

Feasibility analysis of Tilapia (*Oreochromis niloticus*) fish cultivation business at Fish Makmur MRS

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Abstract: This research aims to determine the feasibility of cultivating tilapia in the "Prosperous Fish MRS" business in Baju Bodoa Village, Maros Baru District, Maros Regency. This research uses business feasibility study analysis on financial and non-financial aspects. The type of research used is descriptive research. Qualitative and quantitative data were obtained using observation, interviews, and documentation techniques. In the financial aspect, business analysis is used, namely profit analysis, income and cost balance analysis (Revenue Cost Ratio), Payback Period (PP) analysis, Break Even Point (BEP) analysis, and Net Present Value (NPV). The results of non-financial analysis research show that: Legal aspects are still weak and not yet feasible, market and marketing aspects are adequate, human resource aspects are adequate, environmental aspects are adequate, and technological aspects are feasible. The financial aspect shows that it is feasible to cultivate because the profit obtained is IDR 28,290,000, - Revenue Cost Ratio is 1.9, the Payback Period is 7 months 11 days, the Sales Break Point of IDR 4,166,667 with an even Point of 132.28 kg of fish indigo, and the Net Present Value calculation is IDR 25,873,830.

Keywords: Business Feasibility; Tilapia; Financial; Non-Financial; Net Present Value

INTRODUCTION

Tilapia or its Latin name *Oreochromis niloticus* (Budiardi et al., 2022) is an aquatic product that is well-known worldwide and has become a trend on the global market. The product is traded in fresh or frozen form, some in fillet form. World consumer demand for tilapia is increasing from year to year. The US National Oceanic and Atmospheric Administration (NOAA) noted that in 2020 the United States imported 190,453 tons of tilapia worth \$615 million. These figures show that tilapia imports increased by 10% in volume and 2.3% in value compared to 2019. This fact shows that the prospects for tilapia exports are getting better. As the second largest producer of tilapia in the world, Indonesia has exported 12,29,000 tonnes of fish worth US\$ 78.44 million (BPS, 2020). According to Suhana (2021), in 2019 154 countries imported tilapia fish products. However, Indonesia has only been able to enter the export market of 16 countries.

According to the Central Statistic Agency (BPS), Indonesia exported 9,179 tons of tilapia in 2017 with a total of USD 57.43 million (Gusnawan et al., 2020). According to the 2019 KKP figures, national tilapia production increased from 1,114,156 tonnes in 2016 to 1,265,201 tonnes in 2017. In addition, tilapia production in 2018 fell 7.5% from the previous year to 1,169,144.54 tons. Meanwhile, the production target for 2021 is 1,719,000 tons (KKP, 2019).



Based on the information above, the growth of tilapia cultivation has bright business opportunities to improve national food security, the economy, and community welfare.

Tilapia rearing is carried out in a variety of different cultivation systems (earthen ponds, concrete ponds, jetted ponds, and floating nets), using a variety of management strategies (extensive, semi-intensive or intensive, polyculture, sex and mixed) and different environments (fresh water and brackish water) (Altun et al., 2006). The freshwater fish known as tilapia (*Oreochromis niloticus*) is easy to care for, grows quickly, is disease-free, and hatches quickly (Iskandar et al. 2021). Tilapia is quite well known among consumers, because it has delicious and thick flesh, soft texture, high nutritional content (Yudaswara et al., 2018), and affordable price, so it has very good economic prospects. Therefore, many people are interested in cultivating it.

The goal of a business is to obtain maximum profits by using efficient production factors. To increase business profits, it is necessary to know how much costs are incurred and the profits obtained, whether the business is worth developing or not. To find out whether a business is worth it or not, a business feasibility study is needed. Previous studies on the feasibility of tilapia fishing using floating net cages have been carried out (Marini et al., 2018); Firmansyah, T. W. (2018); Yadus, N. S. (2020); (Wahyuni et al., 2020); (Sarawit, U., 2021); (Yusuf et al., 2022); (Winarni et al., 2022), shows that the business is financially feasible. Apart from using cages, some raise tilapia using tarpaulin ponds (Sjahrudin et al., 2022) and earthen ponds (Hasan, Afifa et al., 2020).

So far, research on tilapia fish using floating net cages has only looked at the aspect of financial feasibility. Research on tilapia cultivation using concrete ponds and non-financial feasibility has never been carried out. The novelty of this research lies in the study of the financial and non-financial feasibility of tilapia using concrete ponds. Therefore, it is important to carry out this research to provide information about the feasibility of a tilapia fish business in terms of financial and non-financial aspects in the "Fish Makmur MRS" business.

