishing gear with different operational characteristics. The results of the analysis of biological, technical, and financial aspects indicate that fixed gillnets with a mesh size of 2–4 inches are the preferred fishing gear for development with the highest V(A) value of 2.25. Therefore, the development of demersal fisheries at the Cikidang FLB can be prioritized by using this fishing gear while still ensuring adequate fishing infrastructure support of fishing equipment and the sustainability of fishing efforts.

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