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Financial Feasibility Analysis of Clam Harvesting Using Dredge in Sedati Waters, Sidoarjo, Indonesia

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ABSTRACT

Dredge is the dominant shellfish fishing gear in Sedati District, this tool has good productivity in the shellfish fishing business. The productivity of fishing gear is related to the ability of fishing gear to provide better catches and the profits obtained by fishermen. This research aims to analyze business finances and the feasibility of shellfish fishing using fishing gear in Sedati Waters, Sidoarjo, East Java, Indonesia. This research used a survey research method with Primary and Secondary data. The samples collected from this study were spread across 224 respondents. The hauling process is carried out while catching shellfish 100-150 times. Shellfish fishing activities are carried out 20-26 days a month. The research results show that the average investment cost for a shellfish fishing business is IDR 31,340,000, fixed costs are IDR 6,988,973 and variable costs are IDR 26,600,000. The shellfish catch obtained by fishermen in one year is around 158 kg - 302 kg, with an average per fisherman of 226 kg consisting of Anadara antiquata, Anadara granosa, and Paratape undulatus batik with a total of IDR 68,380,000. The Net Present Value (NPV) value for the clam fishing business was IDR 75,607,420.00, IRR 72.66%, B/C Ratio 1.39, and the Payback Period was 1.64. By addressing these financial factors, a clam harvesting operation with dredging equipment can be efficiently planned and conducted, ensuring both economic feasibility and operational success.

1. INTRODUCTION

Shellfish fishing efforts should be carried out by looking at the biological and ecological conditions of the shellfish so that they remain sustainable. According to Mollen et al. [1], fishing activities are one of the activities that utilize fisheries resources which can threaten the extinction of aquatic resources, so it is necessary to manage fisheries resources so that the aquatic ecosystem continues to be maintained. Types of shellfish found in Sedati waters include batik clams (*Paratapes undulatus*), blood clams (*Anadara granosa* and *Anadara antiquata*).

The increase in population and urbanization activities can affect the existence of threatened shellfish resources because according to Trottet et al. [2], the increase in global population has resulted in increased urbanization in coastal areas throughout the world. Massive shellfish fishing efforts can affect the catch and size of shellfish, so efforts are being made to reduce the size of shellfish fishing gear.

Shellfish fishing can be carried out using a wide variety of methods, from very simple techniques (e.g., hand fishing) to sophisticated equipment (e.g., hydraulic dredging) [3]. Fishermen in the Sedati area, Sidoarjo generally use dredge fishing gear which is pulled using a boat with a 10 HP engine capacity. The production of shellfish in 2013 was 12,359.4 tons and in 2014 was 9,586.1 tons. Meanwhile, the number of clam exports in 2015 was 7,812 tons with a value of 20,759 USD. The main catch from this tool is shellfish and the by-catch is shrimp, crab, and crab. This fishing gear is grouped into dredge gear [4].

Excessive shellfish fishing from an economic perspective will reduce fishermen's income due to reduced catches over time. From a technical perspective, fishing for shellfish with fishing gear has a negative impact on the environment [5]. With the trend of decreasing catches, but on the one hand, there is an increase in the number of fishing units due to the increase in the fishing population, the author is interested in analyzing business finances and the feasibility of shellfish fishing using fishing gear in Sedati, Sidoarjo, East Java, Indonesia. Evaluating the financial viability of a clam fishing enterprise involves examining average investment, fixed costs (including boat maintenance, licenses, and equipment), and variable costs (such as fuel, labor, and bait). This analysis aids in determining profitability, estimating the break-even point, managing financial risks, optimizing resource allocation, securing funding, and informing strategic planning for sustainable and profitable growth in clam harvesting.

