

# Profit and loss analysis of Fish Hatchery Operations at the Brackish and Marine Water Hatchery Center, Sebulu Ulu Village, Kutai Kartanegara Regency

Chyntia Ayu Matofani | Muhammad Syafril\* | Qoriah Saleha

Department of Social Economic, Faculty of Fisheries and Marine Science, Mulawarman University  
Jl. Gunung Tabur No. 1. Kampus Gn. Kelua Samarinda 76123

\*E-mail: [syafril@fpik.unmul.ac.id](mailto:syafril@fpik.unmul.ac.id)

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## ABSTRACT

*This study aims to analyze the profit and loss of fish hatchery operations at the Regional Technical Implementation Unit (UPTD) for Brackish and Marine Water Hatchery, located in Sebulu Ulu Village, Sebulu Subdistrict, Kutai Kartanegara Regency, as well as to identify the driving and inhibiting factors of the business. The research was conducted from November 2023 to December 2024 at the UPTD Brackish and Marine Water Hatchery Center in Sebulu Ulu Village. The study utilized both primary and secondary data, with sampling carried out using a census method involving 6 respondents. The results showed that the hatchery operations, which focus on four fish commodities—Nile tilapia (*Oreochromis niloticus*), catfish (*Pangasius sp.*), African catfish (*Clarias sp.*), and climbing perch (*Anabas testudineus*)—incurred a Total Cost (TC) of IDR 309,644,087 per year, while generating a Total Revenue (TR) of IDR 253,156,140 per year. Consequently, the business experienced a loss of IDR 56,487,947 per year. The identified driving factors include a strategic location, adequate water resources, availability of electricity, high market demand for fish seed, and government support. In contrast, the inhibiting factors are limited labor availability, inadequate facilities, climatic factors, and the quality of broodstock.*

## INTRODUCTION

Kutai Kartanegara Regency, with a land area of 27,263.10 km<sup>2</sup> and approximately 4,097 km<sup>2</sup> of water area, is administratively divided into 18 subdistricts, one of which is Sebulu Subdistrict. Sebulu covers an area of 859.50 km<sup>2</sup> and has a population of 42,870, with a population density of 10 people per km<sup>2</sup>. Geographically, Sebulu is a lowland area without mountains, characterized only by small hills. The Mahakam River flows through the subdistrict and remains the primary water transportation route for the local community (Central Bureau of Statistics of Sebulu Subdistrict, 2021).

To support the fisheries sector in Sebulu, the government established a Fish Hatchery Center (Balai Benih Ikan/BBI) in 1979, funded through the Transmigration Development Area Project in collaboration with the German government until 1986. In 2018, the status of BBI Sebulu was upgraded to a Regional Technical Implementation Unit for Brackish and Marine Water Hatchery (UPTD SPAPAL). UPTD SPAPAL Sebulu later partnered with UPTD SPAPAL Muara Badak, leading to its current name: UPTD SPAPAL Muara Badak–Sebulu, East Kalimantan Province.

The fish hatchery business at UPTD SPAPAL Sebulu has been managed by the East Kalimantan Provincial Government for many years, focusing on the cultivation of Nile tilapia (*Oreochromis niloticus*), catfish (*Pangasius sp.*), African catfish (*Clarias sp.*), and climbing perch (*Anabas testudineus*). This hatchery operation has absorbed significant fisheries development funds, including both capital investment and operational costs. While the hatchery yields financial returns through the sale of fish seed, a comprehensive analysis, particularly of the profit and loss has not previously been conducted. Therefore, this study aims to assess the profit and loss status of the fish hatchery operations at UPTD SPAPAL Muara Badak–Sebulu, East Kalimantan Province. Additionally, the study identifies the key driving and inhibiting factors affecting the hatchery business.

