
ANALYSIS OF INCOME FROM MUJAIR FISH (*Oreochromis massambicus*) CULTIVATION IN TARPON PONDS (Biofloc) (A Case Study of Biofloc Business in Matungkas Village, Minut Regency)

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ABSTRACT

KEYWORDS

Mujair Fish, Cultivation,
Tarpon Ponds

This research investigates the economic viability of tilapia fish farming utilizing the pond liner method (biofloc) in Matungkas Village, Dimembe Subdistrict, North Minahasa Regency, Indonesia. With the agricultural, animal husbandry, and fisheries sectors playing pivotal roles in supporting Indonesia's economy, the study focuses on the freshwater fisheries potential, particularly tilapia, in North Minahasa. The research delves into the innovative use of biofloc technology, analyzing its benefits such as minimal water and land requirements, efficient feed utilization, and waste conversion into fish feed. Mr. Ronny Lensun's tilapia fish farming business, employing the pond liner method, is examined. Despite the region's rich natural resources, the income calculation method used by the owner is identified as simplistic. The study employs quantitative methods to perform a comprehensive income analysis, considering revenue, production costs, and financial metrics. Results demonstrate the profitability of Mr. Ronny Lensun's business, with a break-even point at a selling price of IDR 1,167,807.9 and a production volume of 33.36 kg. The Revenue Cost Ratio (R/C) is calculated at 1.85, indicating the business's sustainability and profitability. The literature review encompasses the biofloc technology and business analysis, emphasizing its advantages in water quality maintenance, organic matter decomposition, and feed efficiency. The study contributes to understanding the economic feasibility of tilapia fish farming with the biofloc method, suggesting potential for wider adoption and development in the region.

INTRODUCTION

In Indonesia, particularly in the fields of Agriculture, Animal Husbandry, and Fisheries, play a crucial role in supporting the economic sector. The Indonesian population is closely tied to daily fish consumption, prompting fishermen and entrepreneurs to engage in these fields using new technologies and more efficient methods in terms of quality and price. North Minahasa Regency is one area blessed with extraordinary natural resources, offering numerous opportunities and potentials that are continually maximized and developed. One of the potentials in North Minahasa Regency is the freshwater fisheries, especially the tilapia fish. According to data from the Central Statistics Agency (BPS) in 2021, the production of freshwater fish, including tilapia, in North Minahasa reached 36,808.75 tons. The consumption rate of tilapia in North Minahasa, according to the Ministry of Maritime Affairs and Fisheries statistics in 2023, averages 0.079% of the total tilapia consumption in the region.

Tilapia can be processed into various food products due to its delicious meat, and it is readily available. Many entrepreneurs have entered the market to promote this freshwater fish. With the high demand for this type of fish, many fishermen and entrepreneurs in the region are

innovating and adopting new methods to facilitate tilapia cultivation (Abraham et al., 2013). One such innovation used by some fishermen and entrepreneurs is tilapia cultivation using the pond liner method (biofloc) (Rochaeni & Humaerah, n.d.).

Biofloc Technology (BFT) has several advantages, including the ability to cultivate fish with minimal water and land requirements, and sometimes without changing water, as well as high feed efficiency (Avnimelech, 2009). In this technology, the waste from feed and fish excretion, which would normally become pollution, is converted into feed for fish growth, reducing the amount of feed required. The balance between beneficial bacteria, feed, carbon supply, and strong aeration maintains good water quality. The floccules composed of various organic materials, plankton, and bacteria can be used as feed for fish (Emerenciano et al., 2013).

In the North Sulawesi Province, specifically in the Matungkas Village, North Minahasa, there is an entrepreneur who specializes in freshwater fish farming, particularly tilapia, using the pond liner method. This method is still uncommon in North Minahasa Regency. The owner, Mr. Ronny Lensun, has been running this business for approximately three years. The marketing process is conducted directly from the cultivation site.

After an initial observation, the issue identified by the author is that the income calculation for this business, undertaken by the owner, still uses a simple method, such as calculating income and expenses. With a proper income analysis, a business can clearly understand the production and selling prices, which significantly impact the entrepreneur's income (Irwandi et al., 2015).

Based on the above background, the author aims to analyze the income of tilapia fish farming using the pond liner method (biofloc) in Matungkas Village, Dimembe Subdistrict, North Minahasa Regency. The research objectives are to gain a clear and detailed understanding of tilapia fish farming using the pond liner method.