METHODS

Location and Time of Research

This research was carried out at Fish Makmur Mrs which is located in Baju Bodoa Village, Maros Baru District, Maros Regency. The location of this research was determined deliberately (purposive method) because Fish Makmur MRS is an individual business that cultivates tilapia fish and is still a beginner. After all, it has only been established for approximately 2 years. Apart from that, the Fish Makmur Mrs tilapia fish business is located close to the city and is a research object that is in line with the research objectives. The research period was carried out from September to November 2023.

Types and Sources of Data

The research method used in this research is the case study method. Primary data is that which comes from the original or first source. Primary data was obtained from interviews with Fish Makmur business owner Mrs. This secondary data is data that supports primary data needs such as; books, literature, and information related to research.

Data Analysis

The feasibility study for tilapia farming was analyzed using financial and non-financial aspects.

Non-financial feasibility aspects

Testing of non-financial factors includes 1) legal issues, which concern the business entity's ability to comply with the terms and conditions of permits, and 2) environmental factors related to the company's positive and negative impacts on the environment. 3) factors related to markets and marketing, such as supply, demand, price, and distribution channel analysis; 4) Aspects related to management and human resources, which verify the availability of human resources; and 5) Technical and technological factors, which verify technological availability and technical readiness.

Aspects of financial feasibility

Quantitative methods in assessing the feasibility of tilapia farming are used to assess financial aspects such as revenue, investment costs, and operational costs. The analysis carried out in business analysis is profit analysis, revenue and cost balance analysis (Revenue Cost Ratio), Payback Period (PP), Break Event Point (BEP), and Net Present Value (NPV) analysis. Formula used:

Analysis of Revenue, costs, and profits

In the short term, production costs can be grouped into fixed costs and non-fixed costs or variable costs (Rita Hanafie, 2010). Fixed costs are all types of costs whose size does not depend on the size of production. Meanwhile, the size of variable costs is directly related to the size of production. The total amount of costs incurred by a company to produce goods/services is called total costs. The formula used:

$$TC = FC + VC$$

Information:

TC = *Total Cost*

FC = *Fixed Cost*

VC = *Variable Cost*

To find out the total revenue and profits obtained by the Fish Makmur MRS tilapia business, the formula is used, namely:

$$TR = P \times Q$$

Information:

TR = *Total Revenue*

P = *Price*

Q = *Quantity*

Meanwhile, to find profits, use the formula:

$$\Pi = TR - TC$$

Information:

Π = *Profit*

TR = *Total Revenue*

TC = *Total Cost*

Meanwhile, efficiency is the comparison between revenue and costs where revenue is greater than total costs. According to Hernando (2003), to find out the R/C ratio obtained by the Fish Makmur MRS tilapia business:

R/C ratio

Information:

R/C ratio = Comparison between revenue and costs

TR = *Total Revenue (Rp)*

TC = Total/Total Cost (Rp)

Decision:

R/C ratio >1 = the business is economically efficient or profitable.

R/C ratio <1 = the business is economically inefficient or unprofitable.

R/C = 1 = Means the business breaks even

Payback Period

The payback Period is the period or number of years required to return the money that has been invested from the annual cash inflow generated by the investment results of a project or business undertaken (Jumingan, 2009). The formula used in PP calculations is as follows:

$$PP = \frac{\text{Investasi}}{\text{Kas Bersih/Tahun}} \times 1 \text{ Tahun}$$

Break Even Point

Break Even Point (BEP) shows the minimum production each year at the level of no profit and no loss. The formula used to determine the amount of BEP is:

Price Break Even Point

$$BEP \text{ Harga} = \frac{TC}{TP}$$

TC = Total Cost (Rp)

TP = Total Production (kg)

Production Breakeven Point

$$BEP \text{ Produksi} = \frac{TC}{P}$$

TC = Total Cost)

P = Price (Rp/kg)

Net Present Value

NPV, also known as net present value, is obtained from the difference between the present value of the investment and the present value of net cash receipts in the future (Kasmir & Jakfar, 2012). According to Jumingan (2009), the NPV calculation formula is:

$$NPV = \sum_{t=0}^n \frac{B_t - C_t}{(1+i)^t}$$

Project or business proposals will be accepted if the NPV value is more than 0 (NPV>0), if the NPV calculation result is below zero (NPV<0) then the proposed project or business will not be accepted and if the NPV value is equal to 0 (NPV=0) then the company is in BEP (break-even point)

RESULTS AND DISCUSSION

Fish Makmur MRS Business Performance

The initial formation of the business came from the business owner's hobby because of his interest in tilapia fish. Tilapia fish cultivation began in early March 2020 and was named "Fish Makmur MRS", after the name of the business owner, namely Pak Makmur. The business is in

Baju Bodoa Village, Maros Baru District, Maros Regency. This location is very strategic because it is close to the city center so it is easy to access. Fish Makmur MRS business has a pond and aquarium. The pond is for tilapia fish hatchery, enlargement, and broodstock pond for tilapia. The characteristics of tilapia ponds can be seen in the Table 1.