## METHODOLOGY

This research was conducted from November 2023 to December 2024. The study site was the Technical Implementation Unit for Freshwater Aquaculture Development (UPTD SPAPAL) in Sebulu Ulu Subdistrict, Kutai Kartanegara Regency. The fundamental method employed in this study was a case study approach. According to Raco et al. (2010), a case study is a research method that involves an in-depth investigation of a particular case within a defined setting.

The study utilized both primary and secondary data. Primary data served as the main data source and were obtained through direct interviews with the head and staff of UPTD SPAPAL Sebulu, using a structured questionnaire developed based on the research objectives. Secondary data were used as supporting information and were collected from governmental institutions such as the Central Statistics Agency (BPS), the Department of Fisheries, the Village Office, UPTD SPAPAL, as well as from previous research studies, including undergraduate theses and peer-reviewed journal articles relevant to the research objectives.

This study adopted a survey research method. As stated by Sugiyono (2013) and cited by Purnamasari and Syafril (2022), the survey method involves the use of questionnaires as a primary research tool. It can be applied to both large and small populations, although the data analyzed typically come from a sample drawn from the population. This method enables the identification of relative frequencies, distributions, and relationships among sociological and psychological variables.

The primary data required for this research included respondent identity and variables related to profit and loss (such as investment costs, production costs, production volume, and selling price), as well as driving and inhibiting factors. Secondary data included information on regional conditions, one-year management performance of UPTD SPAPAL's hatchery operations, the status of the fisheries sector in Sebulu Subdistrict and village, and previous studies on freshwater fish hatchery enterprises.

### Sampling Method

The selection of respondents in this study was conducted using a census method. A census study is one in which the entire population group is taken as the sample, and a structured questionnaire is used as the primary tool for data collection to obtain specific information (Usman et al., 2005).

The respondents consisted of employees at UPTD SPAPAL Sebulu, totaling six individuals. Therefore, the entire population was included in the sample, making the sampling technique a full census. This approach is in line with Sugiyono (2014), who states that if the population size is less than 30 individuals, then all members of the population should be taken as the sample.

## Profit and Loss Analysis

The purpose of the profit and loss analysis is to assess the net income earned by the aquaculture business during a single production cycle. In the context of aquaculture business feasibility, this is commonly referred to as profit analysis.

### 1. Production Costs

According to Puspita et al. (2022), the variables involved in analyzing production costs in aquaculture businesses consist of fixed costs, variable costs, and total costs, where total costs are the sum of fixed and variable costs. This is supported by Pracoyo et al. (2006), who define total cost as the overall production cost incurred by producers, including both fixed and variable components. Case et al. (2006) further explain that fixed inputs refer to the total fixed costs, while variable inputs are the costs incurred by the business to produce a given output within a certain period. Based on these definitions, the total cost can be formulated as follows:

$$TC=FC+VC$$

Where:

TC : Total production cost (IDR/year)  
 FC : Fixed cost (IDR/year)  
 VC : Variable cost (IDR/year)

### 2. Revenue

Revenue is defined as the product of the total volume of fish produced and the unit selling price. The revenue figure still includes the production costs incurred. Mesra (2016) states that revenue represents the total income received from the sale of products at a given price. As noted by Soekartawi (2006), as cited by Syafril and Fahrizal (2021), the revenue of an aquaculture business can be calculated using the following formula:

$$TR=P\times Q$$

Where:

TR : Total revenue (IDR/year)  
 P : Selling price per unit (IDR/fish)  
 Q : Number of units sold (fish/year)

### 3. Profit

According to Pribadi et al. (2022), profit is the difference between the revenue generated from the sale of aquaculture products and the production costs borne by the business operator (e.g., fishers, farmers, or processors). Soekartawi (2003), as cited by Yolanda et al. (2025), explains that profit can be systematically calculated using the following formula:

$$\pi=TR-TC$$

Where:

$\Pi$  : Net profit (IDR/year)  
 TR : Total revenue (IDR/year)  
 TC : Total cost (IDR/year)

## RESULT AND DISCUSSION

### Investment Costs

Investment costs refer to expenditures incurred prior to the operation of the aquaculture hatchery business at UPTD SPAPAL Sebulu. These costs cover the procurement of equipment and infrastructure necessary for freshwater fish hatchery operations. The total investment cost incurred for the purchase of equipment and facilities amounts to IDR 986,044,416, with asset lifespans ranging between 1 and 13 years.

