

# Analysis of fish farming business in floating cages in Jembayan Village, Kutai Kartanegara Regency

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## ABSTRACT

Cage cultivation is one of the cultivation techniques that is widely practiced by people who live around the river, because cage cultivation is easy and effective to do. The description of the people in Jembayan Village who have fish cultivation in cages is quite a lot and as a source of livelihood because the resulting production is very clear to meet the needs of the people in Jembayan Village. Based on this, this study aims to determine the amount of costs, profits and business feasibility with RCR and Payback Period criteria from fish farming in cages in Jembayan Village, Kutai Kartanegara Regency. The methods used in this research are simple random sampling, analysis of production costs and profits and analysis of business feasibility. The amount of costs used in the tilapia and goldfish cultivation business amounted to Rp143,442,967, - while the amount of revenue obtained by the cultivator was Rp 260,226,000, - Thus, the total profit obtained from all cultivators was Rp 116,783,033. The total R/C Ratio value of 2 and payback period of 3 means that every rupiah of total costs incurred for the tilapia aquaculture business will generate total revenue of Rp 2,000,000, - with a payback period of investment costs of 3 years or 36 months.

## INTRODUCTION

Kutai Kartanegara Regency is one of the regencies/cities in East Kalimantan Province that has great potential for both capture fisheries and aquaculture businesses. Aquaculture production in Kutai Kartanegara Regency has increased over the past 5 years, with the highest increase occurring in 2020. During that year, there was a significant increase compared to the previous years. Aquaculture production includes marine aquaculture, ponds, tanks, floating net cages, and rice fields. Loakulu District is the district with the highest number of floating net cages, totaling 14,768 units. Therefore, the potential for aquaculture in Loakulu District, particularly with the widespread presence of these cages, makes the area highly promising for fisheries production.

One of the villages in Loa Kulu District is Jembayan Village, which has a river spanning 180 km. Local communities utilize this river for floating net cage aquaculture. Additionally, Jembayan Village's proximity to the East Kalimantan provincial capital, Samarinda City, facilitates easy marketing of the cage aquaculture products.

Calculating the costs incurred and the revenue generated is essential for assessing the feasibility of fish farming in floating net cages. Given the significant production of fish from floating net cages and the considerable number of local residents engaged in cage aquaculture in Jembayan Village, the researchers were motivated to conduct this study.

## METHODOLOGY

This research was conducted from December 2022 to June 2023, encompassing preparation, execution, data collection, data processing, discussion, and final report writing stages, all conducted in Jembayan Village, Loa Kulu District, Kutai Kartanegara Regency.

### 1. Sampling Method

According to Sugiyono (2017), a sample is a part of the population that serves as the data source in research, where the population represents all characteristics within a population. In Jembayan Village, there are 309 floating cage farmers cultivating carp (*Cyprinus carpio* L.), tilapia (*Oreochromis niloticus*), and catfish (*Pangasius* sp.) (Loa Kulu District in figures, 2022). Based on a survey, there are 12 tilapia cage farmers. This study used a census method, sampling all 12 tilapia cage farmers, following Sugiyono's (2020) recommendation that total sampling (census) is suitable when the population size is relatively small, less than 30 individuals.

### 2. Data Analysis Method

Data obtained from the research were presented in tables, then analyzed, discussed, and conclusions drawn. The data analysis methods used to address the research objectives are as follows:

#### a. Production Costs and Profits

Boediono (2002) categorizes production costs based on their relationship to output levels. Sum of fixed costs regardless of output level, calculated as:

$$\text{TFC} = \text{Total depreciation cost} + \text{Total maintenance cost}$$

Depreciation cost for equipment is calculated using the Straight Line Method:

$$\text{Dep} = (\text{P} \times \text{Q}) / \text{Useful Life}$$

$$\text{TVC} = \text{Price per unit} \times \text{Quantity}$$

$$\text{TC} = \text{TFC} + \text{TVC}$$

Total income from sales of a specific quantity of output:

$$\text{TR} = \text{Price} \times \text{Quantity}$$

Profit ( $\pi$ ): Calculated as:

$$\pi = \text{TR} - \text{TC}$$

#### b. Business Feasibility Analysis

Business analysis in fisheries involves financial examination to determine the level of success achieved during operations. With this analysis, entrepreneurs can make calculations and decisions to improve and enhance profitability in their operations (C.B. Supartomo et al., 2014).