2. MATERIAL AND METHODS

2.1 Study area

This research was conducted in the Sedati sub-district, Sidoarjo regency Sidoarjo Regency, East Java Province, Indonesia which was divided into 2 regions, namely Banjar Kemuning and Gisik Cemandi (Figure 1). The research was conducted from March 2019 to February 2020. Sampling of socio-economic conditions was carried out by purposive random sampling

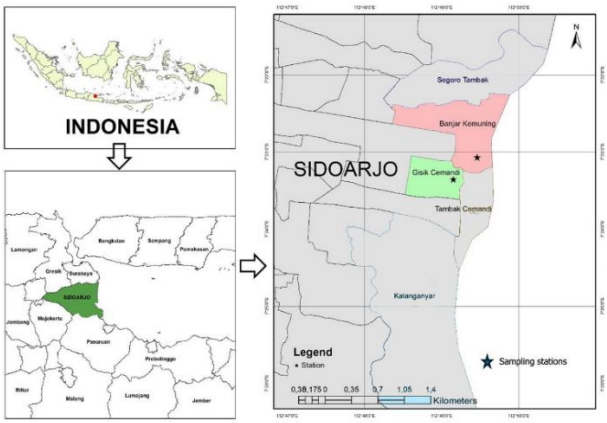

Figure 1. Research location

This research used a survey research method. Survey research is part of a quantitative research method, which aims to find and examine various relative events, distributions, and correlations of sociological and psychological variables, in a population or sample group [6].

This study uses primary data and secondary data. Primary data collection was carried out by way of direct observation of the research location, and interviews with respondents, guided by a list of questions (questionnaire) that had been prepared based on the research objectives. Primary data includes the identity of the respondent, the performance of the capture fisheries business (investment costs and production costs, the amount and type of production), and commodity selling prices. Secondary data was collected through a literature review of literary sources related to the research objectives. Secondary data in this study included published and unpublished research results.

The sample or research respondents are shellfish fishermen in Gisik Cemandi Village and Banjar Kemuning Village who are still active in running a shellfish fishing business in the waters of the Sedati Waters. Interview data was evaluated and coded after transcribing verbal responses into written form, followed by a thorough analysis of the transcripts. An initial coding process was undertaken, whereby key segments of the data were labeled to reflect significant concepts or themes, either through pre-assigned codes or by allowing patterns to emerge organically. These codes are categorized into broader themes by thematic analysis, and this process is validated for consistency through multiple reviewers or member checks.

The sample from this study was shellfish fishermen in Sedati using Eq. (1) the determination formula based on [7]:

$$n = \frac{N}{(1 + N[d]^2)} \quad (1)$$

The number of shellfish fishermen in these two villages was 305 shellfish fishermen. The samples collected from this study were spread across 224 respondents, including 118 fishermen in Banjar Kemuning Village and 106 fishermen in Gisik Cemandi Village.

2.2 Data analysis method

Analysis of business efficiency Analysis of business efficiency begins with calculating the total cost of production or operational costs (total cost, TC), total revenue (total revenue, TR), and the amount of profit (profit). The income or profit earned by fishermen from fishing efforts is measured using Eq. (2) as follows:

$$л = \mathrm{TR} - \mathrm{TC} = \mathrm{p.h.} - \mathrm{c.E} \quad (2)$$

The analysis of business efficiency in this study uses a ratio approach between total revenue from sales (TR) and total production costs, or business operating costs (TC). This analysis was commonly called the Revenue Cost Ratio (RCR) analysis. Soekartawi [8] states that mathematically, the ratio of total revenue to total production costs can be written as follows:

$$\mathrm{RCR} = \mathrm{TR}/\mathrm{TC} \quad (3)$$

Criteria:

- If the RCR value is greater than 1, the business is in an efficient and profitable condition.
- If the RCR value is less than 1, the business is not efficient and is detrimental.

2.3 Financial analysis

Chapter 1 Financial analysis was carried out by measuring the performance of the clam fishing business by following the method used by Yafiz et al. [9], namely by calculating the NPV (net present value), NB/C (net benefit-cost ratio), IRR (internal rate of return), ROI (return on investment), and PP (payback period). The following is an explanation of the calculation of financial indicators:

2.3.1 NPV

According to Budiman and Wijayanto [10], NPV is the difference between the present value of the investment and the present value of net cash receipts (operating cash flow and terminal cash flow) in the future. Based on Khan [11], the NPV formula Eq. (4) is:

$$NPV = \sum_{(t=1)}^{n} \llbracket CFt/((1+i))\, t - Co \rrbracket \quad (4)$$

If the NPV is greater than 1, then the business is feasible; if it is equal to 0, then the business can be feasible; if the NPV is less than 1, then the business is not feasible [12]. Normally, the higher NPV value indicates that the project is better to choose [13].