A detailed breakdown of the investment costs for the hatchery business at UPTD SPAPAL Sebulu is presented in Table 1 below.

Table 1. Investment Costs at UPTD SPAPAL Sebulu

No.	Equipment Type	Quantity	Unit	Unit Price (IDR)	Total Cost (IDR)
1	Office Building	1	Unit	14,937,142	14,937,142
2	Spawning Facility	1	Unit	295,948,000	295,948,000
3	Water Source Development Facility	1	Unit	19,950,000	19,950,000
4	Employee Dormitory	4	Units	44,298,000	177,192,000
5	Feed Storage Building	1	Unit	58,338,498	58,338,498
6	Equipment Storage Building	1	Unit	62,321,000	62,321,000
7	Reservoir	1	Unit	74,560,000	74,560,000
8	Ponds	18	Units	6,098,932	109,780,776
9	Aquariums	60	Units	995,000	59,700,000
10	Large Circular Tanks	5	Units	160,000	800,000
11	Rectangular Fiber Tanks	4	Units	9,925,000	39,700,000
12	Water Reservoirs	3	Units	2,200,000	6,600,000
13	Generator Set	1	Unit	12,950,000	12,950,000
14	Diesel Water Pump	2	Units	5,460,000	10,920,000
15	Alkon Water Pump	2	Units	2,500,000	5,000,000
16	Oxygen Cylinder	2	Cyl.	127,000	254,000
17	Cart	2	Units	500,000	1,000,000
18	Digital Scale	1	Unit	500,000	500,000
19	3-Inch Spiral Hose	3	Units	450,000	1,350,000
20	100m Aerator Hose	3	Rolls	150,000	450,000
21	Tarpaulins	5	Pieces	98,000	490,000
22	Dippers	25	Units	5,000	125,000
23	Buckets	20	Units	50,000	1,000,000
24	Larvae Nets	9	Pieces	105,000	945,000
25	Broodstock Nets	4	Pieces	20,000	80,000
26	Transparent Hose	3	Rolls	300,000	900,000
27	Aerator	1	Unit	3,750,000	3,750,000
28	Waring (Netting)	3	Rolls	120,000	360,000
29	Basins	20	Pieces	20,000	400,000
30	3-Inch PVC Pipe	4	Pieces	368,000	1,472,000

No.	Equipment Type	Quantity	Unit	Unit Price (IDR)	Total Cost (IDR)
31	Filter Pipes	6	Pieces	519,500	3,117,000
32	Mobile Phone	1	Unit	3,900,000	3,900,000
33	Two-Wheeled Vehicle	1	Unit	17,254,000	17,254,000
Total					986,044,416

### Operational Costs

Operational costs refer to the expenditures incurred during the production or operational phase of the fish hatchery activities at UPTD SPAPAL Sebulu. These expenses consist of fixed costs and variable costs. A detailed breakdown of the operational costs for the hatchery business is presented in Table 2 below.

Table 2. Operational Costs of UPTD SPAPAL Sebulu

#### A. Fixed Costs

No.	Item Description	Unit	Quantity	Unit Price (IDR)	Total Cost (IDR/Year)
1	Electricity	IDR/Month	1	1,637,425	19,649,100
2	Clean Water (PLN)	IDR/Month	1	321,850	3,862,200
3	Non-Civil Servant Labor	Person/Month	3	5,400,000	64,800,000
4	Wi-Fi	IDR/Month	1	342,825	4,113,900
5	Pond Maintenance	IDR/4 Months	1	2,100,000	6,300,000
6	Motorbike Maintenance	IDR/2 Months	1	150,000	900,000
7	Depreciation Cost	IDR	1	88,614,887	88,614,887
Subtotal A					188,240,087