Table 1. Characteristics of tilapia cultivation fish ponds at Fish Makmur MRS in Baju Bodoa Village, Maros Baru District.

Number	Pool Type	Pool Size	Pool Depth
1.	Nursery pond round	Diameter 3m	1m
2.	Enlargement box pond	2m x 1m	0,5m
3.	Broodstock ponds	1m x 1,65m	1,2m
4.	Rearing ponds	4m x 1,65m	1,2m
5.	Hatchery ponds	5m x 30 cm	25cm
6.	Aquarium ponds	1m x 30 cm	30cm

Source: Primary data, processed 2023

Tilapia is a type of freshwater fish and its consumption level is quite high. The delicious taste of the meat and the relatively cheap price make it popular with the Indonesian people so many business opportunities have emerged related to tilapia cultivation as a way to earn income considering the increasing needs of the community (Marhawati, 2023).

Tilapia hatchery is an activity carried out while rearing fish fry from larvae to a certain size until they are ready to be raised. Based on the results of an interview with the owner of the Fish Makmur Mrs business, tilapia fish seeds were initially purchased at a fish shop in Marusu District, Maros Regency. These tilapia fish seeds are kept for the enlargement process. The large fish are then moved to a broodstock pond measuring 1m x 1.65 m. The fish hatchery process runs naturally without any additional activities. Fish eggs that have hatched into larvae will swim to the edge of the pond so they can be collected using a filter. The larvae are then placed in existing breeding ponds or aquariums (Pantaw et al., 2017). Each broodstock weighs 500 grams and can produce as many as 5000 larvae. The number of broodstock is only 35, but it can produce a lot of larvae.

Tilapia Fish Rearing

Producing tilapia fish that are ready to sell is the goal of tilapia farming. High protein pellets are given to tilapia fry that have been transferred to rearing ponds so they can grow quickly. The tilapia cultivation pond measures 4 x 1.65 meters with a depth of 1.2 meters. Tilapia receives food twice a day, morning and evening. Feeding is appropriate for the fish species because small and large fish require varied feed due to differences in protein content. This tilapia fish takes four months to grow from seed size until it is suitable for consumption (Wowor et al., 2017). Tilapia fish production after harvest can reach 3000 fish.

Non-Financial Eligibility

Legal Aspects

Analyzing legal considerations in business feasibility studies to determine the company's ability to fulfill applicable legal requirements. The research findings are from the interview with the Fish Makmur MRS business owner who stated that there was no Taxpayer Identification Number (NPWP), location utilization permit, or Fisheries Business License (SIUP) because this business was still newly developed. Fulfilling the criteria for a business establishment permit is very important and must be considered to minimize the risks that arise, such as the company being closed by the authorities. This result is consistent with Purwana's (2016) statement that

a business is considered sustainable as long as it complies with all relevant regulations and documents. If it has not been fulfilled, then it is currently considered unworkable and there will be losses caused due to permit and legal issues.

Market and Marketing Aspects

Analysis of market aspects is the first and main variable that needs to be studied in discussing feasibility studies, if there is no market in the business unit then investment decisions need to be reviewed (Purwana, 2016). Business feasibility from the market aspect of the Fish Makmur Mrs business includes: supply and demand, pricing, and marketing channels. The demand for tilapia in Maros Regency is quite high, both from the surrounding area and from outside the city. Demand for tilapia will increase, especially during the rainy season because the price of sea fish soars, so consumers switch to freshwater fish. In marketing tilapia, Mr. Makmur uses social media such as Facebook, Instagram, and TikTok. So marketing has utilized technology as an information medium.

The price offered to collecting traders or middlemen is IDR 28,000 per kilogram. This is different from the price given to direct consumers of IDR 35,000 per kilogram. The prices offered are competitive because the business location is close to urban areas, so transportation access is easier. Business owners say that prices tend to increase during the month of Ramadan due to high consumer demand for tilapia.

Marketing channels carry out the task of moving goods from producers to consumers. Fishery commodities that have experienced improvements in time, place, and new forms can meet consumer needs, if there has been a transfer of property rights from producers or marketing institutions to consumers (Sudiyono, 2002).

Tilapia marketing goes through various channels and stages before reaching the final consumer. The research results show that tilapia marketing as a whole has two marketing chains.