2.3.2 B/C Ratio

The B/C Ratio is meant to determine the magnitude of the comparative value of receipts and production costs used. The formula Eq. (5) for this calculation [14, 15] is as follows:

$$B/C\ ratio = Benefit/(Total\ Cost) \quad (5)$$

The criteria used are:

B/C Ratio > 1, means that the business generates profits so it is feasible to run.

B/C Ratio = 1, which means the business has no profit and no loss (break-even).

B/C Ratio < 1, means that the business suffers losses so it is not feasible to run.

2.3.3 IRR

According to Dahlan [16], IRR is an interest rate that will make the total present value of products equal to the total present value of capital expenditures. The IRR value can be calculated using the formula Eq. (6):

$$IRR = i\_t + NPV1/(NPV1 - NPV2)(i\_2 - i\_1) \quad (6)$$

Business is said to be feasible if IRR > discount rate, while business is said to be not feasible if IRR < discount rate.

2.3.4 Payback period

Payback Period is a method of investment valuation based on repayment of investment costs by profits or in other words the time needed to return the invested capital, formula Eq. (7) [17, 18].

$$PP = Investment/(Average\ benefit) \quad (7)$$

3. RESULTS

3.1 Profile of fisherman's social condition in shellfish fisheries

All fishermen join a joint business group which in this case is also accompanied by fisheries instructors from the Sidoarjo Fisheries Service. All shellfish fishermen in the villages of Banjar Kemuning and Gisik Cemandi are men, while fishermen's wives have a role in the post-harvest process, starting from sorting, cleaning, and selling to collectors. Some fishermen's wives clean shells at the pier and some clean shells in their own homes. The average condition of fishermen's houses is that the floors are tiled and the walls of the house are permanently walled with the land ownership status being one's own. The water source that fishermen use for cooking, bathing, and washing comes from PDAM water with toilet sanitation located in the house, while the entire house's lighting source comes from PLN.

Table 1. Age profile of fisherman

Age Interval	Total	Percentage
25-30	22	9.82
31-36	37	16.52
37-42	61	27.23
43-48	51	22.77
49-54	33	14.73
55-60	13	5.80
61-66	5	2.23
67-72	2	0.89

Source: Author's work, 2020

The furniture owned by fishermen is generally the same, namely, furniture, wall clocks, stoves, and TVs, and some fishermen have computer equipment. The means of transportation owned by shellfish fishermen are bicycles and motorbikes. Apart from working as shellfish fishermen, several fishermen's families also raise poultry, goats, and ducks. There are also fishermen who own grocery store businesses and work as pond workers.

Table 1 showed the age of the respondents varied from 25 to 72 years. The profile of respondents shows that there are more fishermen aged 37-42 years than in other age distributions, namely 27.23%, followed by fishermen aged 43-48 years with 22.77%. Fishermen aged 31-36 years contributed as much as 9.82%, followed by those aged 55-60 years as much as 5.80%, and those aged 61-66 as much as 2.23%; besides that, respondents with ages 67-72 years contributed 0.89 percent.

The education level of fishermen respondents was generally 60.71% junior high school, 4.91% high school, and 34.38% elementary school. The data on the education level of the respondents are described in the following Table 2.

Table 2. Education profile of fisherman

Education	Total	Percentage
Elementary	77	34.38
Junior	136	60.71
Senior	11	4.91

Source: Author's work, 2020

The highest experience of shellfish fishermen at the study site was 65 fishermen who had 19-25 years of experience at sea and the lowest was 3 fishermen who had 47-53 years of experience. Based on interview data with fishermen related to the number of dependents, it was found that as many as 29% of fishermen had 7 family dependents, and as many as 24% had 6 dependents. Sequentially, as many as 19% of fishermen have 5 dependents, followed by 14% who have 4 dependents. Furthermore, as many as 9% of fishermen have 3 dependents, and 5% of fishermen only have 2 dependents.