#### B. Variable Costs

No.	Item Description	Unit	Quantity	Unit Price (IDR)	Total Cost (IDR/Year)
1	Feed F0	kg	920	26,000	23,920,000
2	Feed F1000	kg	60	26,000	1,560,000
3	Feed F888	kg	930	26,000	24,180,000
4	Broodstock Feed	kg	1,500	18,000	27,000,000
5	Nile Tilapia Broodstock	Fish	220	60,000	13,200,000
6	Pangasius Broodstock	Fish	32	150,000	4,800,000
7	Papuyu Broodstock	Fish	240	20,000	4,800,000
8	Catfish Broodstock	Fish	38	33,000	1,254,000
9	Lime	kg	50	6,000	300,000
10	Manure Fertilizer	kg	60	3,500	210,000
11	Urea Fertilizer	kg	60	12,000	720,000
12	Ovaprim	mL	7.2	832,500	5,994,000
13	Pesticides (HSG)	mL	7.2	800,000	5,760,000
14	Generator Oil	Liter	39	50,000	1,950,000
15	Pertalite Fuel	Liter	92	15,000	1,380,000
16	Styrofoam Boxes	Unit	48	74,500	3,576,000

No.	Item Description	Unit	Quantity	Unit Price (IDR)	Total Cost (IDR/Year)
17	Packing Plastic	Meter	150	3,000	450,000
18	Rubber Bands	Pack	14	25,000	350,000
Subtotal B					121,404,000
Total A + B       309,644,087					

As shown in Table 2, the total operational costs incurred by UPTD SPAPAL Sebulu amount to IDR 309,644,087 per year, comprising both fixed and variable cost components.

## Revenue

The hatchery production activities at UPTD SPAPAL are conducted six times annually. Each fish commodity undergoes one production cycle per month; however, production may be halted for several months due to factors such as inadequate facilities, broodstock that have not reached optimal maturity for spawning, and unpredictable weather conditions that hinder the production process.

A detailed breakdown of the revenue generated from hatchery operations at UPTD SPAPAL Sebulu is presented in Table 3.

Table 3. Revenue Generated by UPTD SPAPAL Sebulu

No.	Fish Species	Net Production Volume (individuals/year)	Unit Price (Rp)	Annual Revenue (Rp)
1	Nile Tilapia	181,129	200	36,225,720
2	Pangasius Catfish	158,407	600	95,044,320
3	Clarias Catfish	161,417	350	56,495,880
4	Papuyu (Anabas)	186,829	350	65,390,220
Total		687,782		253,156,140

The total annual revenue of UPTD SPAPAL Sebulu amounts to Rp 253,156,140 (see Table 3). The volume and unit price of fish fry sales vary by species. The average mortality rate during hatchery operations for Nile tilapia (*Oreochromis niloticus*), Pangasius catfish (*Pangasius* spp.), Clarias catfish (*Clarias* spp.), and Papuyu (*Anabas testudineus*) is approximately 10%. This is consistent with the findings of Ismail et al. (2016), which reported a 10% mortality rate in Nile tilapia hatchery operations at the Fish Hatchery Center (BBI) in Tenggarang, Bondowoso.

## Profit and Loss Analysis

Profit refers to the net income received by the hatchery management, calculated as the difference between total revenue and total operational costs (Rp/year). A detailed profit and loss summary for hatchery operations at UPTD SPAPAL Sebulu is provided in Table 4.

Table 4. Profit and Loss of UPTD SPAPAL Sebulu

No.	Description	Amount (Rp/year)
1	Total Revenue	253,156,140
2	Total Operational Cost	309,644,087
Net Profit/Loss		(56,487,947)

As shown in Table 4, the total annual revenue from hatchery operations (Rp 253,156,140) is lower than the total operational costs (Rp 309,644,087). According to Gupito et al. (2014), a business is considered profitable if its revenue exceeds its operational expenses. The results indicate that hatchery operations at

UPTD SPAPAL Sebulu incurred an annual loss of Rp 56,487,947, suggesting that the current operation is not yet economically viable.