Return on Cost Ratio (R/C Ratio): Used to assess whether a business venture is worth developing, calculated as:

$$\text{RCR} = \text{TR} / \text{TC}$$

Criteria:

- RCR > 1 indicates profitability
- RCR < 1 indicates unprofitability
- RCR = 1 indicates breakeven

Payback Period Analysis: The period required to recover initial investment expenditures using cash flows, compared against the asset's lifespan in the production capital:

$$\text{Payback Period} = (\text{Total investment}) / \text{Profit}$$

## RESULT AND DISCUSSION

### A. General Situation of the Research Location

Loa Kulu District remains a tropical region with two seasons: rainy and dry. The district experiences relatively high rainfall on average, contributing to fertile land and advancing agricultural sectors. From December to May, rainfall and rainy days are quite frequent.

The population in Loa Kulu District has been increasing annually, evident from the previous count in 2019 which totaled 52,376. Among all villages, Jembayan Village is the most populous with 11,270 inhabitants, comprising 25,276 males and 27,460 females. Population numbers fluctuate significantly due to factors such as births, deaths, and migration in and out of the area. In Jembayan Village, the population numbers 1,087 males and 811 females in the central area, while in Jembayan Dalam, there are 1,070 males and 1,036 females (Loa Kulu District in Figures, 2022).

Education serves as a vital indicator of regional development. In Loa Kulu District, there are 29 Public Elementary Schools (SDN) spread across all villages. There are 9 Public Junior High Schools (SMP) and 3 Private Junior High Schools (SMP). As for Senior High Schools (SMA), there are only 2 Public Schools and 3 Private Schools in the district (Loa Kulu District in Figures, 2022). Regarding religion, the majority of Loa Kulu District residents are Muslims, with a minority practicing Protestantism and Catholicism. There are 59 mosques, 96 prayer rooms, and 5 small mosques available for worship (Loa Kulu District in Figures, 2022).

### B. Respondent Identity

Observations conducted previously in the field identified 12 respondents whose primary livelihood is tilapia (*Oreochromis niloticus*) fish farming. Respondents' age categories in this study range from 28 to 59 years old, with:

- 1 respondent (8%) aged 28-37 years,
- 7 respondents (58%) aged 38-47 years,
- 4 respondents (33%) aged 48-59 years.

The majority of respondents fall within the productive age range of 38 to 47 years. Educationally, most respondents have completed Junior High School (SMP), totaling 5 individuals (42%), while the least represented educational level is D3 Diploma, with 1 respondent (8%). Ethnicity data collected from respondents shows that the majority are Javanese (67%), followed by Banjar (25%), and Kutai (8%).

Regarding family responsibilities, most respondents in Jembayan Village have 4 dependents, accounting for 7 respondents (58%). The least common number of dependents is 1, represented by 1 respondent (8%). In terms of business tenure, tilapia farming (*Oreochromis niloticus*) has been practiced for varying durations among respondents, with the majority (42%) having engaged in the business for 1 to 5 years. The least common duration is over 20 years, represented by 1 individual (8%).

### C. Overview of Tilapia Fish Farming Business

Tilapia (*Oreochromis niloticus*) fish farming in floating net cages in Jembayan Village is the primary occupation for villagers. The tilapia species cultivated are grown for approximately 3 months per harvest cycle in the floating net cages. The fish reach a size of 4 cm within 4 to 5 months. The tropical climate significantly influences the natural conditions in Jembayan Village, where rainfall occurs consistently throughout the year, contributing to a humid tropical environment.