3.2 Fishing unit profile

Shellfish fishermen in Sedati use boats made of wood with dimensions of an average length of 11 meters, width of 1.75 meters, and height of 0.8 meters. The boat uses a diesel engine with a capacity of 8-10 HP (horsepower). The fishing tool used in the clam-catching process is a dredge with the local name "garit" which is made of stainless steel with dimensions of 135x40x80 cm. Each ship has 8-10 pieces of fishing gear. The hauling process carried out by shellfish fishermen during fishing is 100-150 times. In one month, fishermen generally go to sea for 20-26 days, one trip in peak season usually lasts 5-8 hours, and in medium and lean seasons it lasts 5-7 hours.

3.3 Financial analysis

3.3.1 Investment cost

Investment costs are costs that must be paid by fishing communities in Banjarkemuning and Gisik Cemandi villages, to purchase the main supporting equipment for the shellfish fishing business.

Investment equipment owned by fishermen in the form of boats or boats and engines, fishing gear, lights, and baskets. The total investment costs incurred by shellfish fishermen range from IDR 21,950,000.00 to IDR 46,950,000.00 - with an average of IDR 31,340,000.00. The Calculation investment is shown in Table 3.

Table 3. The calculation of investment

No.	Investment	QYT	Cost (IDR)	Total Cost (IDR)
1	Boat	1	16,919,643	16,919,643
2	Engine	1	12,150,000	12,150,000
3	Gear	3	628,348	1,885,045
4	Paddle	2	100,000	200,000
5	Lamp	1	100,000	100,000
6	Basket	3	50,000	150,000
	Total			31,340,000

Source: Primary Data (2020) currency 1 USD = 15,384 IDR

3.3.2 Operating cost (fixed cost and variable cost)

Production costs are an important component in supporting the sustainability of the shellfish fishing business in Sedati Waters, Sidoarjo. Production costs are costs that must be sacrificed by fishing communities in this village when carrying out fishing and shrimp farming on each activity trip. Production costs in the research are fixed costs and operational costs. The total fixed costs per year of shellfish fishing activities are at intervals of IDR 5,150,000.00 - up to IDR 8,110,000.00, with an average of IDR 6,988,973.00. The fixed cost for caching shellfish is shown in Table 4.

Table 4. Fixed cost for caching shellfish

(Fc)	Depreciation and Maintenance Costs	Age	Price	Times	Total Cost
1	Ship Depreciation	10	16,919,640		1,691,964
2	Machine Depreciation	5	12,150,000		2,430,000
3	Depreciation of Fishing Gear	5	1,885,045		377,009
4	Paddle Depreciation	2	100,000		50,000
5	Depreciation of Lamps	1	100,000		100,000
6	Basket Shrinkage	1	50,000		50,000
7	Ship Maintenance		400,000	3	1,200,000
8	Machine maintenance		150,000	3	450,000
9	Gear Maintenance		200,000	3	600,000
10	Lighting Treatment		10,000	4	40,000
	Total Fix cost (Fc)				6,988,973

Source: Primary Data (2020) currency 1 USD = 15,384 IDR

Table 5. Variable cost caching shellfish

No.	Variable Cost (Vc)	Unit	Total	Total (Month)	Total Trip/Month	Price (IDR)	Total (IDR)
1	Fuel	Liter	7	10	26	10,000	18,200,000
2	Consumption	Package	1	10	26	30,000	7,800,000
3	Oil	Package	Every 2 month		4	150,000	600,000
							26,600,000

Source: Primary Data (2020) currency 1 USD = 15,384 IDR

The variable costs per year of shellfish fishing activities are at intervals of IDR 11,370,000.00 - up to IDR 31,095,000.00, with an average of IDR 26,600,000.00. The variable cost component that contributes the most is consumption and diesel fuel. The variable Cost for Caching Shellfish is shown in Table 5.