Literature Review

1. Pond Liner Method (Biofloc)

According to Suprpto and Samtafsir (2013:17), biofloc comes from the words "bios," meaning life, and "floc," meaning clump. Biofloc refers to a collection of various organisms (bacteria, fungi, algae, protozoa, worms, etc.) that are grouped together in clumps. This technology initially adopted the principles of biological waste treatment (activated sludge) involving microorganism activities, such as bacteria.

Organic matter is stirred and aerated. Suspended organic matter is broken down by aerobic heterotrophic bacteria into inorganic compounds. If organic matter settles without stirring, anaerobic conditions occur, stimulating anaerobic bacteria to break down organic matter into simpler organic substances and toxic compounds such as ammonia, nitrite, H₂S, and methane. Sedimented waste must be removed promptly to prevent problems (Rahman, 2018).

In the biofloc technology concept, inorganic nitrogen compounds, especially toxic ammonia, are recycled into microbial cell protein that can be consumed by detritus-eating organisms such as tilapia, shrimp, vaname shrimp, catfish, and tilapia. The process involves stirring and aerating organic matter in the pond to dissolve it in the water, promoting the development of aerobic heterotrophic bacteria on organic particles. These bacteria break down organic matter, absorb minerals such as ammonia, phosphate, and other nutrients in the water. As a result, water quality improves, and organic matter is recycled into enriched detritus (Suprpto & Samtafsir, 2013).

According to Suprpto and Samtafsir (2013:19-20), the functions of biofloc in the pond include:

- Decomposing organic matter and removing toxic compounds.
- Stabilizing and improving water quality.
- Converting ammonia into cell protein by adding carbohydrates.
- Suppressing pathogenic organisms.
- Serving as additional food for fish

2. Business Analysis

The business analysis used in this research includes an analysis of revenue, costs, and business income. It also includes Break Even Point (BEP) and Revenue Cost Ratio (R/C).

1. Cost Structure of the Business

The cost structure involved in the business includes total fixed costs, total variable costs, and total costs.

- 1) *Total Fixed Cost* (TFC), The fixed cost is an expenditure incurred by the company but does not affect production or output. Fixed costs include land tax, depreciation of equipment and buildings, and other costs (Shinta, 2011). The depreciation cost of equipment is calculated using the following formula:

$$D = \frac{p - s}{N}$$

(sumber : Rahman, 2018)

Explanation:

D = Depreciation Cost (Rp/Production Period)

P = Equipment Price (Rp)

S = Residual Value (Rp)

N = Economic Life (Years)

- 2) *Total Variable Cost* (TVC), or total variable cost, is the cost that can change according to the quantity of production or output. The larger the output, the higher the variable cost used (Shinta, 2011).
- 3) *Total Cost* (TC), or total cost, is the sum of fixed costs and variable costs incurred in the production process of a business (Zaman et al., 2020). Total Cost can be formulated as follows:

$$TC = FC + VC$$

Explanation:

TC = Total Cost (Rp)

FC = Fixed Cost (Rp)

VC = Variable Cost (Rp)

2. Revenue

Business revenue is the amount of money obtained from the sale of business output. Business revenue can be calculated from the quantity of production multiplied by the selling price (Shinta, 2011).

$$TR = Y_i \cdot P_{y_i}$$

Explanation:

TR = Total Revenue (Rp/Kg)

Yi = Quantity of output (Kg)

Pyi = Price of output (Rp/Kg)

3. Income

Income is the result of the difference between the revenue from the sale of business output and the total of all costs used in the business production process (Shinta, 2011). If income is positive, it is called profit, but if income is negative, it is called a loss. The following is the formula used to obtain business income:

$$\pi = TR - TC$$

Explanation:

π = Income (Rp)

TR = Total Revenue (Rp)

TC = Total Cost (Rp)

4. Break Even Point (BEP)

Break Even Point is an analysis technique used to study the relationship between fixed costs, variable costs, profit, and the volume of activities. In profit planning, this analysis is an approach based on the relationship between costs and revenue (Shinta, 2011).