The floating net cages consist of nets, frames or rafts, and floats. All materials must meet specific criteria: strength, lightweight, resistance to pests, flexibility, non-injurious to fish, cost-effectiveness, and availability. In Jembayan Village, the floating net cages are constructed using resak wood and galvanized materials. The cages measure 6 x 6 x 2.5 meters with a depth of 2.5 meters in the water. Mesh sizes are adjusted to prevent fish escape, using fine mesh nets (mosquito nets) for tilapia to ensure they remain inside.

Tilapia fingerlings are sourced from Bangkinang and must meet maturity and size criteria to minimize mortality rates. Fingerlings used in Jembayan Village are typically 4-5 cm in size, with an average stocking density of 3,000 fingerlings per cage measuring 6x6x2.5 meters.

Tilapia fish farming in floating net cages requires a considerable amount of time. The fish reach harvest size (approximately 6 to 7 pieces per kg) after 4 to 5 months of growth. Harvesting involves preparing all necessary components such as plastic bags, rubber bands, oxygen tanks, dip nets, and scales.

### D. Details of Tilapia Farming Business Costs

#### 1. Investment Costs

Table 1. Breakdown of Investment Costs

Description (unit)	Investment Costs	
	Amount (Rp)	Percentage (%)
Cage Frame	113743500	33
Cage Nets	148400000	43
Guard House	22116000	6
Rumah Jaga	40200000	12
Scoop	6640000	2
Basin	5160000	2
Scale	5600000	2
Total	341,859,500	100
Average	28,488,291	

Total investment costs required for tilapia (*Oreochromis niloticus*) farming in cages in Jembayan Village range from Rp 5,160,000 to Rp 148,400,000. The total investment cost incurred is Rp 341,859,500, with an average per respondent of Rp 28,488,292. The highest percentage of investment cost is for cage nets at 43%, while the lowest is for scoops, basins, and scales at 2%. The economic life span in the above table ranges from 1 year to 20 years.

## 2. Depreciation Costs

Total depreciation costs incurred by all respondents during the production cycle amount to Rp 13,842,967, with an average expenditure of Rp 1,153,581 per production cycle per respondent. The largest percentage of depreciation costs is for cage nets at 43%, while the smallest percentage is 2% for scoops, basins, and scales. Details can be seen in the following table:

Table 2. Depreciation Cost Breakdown

Description (unit)	Amount (Rp)	Depreciation			
		Economic Life (Years)	Residual (Rp)	Depreciation (Rp)	Percentage (%)
Cage Frame	113743500	20	5687175	1350704	33
Cage Nets	148400000	4	7420000	8811250	43
Guard House	22116000	4	1105800	1313138	6
Rumah Jaga	40200000	20	2010000	477375	12
Scoop	6640000	5	332000	315400	2
Basin	5160000	5	258000	245100	2
Scale	5600000	1	280000	1330000	2
Jumlah	341,859,500	59	17,092,975	13,842,967	100
Rata-rata	28,488,291		1,424,415	1,153,581	

## 3. Operational and Maintenance Costs

Operational and maintenance costs are divided into fixed and variable costs. Variable costs in this study include expenses for seedlings, feed, and medicine, while fixed costs include depreciation costs on investment equipment, electricity, working capital, and other costs. The details are shown in the table below:

Table 3. Breakdown of Variable Costs

No.	Description (unit)	Variable Costs		
		Amount (Rp/Production)	Percentage (%)	Average (Rp/org)
1	Seedlings	17100000	15	1425000
2	Feed	94050000	83	7837500
3	Medicine	2400000	2	200000
Total		113,550,000	100	9,462,500

Based on the table above, the total variable costs for all respondents in tilapia farming in Jembayan Village range from Rp 113,550,000 to Rp 2,400,000. The majority of variable costs are dominated by feed at a percentage of 83%, while medicine expenditure represents the smallest percentage at 2%. Thus, the average variable cost per respondent is Rp 9,462,500 per production cycle. Detailed analysis of variable cost calculations can be seen in the table below:

Table 4. Breakdown of Fixed Costs

Fixed Costs				
No.	Description (unit)	Amount (Rp)	Percentage (%)	Average (Rp)
1	Cage Frame depreciation	1350704	5	112559
2	Cage Nets depreciation	8811250	29	734271
3	Cage Nets depreciation	1313138	4	109428
4	Guard House depreciation	477375	2	39781
5	Scoop depreciation	315400	1	26283
6	Basin depreciation	245100	1	20425
7	Scale depreciation	1330000	4	110833
8	Electricity	1500000	5	125000
9	Salary	11900000	40	1983333
10	Maintenance Costs	2650000	9	220833
Total		29,892,967	100	3,482,747

Total fixed costs for all respondents in tilapia farming in Jembayan Village range from Rp 245,100 to Rp 11,900,000. The majority of fixed costs are dominated by salaries at a percentage of 40%, while basin depreciation and scoop depreciation represent the smallest percentage at 1%. Thus, the average fixed cost incurred by respondents is Rp 3,482,747 per production cycle or four months. The total operational and maintenance costs can be seen in the table below:

Table 5. Total Costs

Variable Cost	Rp 113.550.000
Fixed Cost	Rp 29.892.967
Total Cost	Rp 143.442.967

#### 4. Production and Price

Production is the activity to produce or increase the utility of a product. Based on research on 12 respondents, it is known that the total production of tilapia (*Oreochromis niloticus*) farming in Jembayan Village is 9,638 kg per production cycle. The average production per respondent of tilapia farmers in Jembayan Village is 803 kg, with a selling price of Rp 27,000 per kg.

#### 5. Revenue and Profit

The average revenue generated per respondent of tilapia farmers in Jembayan Village is Rp 260,226,000. On average, farmers earn approximately Rp 21,685,500 per production cycle. Each farmer can sell approximately 803 kg of tilapia. The total profit earned by all farmers is Rp 116,783,033, with an average profit of approximately Rp 9,731,919. Details of the profit table are as follows:

Table 8. Profit

Total Revenue	Rp 260,226,000
Total Costs	Rp 143,442,967
Profit	Rp 116,783,033
Average	Rp 9,731,919

## E. Analysis of Tilapia Farming Business

### 1. Revenue to Cost Ratio (R/C Ratio)

Research results show that the total revenue obtained from tilapia (*Oreochromis niloticus*) farming activities by 12 farmers in Jembayan Village amounts to Rp 260,226,000, or an average revenue of Rp 21,685,500 per production cycle. Meanwhile, the total costs incurred by respondents amount to Rp 143,442,967, or an average total cost of Rp 11,953,580 per production cycle. The Revenue Cost Ratio or R/C Ratio ranges from 1.3 to 2.9, with an average R/C Ratio obtained from respondents indicating 2. This means that with  $R/C > 2$ , tilapia farming conducted by farmers in Jembayan Village is feasible. Therefore, every rupiah spent on total costs for tilapia farming will yield Rp 2.000.000.

### 2. Payback Period

The Payback Period is an investment assessment used to analyze the length of time for return on investment in a business. The Payback Period is obtained by dividing investment costs by profit or net benefits obtained. The average Payback Period value for tilapia farming in Jembayan Village is 3 years or 36 months. Thus, the return period for investment costs is 3 years or 36 months, equivalent to 1,080 days.

## CONCLUSION

1. The total expenses incurred in tilapia farming amount to Rp 143,442,967, while the total revenue received by the farmers is Rp 260,226,000. Thus, the total profit gained by all farmers is Rp 116,783,033.
2. The total R/C Ratio value of 2 and a payback period of 3 mean that every rupiah spent on total expenses for tilapia farming will yield total revenue of Rp 2,000,000. The payback period for the investment cost is 3 years or 36 months.

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