3.3.3 Production and productivity

The shellfish fishing business produces an economically important shellfish commodity. The amount of production caught by fishermen for 1 year was in the range of 158 kg - 302 kg, with an average per fisherman of 226 kg consisting of *Anadara antiquata*, *Anadara granosa,* and batik *Paratape undulatus*. The range of *Anadara antiquata* caught per year is between 40-160 kg with an average catch of 108 kg, 60-100 kg of *Anadara granosa* with an average catch of 77kg, and 20-72 kg of *Paratape undulatus* with an average catch of 40 kg. The Production and sales of shellfish are shown in Table 6.

Table 6. Production and sales of shellfish

No.	Commodities	Total Month	Total Catch	Total Trip/Month	Price (IDR)	Total
1	Blood Cockles (*Anadara antiquata*)	4	108	26	3,000	33,696,000
2	Blood Cockles (*Anadara granosa*)	4	77	26	3,000	24,024,000
3	Short Neck Clam (*Paratapes undulatus*)	2	41	26	5,000	10,660,000

Source: Primary Data (2020) currency 1 USD = 15,384 IDR

Table 7. Information data of capturing activity

No.	Description	Information
1	Fishery trip	1 day/trip
2	Number of trips per month	24 trips
3	Period effective of fishing activities	10 months
4	The benefit component in the analysis	Result selling
5	Sources of business capital (investment capital and working capital, or production costs)	Owner's equity
6	Business implementation period	5 years

Source: Author's work, 2020

Table 8. Cashflow result

No.	Indicator	Result	Conclusion
1	NPV	75,607,420	NPV Positive or > 0, the project is feasible (GO)
2	IRR	72.66%	IRR > discount rate level, project feasible (GO)
3	B/C Ratio	1.39	Gross B/C > 1, the project is feasible (GO)
4	Payback Period	1.64	Period for repayment of all cost investment for the project

Source: Author's work, 2020

Table 9. Sensitivity analysis on shellfish capturing activity

No.	Indicator	Result				Conclusion
		Operating Cost Increase 5%	Operating costs Increased 10%	Production Decrease 5%	Production Decrease 10%	
1	NPV ↘	70,817,790	66,028,360	64,403,620	53,199,820	NPV Positive or > 0, the project is feasible (GO)
2	IRR ↘	59.10%	56.91%	56.12%	50.53%	IRR > discount rate level, project feasible (GO)
3	B/C Ratio ↘	1.36	1.33	1.33	1.28	Gross B/C > 1, the project is feasible (GO)
4	Payback Period ↗	1.72	1.81	1.84	2.10	Period for repayment of all cost investment for the project

Source: Author's work, 2020

Feasibility Study

Revenue, income and business efficiency Revenue in this study is the sale of fishermen's catch to local collectors in the villages of Banjar Kemuning and Gisik Cemandi, both per activity trip and per month. Local collectors come to fishermen to carry out buying and selling transactions, so there are no marketing costs that must be incurred by fishermen to market their catch. The information data of capturing activity is shown in Table 7.

Financial feasibility analysis in this study uses discounted investment criteria with measurement indicators in the form of net present value (NPV), internal rate of return (IRR), and investment Payback Period. The result of the analysis financial is shown in Table 8.

Revenue is the amount of revenue minus the total cost of production. Revenue is also called profit or business profit and reflects the actual productivity of the business because the size of the amount of income is greatly influenced by the operational efficiency of the business, which is reflected by the production costs sacrificed by fishermen. The amount of fishermen's income each year was around IDR 11,934,000.00 (up to IDR 51,656,000.00), with an average revenue per fisherman of IDR 34,812,000.00. The clam fishing business carried out by fishermen in Sedati has been efficient. The efficiency value of fishing businesses ranges was 1.39.

Based on the calculations in table cashflow result, the NPV value for the clam fishing business was IDR 75,607,420 (Table 8). This NPV value provides an interpretation that the capture fisheries business managed by the fishing community in Sedati waters in the next 5 years will provide a profit with a present value of the NPV value so that the business is feasible to run and develop in the future. Shellfish fishing businesses are capable of producing an IRR was 72.66% this value provides an interpretation that the investment capital invested in this business was capable of generating a profit (net benefit) over the life of the business equal to the IRR value.