- a) BEP price, which shows the BEP condition in total revenue with the quantity of products. The BEP price is formulated as follows:

$$BEP = \frac{FC}{1 - \frac{VC}{TR}}$$

Explanation:

BEP = Break Even Point (Rp)

FC = Fixed Cost (Rp)

VC = Variable Cost (Rp)

TR = Total Revenue (Rp)

- b) BEP unit, to show the minimum number of products produced so that the business does not experience a loss. The formula for BEP unit is:

$$BEP = \frac{FC}{P - VC \text{ unit}}$$

Explanation:

BEP = Break Even Point (BEP)

FC = Fixed Cost (Rp)

P = Price/Selling Price (Rp)

VC unit = Variable Cost Unit (Rp)

5. Revenue Cost Ratio (R/C)

Revenue Cost Ratio (R/C) is used in determining the level of business efficiency. R/C Ratio is the ratio of revenue obtained to the costs incurred. If the obtained R/C Ratio > 1 , the business makes a profit. Conversely, if R/C Ratio < 1 , the business incurs a loss, and if R/C Ratio = 1, the business is in the BEP condition (Prafiadi & Maturahmah, 2020). The formula for the R/C Ratio is as follows:

$$R/C \text{ Ratio} = \frac{P \cdot Q}{TFC + TVC}$$

Explanation:

R/C Ratio = Revenue Cost Ratio

Q = Quantity (Kg)

P = Price/Selling Price (Rp)

TFC = Total Fixed Cost (Rp)

TVC = Total Variable Cost (Rp)

RESEARCH METHOD

This research was conducted in Matungkas Village, Dimembe District, North Minahasa Regency, North Sulawesi, on the owner of Tilapia (*Oreochromis massambicus*) Fish Farm using the Biofloc Pond System. The study was carried out for 4 months, from February to May 2023. This research used a quantitative method aimed at clearly describing the characteristics of income from the tilapia fish farming with the biofloc pond system. The research is quantitative because the collected data are analyzed based on numerical values. The data collection methods used were primary and secondary data collection. Primary data were obtained through direct interviews with tilapia cultivators using the biofloc pond system, while secondary data were collected by gathering records, books, journals, and articles related to the research.

The variables used in the study of Income Analysis of Tilapia (*Oreochromis massambicus*) Fish Farming with the Biofloc Pond System in Matungkas. The data analysis used in this study is quantitative data analysis with the aim of examining the income from tilapia fish farming with the biofloc pond system owned by Mr. Ronny Lensun in Matungkas Village, Dimembe District, North Minahasa Regency, North Sulawesi, using revenue, production costs, and income analysis.

RESULTS AND DISCUSSION

1. Description of Mr. Ronny Lensun's Tilapia Fish Farming Business with Tarpaulin Ponds

This business is located in Matungkas Village, Dimembe District, North Minahasa Regency. The area is situated at an elevation of 141 meters above sea level, with a flat terrain and fertile soil, precisely at the foot of Mount Klabat.

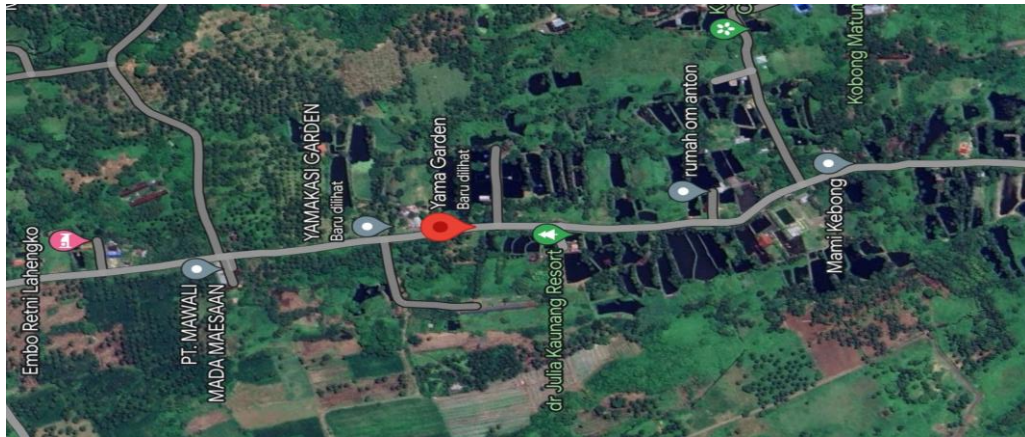


Figure 1. Location of Mr. Ronny Lensun's Tilapia Fish Farming Business

Here is the business profile:

1. **Ownership:** Family
2. **Business Type:** Individual
3. **Business Type:** Tilapia Fish Farming with Tarpaulin Ponds
4. **Land Area:** Diameter of 3 x 8 meters, with 8 ponds, each having a volume of 10,000 liters

Mr. Ronny Lensun has been running this business for approximately 3 years, and he sells the produce directly from the cultivation site to individual consumers. According to the owner, this method is more profitable than conventional methods. The advantages of the biofloc method include:

- a. High fish survival rate, reaching 90%.
- b. Feed-to-weight ratio of 1.03, indicating cost savings on feed.
- c. High stocking density, up to 100 fish/m³, indicating that it does not require extensive land for fish farming.
- d. Fast fish growth.
- e. Short cultivation period, approximately three months.
- f. Water efficiency as water does not need frequent replacement.
- g. Pond water does not have a foul odor due to bacteria consuming fish waste (Siswoyo et al., 2021).

The business was initially established with assistance from the Tatelu Freshwater Fish Cultivation Fisheries Office to manage the tilapia fish farming in tarpaulin ponds. All necessary equipment at the beginning of the business was provided by the Tatelu Freshwater Fish Cultivation Fisheries Office. Mr. Ronny Lensun operates this business on family-owned land. The tilapia fish farming business in tarpaulin ponds uses 8 ponds, each capable of holding approximately 750-1000 tilapia fingerlings. The size of the tilapia fingerlings typically used by the owner is 8-10 cm per fish.

In the tilapia fish farming period from February to May 2023, the owner only utilized 4 ponds, with each pond holding 62 kilograms of tilapia. The selling price set by the owner is Rp. 35,000 per kilogram of tilapia.

2. Income Analysis

In the income calculation of the tilapia fish farming business in tarpaulin ponds, several data collected during interviews and observations at the research location were used. Here are some data findings:

1. The land is owned by the family.
2. The initial capital for the business, consisting of all the equipment needed in the tarpaulin pond method, was provided by the Tatelu Freshwater Fish Cultivation Fisheries Office.
3. The total land area is a diameter of 3 x 8 meters, with 8 tarpaulin ponds, each holding a volume of 1000ml of water.
4. The business is directly managed by the owner, so there is no hired labor.
5. The total production of tilapia using 4 ponds during the February-May 2023 period is 248 kg.
6. The selling price set is Rp 35,000 per kg of tilapia

i. Total Production Costs Analysis

1. Total Fixed Cost (TFC)

The fixed cost analysis of this business is as follows:

Table 1. Total Fixed Costs of Mr. Ronny Lensun's tilapia business

Types of Cost	Total Cost (Rp)
Equipment Depreciation Cost	Rp 472.500
Electricity Cost	Rp 150.000
Total	Rp 622.500

Based on Table 1 shows that the total fixed costs (TFC) incurred amounted to IDR 622,500., obtained from the sum of equipment depreciation costs of IDR 472,500., and electricity costs of IDR 150,000., during the cultivation period of March-May 2023.

2. Total Variable Cost (TVC)

The variable cost analysis of this business is as follows:

Table 2. Total Variable Costs of Mr. Ronny Lensun's Tilapia Business

Types of Cost	Total Cost (Rp)
Pakan	Rp 2.936.000
Bibit	Rp 600.000
Formula floc	Rp 517.200
Total	Rp 4.053.200

Table 2 shows that the total variable cost (TVC) is IDR 4,053,200., with the following details:

1. The seeds used are 8-10 cm in size with a price / head of Rp 500., the number of seeds used is 1200 seedlings to 300 heads / pond. The number of seeds is IDR 600,000., obtained from the number of seeds used multiplied by the price of seedlings.
2. The feed used amounts to 8 sacks. The price of 1 bag of feed is IDR 367,000., the total cost for feed in 4 ponds used is 2,936,000.,
3. Which is included in the Floc Formula:

Table 3. Total Cost of Floc Formula used in undertaking

Types of Cost	Number of units	Total (Rp)
Garam	32 Kg	Rp 480.000

Molase	1 Kg	Rp 22.000
Probiotik	100 MI	Rp 10.000
Kapur Dolomit	1 Kg	Rp 5.200
Total		Rp 517.200

3. Total Cost Analysis

The total cost analysis of this business for the period March-May 2023 is as follows:

Table 4. Total Cost of Mr. Ronny Lensun's tilapia business

Types of Cost	Total Cost (Rp)
Total Fixed Costs	Rp 622.500
Total Variable Costs	Rp 4.053.200
Total	Rp 4.675.700

Based on the table above, it shows that the total cost of this business is IDR 4,675,700 obtained from the total fixed costs of IDR 622,500 added with a total variable cost of IDR 4,053,200.

ii. Revenue

Revenue Analysis is the result obtained from tarpaulin pond tilapia production activities. The total Revenue for the period March-May 2023 obtained by the owner is as follows:

Table 5. Total Business Revenue of Mr. Ronny Lensun

Revenue	Average Production	Selling Price (Rp)
tilapia fish	248 Kg (744 tilapia fish)	Rp 35.000
Total Revenue		Rp. 8.680.000

The revenue obtained from tarpaulin pond tilapia fish farming by the owner during a period of 3 months was Rp 8,680,000 with an average production of 248Kg and the number sold was 744 tilapia fish.

iii. Income

The revenue analysis used in this study is the gain from the difference in total revenue (TR) minus the total production cost (TC) of this business. Income for 1 period of cultivation in this business can be seen in the table below:

Table 6. Business Income of Tilapia Fish Mr. Ronny Lensun

Description	Total (Rp)
Total Revenue (TR)	Rp 8.680.000
Total Costs (TC)	Rp 4.675.700
Income	Rp 4.004.300

Based on the table above, it shows that the revenue obtained from this business during the period of February-May 2023 is IDR 4,004,300., which is obtained from total receipts (TR) of IDR 8,680,000 minus production costs (TC) of IDR 4,675,700.

iv. Break Even Point - BEP

Break Even Point (BEP) is an analysis to see the break-even point of this business . The results of BEP can be seen in the table below:

Table 7. Break Even Point of Mr. Ronny Lensun's Tilapia Fish Business

Component	Total (Rp/Kg)	Cost/Unit
Production Result	248	
Selling price	35.000	
Fixed Cost	622.500	
Variable Cost	4.053.200	16.343
Total Cost	4.675.700	
Revenue	8.680.000	
Income	4.004.300	
BEP Price (Rp)	1.167.807,9	
BEP Unit (Kg)	33,36	

Table 7. shows that to make a profit in the business, it must obtain revenues of more than Rp 1,167,807.9, - with a total production of more than 33.36 kg. From the results of the revenue obtained, the results have reached the break-even point and it can be said that the owner has benefited.

v. Revenue Cost Ratio (R/C)

The analysis of *revenue cost ratio* can be seen in the following table :

Table 8. Revenue Cost Ratio of Tilapia Fish Business Mr. Ronny Lensun

Analysis	Total (Rp)
Total Costs	Rp 4.675.700
Revenue	Rp 8.680.000
Rasio R/C	1.85

Based on the table above, the revenue cost ratio (*R/C ratio*) of the business obtained from total revenue of IDR 8,680,000 divided by total cost of IDR 4,675,700 is 1.85. The calculation above shows that the *revenue cost ratio* obtained is more than one so that it can be concluded that the owner of the tarpaulin pond tilapia farming business is worthy to continue the business and develop his business.

CONCLUSION

Based on the results of research conducted on the tarpaulin pond tilapia business in Matungkas Village, North Minahasa Regency, the conclusions that can be obtained are as follows: 1. Income obtained during the tarpaulin pond tilapia farming period of March-May 2023 with total revenues of Rp. 8,680,000., from the total production of tilapia fish which is 248 kg and incurs a total production cost of Rp. 4,675,700., 2. BEP (*Break Even Point*) in the tarpaulin pond tilapia farming business, namely for BEP prices of IDR 1,167,807.9, - and BEP units of 33.36 kg. With a total production of 248 kg, the result has reached the break-even point. The R/C ratio (*Revenue Cost Ratio*) that has been obtained from the tarpaulin pond tilapia farming business obtaining results of more than 1 for every Rp 1 spent will provide a profit of 1.85 so it can be said that this business is worth continuing and developing.

Based on the results of research and conclusions, suggestions that can be given are: 1. It is good for business owners to increase the amount of production by utilizing 8 tarpaulin ponds filled according to the capacity of seedlings in one cultivation period with the aim of increasing

more income. 2. Expand marketing again to increase the number of consumers. With the existence of technology now, it is expected that owners can take advantage of social media and existing applications in order to increase the amount of revenue and income.

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