Journal of Coastal and Ocean Sciences *e-issn: 2746-4512*
Volume 4 No. 2, May 2023: 100-54 *p-issn: 2745-4355*

Study of the Environmental Friendliness and Financial Belat in the Waters of Siak River Benayah Village Siak Regency Riau Province

Arief Setiawan[1*], Bustari[1], Arthur Brown[1]
[1]Department of Utilization of Fishery Resources, Faculty of Fisheries and Marine, Universitas Riau
Kampus Bina Widya KM. 12,5 Simpang Baru, Pekanbaru 28293
Corresponding Author: arieftanjung77@gmail.com

Received: 17 April 2023; Accepted: 30 May 2023

ABSTRACT

The waters of the Siak River in Benayah Village have several fishing gears used in fishing activities. One of the fishing gears used is belat. The belat is a type of trap and is included in the classification of other trapping devices (other traps). The purpose of this study was to determine the construction of fishing gear in general, fishing operations, and the level of environmental friendliness and the feasibility of the belat fishing business. This research was carried out in December 2022 in the waters of the Siak River. The method used in this research is the survey method. The results of the FAO withdrawal study (1995) showed that the belat in Benayah Village was classified as a very environmentally friendly fishing technology. The results of the analysis of the business of fishing for belat known (NPV) with a prediction of 10 years show that the business of catching maggots achieves a return of capital in the 1st year of IDR 1,995,283.

Keywords: Belat, Environmental friendliness, Fishing Operations, Business Feasibility

1. INTRODUCTION

Siak Regency is a Regency in Riau Province, Indonesia, with the seat of government in Siak Sri Inderapura. Siak Regency is geographically located at coordinates 1°16'30 "LU-0°20'49 "LU and 100°54'21 "BT-102°14'59 "BT. The physical geography has a coastal area that is adjacent to a number of neighbouring countries and is included in the growth triangle of Indonesia - Malaysia-Singapore (Perhubungan & Infokom, 2015).

One of the problems faced in the utilisation of fish resources is the lack of selectivity of various types of fishing gear used by fishermen. The fish needed is quite a lot and without seeing the size of the fish caught, sometimes the fish caught is not suitable (Ilyas, 2017).

Factors that affect fishermen's income are the level of profit and operational costs incurred. The more fishermen catch, the greater the income, to obtain high profits, operational costs must be minimised. Business feasibility analysis is a criterion for investment for a certain production period (Karningsih et al., 2014). The purpose of this study was to determine the construction of fishing gear in general, fishing operations, the level of environmental friendliness and the feasibility of belat fisheries

2. RESEARCH METHODS

Time and Plae

This research will be carried out in December 2022 which is located in the waters of the Siak River, precisely in Benayah Village, Bungaraya District, Siak Regency, Riau Province.

Methods

The method used in this research is the Survey method, namely went directly to the field to follow the process of catching using belat fishing gear.

Data Analysis

Eco-friendly Analysis

The Food Agriculture Organization (FAO), in 1995 established 9 criteria for environmentally friendly fishing technology (DKP, 2006). According to Wulandari (2021) the score value is obtained from the calculation using the formula:

$$X = \sum Xn : N$$

Description:

X : Fishing gear environmental friendliness score
Xn : Total number of weighted values
N : Number of respondents

Business Feasibility

To determine the business feasibility of bagan perahu fishing gear, it is necessary to analyze the business with several stages, namely determining investment (fixed capital and working capital), determining production costs consisting of fixed costs and variable costs, determining gross income, determining net income, benefit cost ratio (BCR) and determining the length of payback period. The following formula is used:

Total Production Cost (TC) = FC + VC

Description:
TC = Total Cost
FC = Fixed cost
VC = Variable cost

Depreciation Expenses (D) = $\frac{c}{n}$

Description:
D = Depreciation cost (Rp/year)
C = tool price (Rp)
n = economic life of equipment (th)

Gross Income (GI) = Y x Py

Description:
GI = Gross *Income*
Y = Fish production (kg/trip)
Py = Fish selling price (Rp/kg)