This significant annual loss reflects the current limitations of the hatchery's economic performance. It is important to note that UPTD SPAPAL Sebulu primarily serves a public service function, focusing on supporting local fish farmers rather than achieving financial gain. The center prioritizes the production of high-quality fry, which necessitates investment in high-grade broodstock and feed. Based on interviews, several factors contributing to this loss were identified:

Elevated mortality rates are a major contributing factor to financial losses. These are attributed to poor water quality and inefficient feed management practices, including inappropriate or excessive feed application, which can lead to stress and death among fry. The limited number of production cycles per year is influenced by environmental factors such as extreme weather, heavy rainfall, and droughts. These conditions directly affect the success of hatchery operations. Additionally, inadequate infrastructure and limited human resources further hinder efficient fry production. A mismatch between revenue and operational costs reflects that both the production volume and sale prices are insufficient to cover the overall expenses incurred. Fry are sold at relatively low prices (Rp 200–600 per individual), which do not offset the high production costs. As a result, total revenue remains insufficient to break even. The higher operational costs relative to revenue suggest inefficiencies in the utilization of production inputs in fry hatchery activities. In other words, UPTD SPAPAL Sebulu currently bears a heavy production cost burden.

UPTD SPAPAL Sebulu is a strategic fisheries production asset that supports the fishery development program launched by the Provincial Government of East Kalimantan. This program aims to increase freshwater aquaculture production by local communities. The unit serves as a supplier of high-quality fish and shrimp fry, supporting the grow-out phase of aquaculture operations in Sebulu and surrounding areas. This facility addresses the scarcity of standardized, high-quality fry. Syafril (2009) found that the development of fishery production facilities in Paser Regency, such as cold storage units, has yielded several benefits: (1) increased economic added value for capture fisheries commodities enjoyed by local fishery entrepreneurs; (2) stabilization of fishery commodity prices, particularly within the Paser region; and (3) contribution to employment generation by absorbing labor in various roles, including traders, workers, and staff members.

### **Supporting and Inhibiting Factors**

According to Sondang (1995), supporting factors are those that foster the development or advancement of an activity, business, or production process carried out by individuals or organizations. Inhibiting factors, as defined by Kristianda (2020), are elements that obstruct or delay the achievement of desired goals or objectives.

Based on the research, the supporting factors for fish hatchery operations at UPTD SPAPAL Sebulu include:

1. A strategic location conducive to production and marketing activities;
2. Access to a main natural water source, namely the Mahakam River basin (DAS Mahakam);
3. Stable demand for fish fry within and beyond Sebulu District;
4. Financial support from the East Kalimantan Provincial Government and technical assistance to ensure the sustainability of hatchery operations.

Conversely, the inhibiting factors identified are:

1. Limited workforce involvement in hatchery operations;
2. Inadequate infrastructure and facilities;
3. Climatic conditions that affect fry production processes;
4. Broodstock that have not reached optimal gonadal maturity for spawning.

## CONCLUSION

The fish hatchery business at UPTD SPAPAL Sebulu incurred an annual production cost of IDR 309,644,087, while the total annual revenue amounted to IDR 253,156,140. As the production costs exceeded the revenue, the enterprise experienced a financial loss of IDR 56,487,947 per year.

The hatchery operations at UPTD SPAPAL Sebulu are not financially profitable; thus, from a theoretical economic standpoint, the enterprise is not viable for development or expansion.

Despite operating at a loss, UPTD SPAPAL Sebulu continues to function due to support from the East Kalimantan Provincial Government's Department of Marine Affairs and Fisheries. Its primary objective is not profit generation but rather serving the local community by providing high-quality fish seed stock to support aquaculture activities.

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