This study assumes that the return on investment costs in the shellfish fishing business will occur when the cumulative cash flow is equal to the present value of the investment. It is expected that all discounted investment costs can be returned before the business period ends (5 years). The shellfish fishing business that has been managed by the fishermen community of Sedati Waters for a long time is still feasible because it provides a return on investment of 2.46 to 4.13 years.

3.4 Sensitivity analysis

Sensitivity analysis is a simulation analysis where the value of the causative variables changed to find out how impactful and helpful pointing within areas where the estimated risk is high. This sensitivity analysis works to determine the extent to which the level of sensitivity of cash flows is affected by various changes from each causal variable. In this study, sensitivity analysis tests were done assuming that operating costs would go up by 5% and 10% and that production would go down by 5% and 10%. The result of sensitivity analysis of shellfish fishing is shown in Table 9.

From the results of sensitivity analysis calculations for shellfish capture in Sedati sub-district, Sidoarjo, East Java, Indonesia, it was found that by increasing operational costs by 5% and 10%, it still shows that the shellfish fishing business is still feasible to continue. Likewise, the results of the feasibility analysis with the assumption of reducing shellfish income by 5% and 10% still indicate that the shellfish fishing business is feasible to continue for the next 10 years.

4. DISCUSSION

All shellfish fishermen were male because the fishing process requires a lot of energy to get maximum results. This is in accordance with the results of research [19, 20] which states that the majority of fishermen in James Town, Ghana, and Maharashtra, India are dominated by male fishermen. This shows that the majority of fishermen in the James Town community are men. In line with previous research [21, 22] which found that men dominate in the fisheries sub-sector, the lack of involvement of women in shellfish fishing operations may be due to the existing risks. This implies that fishing for shellfish at sea is an energy-intensive job.

In general, the conditions of fishermen's houses are categorized as liveable houses because they meet building safety requirements, the minimum adequacy of the building area, and occupant health standards set by the Ministry of

Public Housing. According to Ali et al. [23], the condition of the house shows the social status of the fisherman.

The age range of fishermen aged 25-66 years can be used as an indication that respondents are at a productive age. Ali et al. [23] research revealed that the age of fishermen ranged from 10-60 years. Research conducted by Bathe et al. [20] shows that the age range of fishermen in Maharashtra, India is between 16-75 years, while the results of research conducted by Larbi Ayisi et al. [19] show the age range of fishermen in the James area Town, Ghana aged between 20-70 years. A total of 10% of fishermen are in the young age group, 60% are in the middle age group, of which 25 are represented by the elderly group and 5% are very old people. However, respondents over the age of 66 do not mean they are not productive in their businesses. Based on data from Sidoarjo [24], the majority of Indonesia's population is in the productive age range of 15-64 years.

The majority of shellfish fishermen's education is that of junior high school graduates, followed by elementary and high school graduates, and fishermen's education is still said to be low. Based on research results, it shows that all shellfish fishermen have attended school and graduated, with this condition the majority of fishermen know about technology. Education in general influences the way of thinking of respondent fishermen, where the higher the education, the faster they accept new innovations [25]. Based on the results [19], fishermen who have sufficient education will have a good impact on their ability to use hidden opportunities in the fishing industry and help them exploit new opportunities supporting technology. Fishermen with poor levels of education generally have not been exposed to much modern technology. The level of education of fishermen is directly proportional to the technology that can be produced by fishermen, so the level of productivity of their catch is also very low [26].

The average experience of being a shellfish fisherman was 19-25 years. The experience of going to sea for fishermen also has an impact on their catch. Previous research shows that as many as 14.85% have less experience from 5 years at sea, and as much 31.68% of respondents had between 5 and 10 years of experience [19]. And as much as 29.70% had 11-15 years of experience and 23.77% of respondents had more than 15 years of experience. According to Anwar and Gunawan [27], to determine whether or not someone is experienced, it can be seen from the length of time or work period that a person has taken so that he can understand the tasks of a job and has carried out the job well. Aminu and Gwarzo [22] stated that the large profits obtained by traditional fishermen depend on their level of fishing experience, the more experience they have, the better they understand the market, conditions, trends, and prices. According to Agbekpornu et al. [28], experience reduces management risk.