Net Income (NI) = GI – TC

Description:
NI = Net Income
GI = Gross Income
TC = Total Cost

Benefit Cost of Ratio (BCR) = $\frac{GI}{TC}$

Description:
BCR = Benefit Cost of Ratio
GI = Gross Income (gross income of fishermen per year)
TC = Total Cost

Financial Rate of Return (FRR) = $\frac{NI}{I}$X100%

Description:
FRR = Financial Rate of Return
Ni = Net Income
I = Investment

Payback Period of Capital (PPC) = $\frac{I}{NI}$X 1 year

Description:
PPC = Payback Period Of Capital
I = Fishermen's investment per year
NI = Net Income (Net income of fishermen per year)

Net Present Value (NPV)= $\sum_{t=1}^{n} = \frac{Bt-Ct}{(1+i)\,t}$

Description:
Bt = Gross *benefit* (profit) obtained in year t
Ct = *Cost* in year t
I = Prevailing interest rate
t = Current project year
n = Economic life of the project
Pv = Present Value
Df = Discount factor

The criteria are, if NPV > 0, then the investment is feasible because it is profitable, and if NPV < 0, then the investment is not feasible because it is detrimental.

Polynomial (Quadratic) Regression

The general form of the quadratic regression mathematical equation Hatidja (2013) is:

(Y) = β0 + β1. x_1 + β2. x_2 ²

Description:
y = the independent variable (the value of the variable to be predicted).
β0 = Constant
β1,β2 = regression coefficient value
x_1 , x_2 = Independent variable (Year)

Quadratic regression coefficients β1 and β2 and β0 can be calculated using the formula:

$$\beta 0 = \frac{(\sum y)-(\beta 1 x \sum x_1)-(\beta 2 x \sum x_2)}{n}$$

$$\beta 1 = \frac{[(\sum x_{2^2} x \sum x_1 y)-(\sum x_2 y x \sum x_1 x_2)]}{[(\sum x_{1^2} x \sum x_{2^2})-(\sum x_1 x x_2)^2]}$$

$$\beta_2 = \frac{[(\sum x_{1^2} x \sum x_2 y)-(\sum x_1 y x \sum x_1 x_2)]}{[(\sum x_{1^2} x \sum x_{2^2})-(\sum x_1 x x_2)^2]}.$$

3. RESULT AND DISCUSSION

General Condition of the Research Area

The area of Benayah Village is 1,550 hectares. The northern boundary of Benayah Village is bordered by Pebadaran Village, Pusako Subdistrict, Siak Regency, the southern boundary is bordered by Dosan Village, Pusako Subdistrict, Siak Regency, the eastern boundary

is bordered by Mengkapan Village, Sungai Apit Subdistrict, and the western boundary is bordered by Siak River and Bungaraya Village, Bungaraya Subdistrict, Siak Regency. People in Benayah Village earn their income from gardening and daily labour. Fishermen in Benayah Village are side fishermen, the main livelihood of the community is gardening (palm oil).

Belat Fishing Gear

The belat fishing area is an area influenced by tides. belat operations in Kampung Benayah are usually carried out on the outskirts along the Siak River waters with muddy characteristics sloping along the riverbank with mangrove trees. The water temperature during the research in the Siak River waters of Kampung Benayah ranged from 28-31°C. While the pH condition of the waters during the observation ranged from 5.2-5.8 outside the threshold, because of the many industrial and shipping activities in the waters of the Siak River Kampung Benayah, it is possible that it has reduced the acidity (pH) value at that location. The limit of acidity (pH) value has been determined by the Decree of the Minister of Environment Number 51 of 2004, which is 6.5 - 8.5. The current velocity obtained during the study ranged from 3.33-4.40 cm/s including slow current. The tides of river water in the Siak River waters of Kampung Benayah ranged from 2-3 m.

Belat fishing gear is operated with 4 sessions, the first session is the installation of fishing gear is done at around 7 am then the second session of immersing the lower ris rope into the mud is done when the water recedes around 3-4 pm, then the third session is done installing the upper ris rope to the stake this is done when the water starts to rise at 10 pm then the last session is at 5 am after the water recedes the fishermen go to the location to take the catch by hand or assisted using a scoop.

During direct observations and interviews with mullet fishermen in the waters of the Siak River in Kampung Benayah related to the catch of the belat. The fish that are often taken by mullet fishermen such as Malaysian prawns (*Macrobrachium rosenbergi*), juaro (*Pangasius polyranodon*), pantau (*Rasbora cephalotaenia)*, Asian redtail catfish (*Mystus wyckii)*, marble goby (*Oxyeleotris marmorata)*, sepengkah (*Parambassis* sp*)*, and rasau. However, the main catches of belat fishing gear are Malaysian prawns (*Macrobrachium rosenbergii*), juaro (*Pangasius polyuranodon*), pantau (*Rasbora cephalotaenia)* because they are marketable and the selling price is more expensive than other types of fish.

Environmental Friendliness of Fishing Gear

Based on the questionnaires that have been carried out during the research, the results of the answers from 9 respondents can be seen in the Table 1.

Table 1. Results of observations on the environmental friendliness of fishing gear

No.	Eco-Friendly Fishing Gear Criteria	Total Weight	Average
1	Has High Selectivity	10	1,11
2	Does not Destroy Habitat	34	3,78
3	No Harm to Fishermen	36	4,00
4	Producing Good Quality Fish	34	3,78
5	Product Does Not Harm Consumers	36	4,00
6	Low by-catch	23	2,56
7	Minimum Impact on Biodiversity	34	3,78
8	No Capture of Protected Species	36	4,00
9	Socially Accepted	36	4,00
Total Weight Score		**279**	**31,00**

Source: Survey Data, 2022

The final score obtained is 31.00, meaning that the mullet fishing gear is included in a very environmentally friendly fishing gear, this agrees with Kurohman et al. (2008) which states that the category of environmentally friendly fishing gear will be divided into 4 categories with the following range of values: 1-9 very environmentally unfriendly, 10-18 not environmentally friendly, 19-27 environmentally friendly, 28-36 very environmentally friendly.

Economic Analysis

Investment is the sum of fixed capital and working capital (Table 2). Production costs are costs that consist of fixed costs and variable costs (Table 3 dan Table 4).

Table 2. Investment costs

No.	Investment Costs	Price (IDR)	Total	Description
1.	Boat	3.000.000	1	Bought in Benayah Village
2.	Fishing Gear	4.000.000	1	Purchased in Siak City
Total Investment				7.000.000

Table 3. Depreciation cost

No.	Investment Type	Price (IDR)	Age	Depreciation Rates	Depreciation Expenses
1	Boats	3,000,000	8 Years	12,5%	IDR.375,000
2	Fishing Gear	4,000,000	6 Years	12,5%	IDR 500,000
Total Depreciation Cost					IDR 875,000

Table 4. Maintenance cost

No.	Care	Maintenance Costs	Maintenance Cost/year
1	Boats	IDR 200,000	IDR 2,400,000
2	Fishing Gear	IDR 200,000	IDR 2,400,000
Total Maintenance Cost			IDR 4,800,000

Total production costs are variable/operational costs added to fixed costs = IDR 5,675,000.

Gross Income is the multiplication of total production (catch) by the price of fish. Below is the catch from the business belat fishing during 2021-2022 (12-month period).