The RC ratio obtained from the analysis shows that the shellfish fishing business is in an efficient condition because the RC value is 1.39 (RC > 1). The results of research conducted by Manalu et al. [29] in Kutaraja, Aceh Province showed an average RC ratio of 1.7. The results of research conducted by Fauzi et al. [30] showed that the RC value in the business of catching shellfish with rake gear in Rawameneng, Subang Regency, obtained a value of 4.36. The RCR value of 4.36 gives the interpretation that every IDR 1.00 of operational costs incurred by cultivators is able to generate IDR 4.36 in revenue.

Based on the payback period calculation results, the PP value is 1.68 years, which means that the business is still feasible to run because the PP value was reached before the end of the business life, namely in the 10th year, so the business is still feasible to run in accordance with the actual conditions of investment costs, operational costs, the amount of production, and receipts. The results of research conducted by Bergamo et al. [31] on the *Perna perna* mussel cultivation business, show a payback period of 1.3. The average payback period obtained was 3.492 [20], which means the payback period is less than five years < 5 years or the payback period for moderate businesses.

Shellfish fishermen in Sedati waters generate an annual income of around IDR 11,934,000 (up to IDR 51,656,000) with an average revenue per fisherman of IDR 34,812,000. with fishermen's business efficiency values 1.39. The NPV value in the shellfish fishing business is IDR 4,699,879 up to IDR 15,614,901 with an average of IDR 11,949,879. The IRR value is 72.66% with a payback period of 1.64 years.

The sensitivity analysis of the shellfish fishing business with the assumptions of increasing production costs by 5% and 10% and reducing production by 5% and 10% in the second year, shows that the shellfish fishing business is still feasible to continue for the next 10 years.

5. CONCLUSION

Social description of shellfish fishermen aged 25 to 72 years with fishing experience of 19-53 years. In general, shellfish fishermen have formal education and also join organizations. The boat used for fishing measures 11 meters long, 1.75 meters wide, and 0.8 meters high. The boat uses a diesel engine with an engine capacity of 8-10 horsepower. The fishing gear used by shellfish fishermen is a dredge which has the local name "garuk" with dimensions of 135×40×80 cm. The hauling process is carried out while catching shellfish 100-150 times. Shellfish fishing activities are carried out 20-26 days a month. The research results show that the average investment cost for a shellfish fishing business is IDR 31,340,000, fixed costs are IDR 6,988,973 and variable costs are IDR 26,600,000. The shellfish catch obtained by fishermen in one year is around 158 kg - 302 kg, with an average per fisherman of 226 kg consisting of *Anadara antiquata*, *Anadara granosa,* and *Paratape undulatus* batik with a total of IDR 68,380,000. The Net Present Value (NPV) value for the clam fishing business was IDR 75,607,420.00, IRR 72.66%, B/C Ratio 1.39 and Payback Period was 1.64. Hydraulic dredging for clams can be highly efficient and have manageable environmental impacts; nevertheless, financial feasibility hinges on reconciling high efficiency with sustainable techniques while minimizing bycatch and damage rates.

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NOMENCLATURE

N	Population
d	Presicion Value
n	Sample area
(π)	Profit (IDR/trip)
TR (Total Revenue)	Total Revenue (IDR/trip)
TC (total cost) or c	Total production costs or operational costs (IDR/trip)
p	The price or selling price of the catch (IDR/kg)
h	Harvest or the number of catches (kg/trip)
E	Total effort or fishing effort (trip)
CFt	Cash flow per year in period t initial investment in year 0 interest rate
t	Year-th
n	Number of years
i1	1st interest rate
i2	2nd interest rate
NPV1	NPV at interest rate i1
NPV2	NPV at interest rate i2