Table 5. Gross Income from belat catch for 1 year

No.	Season	Type of Catch	Total Catch (kg)	Fish Price (IDR/Kg)	Total (IDR)
1	Medium Season (April-September)	malaysian prawns	24.7	IDR 140,000	IDR 3,458,000
		Juaro	27.2	IDR 40,000	IDR 1,088,000
		pantau	35.1	IDR 30,000	IDR 1,053,000
		Asian redtail catfish	22.5	IDR 60,000	IDR 1,350,000
		Marble goby	10.8	IDR 40,000	IDR 432,000
		sepangkah	16.3	IDR 30,000	Rp.489,000
		Rasau	18.6	IDR 30,000	IDR 558,000
		Total	155.2		IDR 8,428,000
2	Western Season (October-December)	malaysian prawns	8.6	IDR 140,000	IDR 1,204,000
		Juaro	8.7	IDR 40,000	IDR 348,000
		pantau	10.7	IDR 30,000	IDR 321,000
		Asian redtail catfish	9.4	IDR 60,000	IDR 564,000
		Marble goby	5.5	IDR 40,000	IDR 220,000
		sepangkah	7	IDR 30,000	IDR 210,000
		Rasau	5.9	IDR 30,000	IDR 177,000
		Total	55.8		Rp.3,044,000
3	Southern Season (January-March)	malaysian prawns	10.9	IDR 140,000	IDR 1,526,000
		Juaro	12.2	IDR 40,000	IDR 488,000
		pantau	12.9	IDR 30,000	IDR 387,000
		Asian redtail catfish	8.7	IDR 60,000	IDR 522,000
		Marble goby	6.8	IDR 40,000	IDR 272,000
		sepangkah	9	IDR 30,000	IDR 270,000
		Rasau	9.1	IDR 30,000	IDR 273,000
		Total	69.6		IDR 3,838,000
		Grand Total	280.9		IDR 15,210,000

In the Table 5, it can be seen that the total catch of fish using belat fishing gear in the Siak River waters of Kampung Benayah from April 2021-May 2022 is IDR 15,210,000.

Net income, it can be seen that the total net income of the mullet catching business in one year is Rp.9,535,000/year. The total result obtained is 2.7, which means that BCR> 1, it can be concluded that this business is profitable and feasible to continue.

Total financial rate of return (FRR) is 1.4%, which means that the FRR is smaller than the interest rate at Bank Rakyat Indonesia (BRI), so the business is not profitable for investment. PPC is a comparison between the investment made and the *net income* received. It serves to measure the length of time required to return an investment from the amount of capital invested. The smaller the PPC value is 8.7 years.

NPV is the difference between the present value of benefits and the present value of costs. The following formula is used:

Table 6. NPV calculation result of belat catching business

YEAR	B-C	DF 6%	PV	NPV
0	- 7.000.000	1	- 7.000.000	- 7.000.000
1	9.535.000	0,943396226	8.995.283	1.995.283
2	11.849.701	0,88999644	10.546.192	12.541.475
3	25.427.275	0,839619283	21.349.231	33.890.705
4	50.705.223	0,792093663	40.163.286	74.053.991
5	87.183.545	0,747258173	65.148.617	139.202.608
6	152.200.615	0,70496054	107.295.428	246.498.036
7	194.491.309	0,665057114	129.347.829	375.845.865
8	265.320.752	0,627412371	166.465.522	542.311.387
9	347.600.568	0,591898464	205.744.242	748.055.629
10	441.368.258	0,558394777	246.457.730	994.513.358

The NPV prediction used by the belat fishing business is 10 years. Where from year one to year ten the benefits obtained using quadratic regression with the equation $Y = \beta 0 + \beta 1.x_1 + \beta 2.x_2{}^2$.

The following diagram shows the results of the calculation of NPV from year 1 to year 10 using the NPV formula. The results of the NPV calculation of the belat catching business can be seen in the Figure 1.

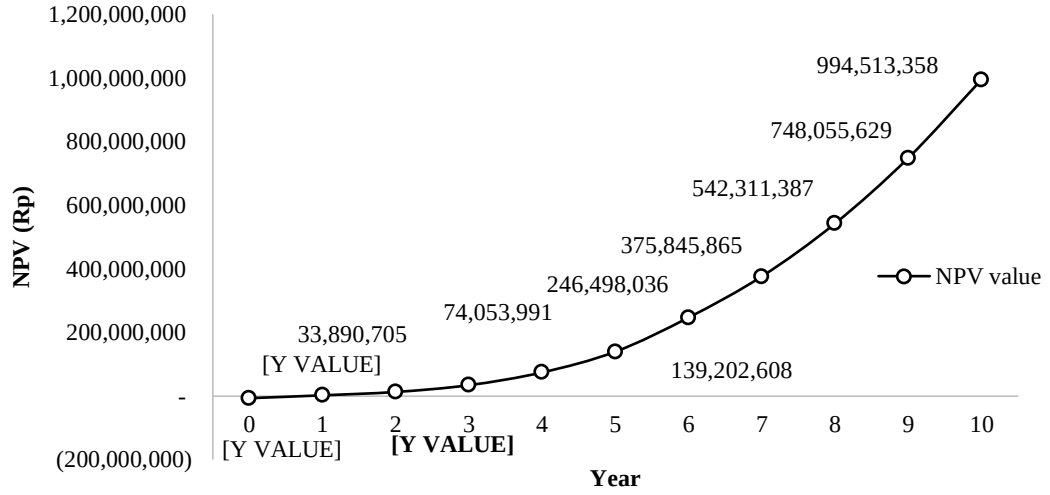

Figure 1. NPV diagram of belat catching business

Based on Figure 1 above, after calculating fixed costs, variable costs and investment and based on the catch, it shows that the mullet fishing business reaches a break-even point or return of capital in year 1, which is IDR 1,995,283

4. CONCLUSIONS

From the results of field research using FAO (1995) criteria, it turns out that the splint in Benayah Village is classified as a very environmentally friendly fishing technology with a value of 31.00. So it can be concluded that the mullet fishing gear is included in environmentally friendly fishing gear with a mesh size of 0.8 inches, From the results of the analysis of the mullet fishing gear fishery, it is known with the following assessment results: 1) BCR is 2.7, meaning that B/C > 1, so the business is profitable, and worth continuing. 2) FRR is 1.4%, meaning that FRR is less than the interest rate at Bank Rakyat Indonesia (BRI), so the business is not profitable for investment. 3) PPC is obtained 8.7, so the period required for fishermen to return the investment capital spent is 8 years and 7 months. 4) NPV with a 10-year prediction shows that the mullet catching business reaches the break-even point in year 1 at IDR 1,995,283.

Based on the results of the study, mullet fishing gear catches several types of fish so further research is needed on the design of mullet fishing gear that is more selective to the type and size of fish and fish caught there are still not reaching adulthood so there needs to be a policy regarding mullet fishing operations in order to achieve sustainable fisheries.

REFERENCES

[DKP] Dinas Perikanan dan Kelautan. (2006). *Panduan Jenis-Jenis Penangkapan Ikan Ramah Lingkungan.* PT. Bina Marina Nusantara. Jakarta.

Dinas Perhubungan & Infokom. (2015). *Kabupaten Siak.* 2015.

Hendrik. (2013). *Studi Kelayakan Proyek Perikanan*. Penerbit Faperika Unri. Pekanbaru. p 160.

Ilyas, G.N., Brown, A., Rengi, P. (2017). Studi Hasil Tangkapan Sampingan (*by catch* dan *discard*) Usaha Penangkapan Belat di Desa Kuala Merbau Kecamatan Pulau Merbau Kabupaten Kepulauan Meranti. *Jurnal Fakultas Perikanan dan Kelautan Universitas Riau.*

Karningsih, F., Rosyid, A., Wibowo, A.B. (2014). Analisis Teknis dan Finansial Usaha Perikanan Tangkap Cantrang dan Payang di Pelabuhan Perikanan Pantai Asemdoyong Kabupaten Pemalang. *Journal of Fisheries Resources Utilization*.

Malensang, J.S., Komalig, H., Hatidja, D. (2013). Pengembangan Model Regresi Polinomial Berganda Pada Kasus Data Pemasaran. *Jurnal Ilmiah Sains*, 12(2), 149-152.