Channel I: Fish Makmur MRS —————> Collector Trader's —————> Consumer (85%)
Channel II: Fish Makmur MRS —————> Consumer (15%).

In marketing channel 1, Fish Makmur MRS sells tilapia fish to collecting traders, where the collecting traders come directly to the business location. This channel is most widely used by the Fish Makmur MRS business because they already know each other. Collecting traders make purchases using motorbikes or pick-up trucks to transport tilapia to traditional markets. The average number of tilapia fish purchased was 637.5 kg for IDR 28,000 per kilogram. Meanwhile, in marketing channel II, Fish Makmur MRS sells tilapia to consumers around the business location, as well as via Facebook. Consumer purchases an average of 113 kg for IDR 35,000 per kilogram.

Environmental Aspects

Every production activity can have an impact on the environment, such as tilapia farming activities. Tilapia cultivation has many positive impacts because it uses a biofloc system. Biofloc technology can minimize cultivation waste, reduce water use, and be efficient on high-density land. Using a biofloc system can help decompose waste in sewers because biofloc contains decomposing bacteria so it is environmentally friendly. The function of biofloc is to improve water quality by converting nitrogen waste into flocculate (additional food for fish being raised) in an aquaponic system (Hutagalung et al., 2021).

The environmentally friendly aquaponic biofloc system can reduce water replacement due to the water purification cycle originating from leftover feed and harmful gas pollutants,

according to research by Sastro (2015), Asni et al (2020) and (Dewi & Ulfah, 2022). A healthy environment is an environment that does not pollute the environment or cause environmental damage. These results support the opinion (Suliyanto, 2010) that a business is said to be environmentally viable if environmental conditions have positive environmental impacts that are greater than negative environmental impacts and do not result in environmental damage.

Technological Aspects

The technology used in cultivating tilapia is an aerator machine, and marketing tilapia using information technology in the form of social media. An aerator is a machine to produces air bubbles or in other words, produces oxygen for the survival of tilapia fish. Without an aerator, the fish can become stressed or die. When the power goes out, the battery has been prepared to be used for the aerator machine. The use of social media such as Facebook and Instagram are used in marketing promotions as well as communication media carried out by fellow cultivator communities.

Human Resources Aspect

The influence of the quality of human resources greatly influences the achievement of a business. Humans as subjects are important because humans are subjects who always play a dominant and active role in all business activities. The owner of the Fish Makmur MRS business has the ability and experience to cultivate tilapia by carrying out several experiments regarding good tilapia cultivation. This experience was learned via YouTube and being active in the fish lover community. Human resources in this case are the procurement of labor or employees which has not been carried out because there are still family members who can help in managing the business.

Financial Feasibility

Business Feasibility Analysis

To determine the feasibility analysis of a business from a financial aspect, it looks at initial capital or investment costs, fixed costs, variable costs, revenue costs, and other costs. Some entrepreneurs consider this aspect to be the most important aspect to analyze because it describes problems related to company performance.

Investment Capital

Capital is a very important aspect to prepare in starting and running a business. Capital costs are costs that must be incurred or incurred by a company to obtain capital to be used in company investment (Sulindawati et al., 2016). The initial investment that was spent on Fish Makmur Mrs's business was IDR 17,325,000. For details, see the Table 2.

Table 2. Average Initial Investment Capital in the Tilapia Fish Business "Fish Makmur MRS"

No.	Investment Capital	Number of units	Value
1.	Concrete pools	3	7.500.000
2.	Tarpaulin pools	2	1.500.000
3.	Aerator machines	3	4.050.000
4.	Big scoops	1	50.000
5.	Small scoops	1	25.000
6.	Scales	2	100.000
7.	Buckets	3	150.000
8.	Big basins	3	600.000
9.	Potential broodstock		1.750.000

Source: Primary data, processed 2023

Cost, Revenue and Profit Analysis

In general, net income or profit is the difference between gross income and total expenses (Marhawati, 2019). Farming income is the multiplication of production and selling prices, while the costs incurred by farmers are fixed costs and variable costs. The sum of fixed costs and variable costs is total costs (Soekartawi et al., 1994).

So the income or profit of a fishing business is the difference between revenue and all costs incurred by the producer. The level of revenue is influenced by the selling price and production quantity. The revenues, costs, and profits of the tilapia cultivation business can be seen in Table 3.

Table 3. Revenue, Costs, and Profits of Tilapia Cultivation at "Fish Makmur MRS"

No.	Description	Value
1.	Revenue	
	a. Production of Tilapia (kg)	1.800
	b. Price (Rp/kg)	31.500
	Amount received (TR)	56.700.000
2.	Fixed Costs	
	a. Electricity token	1.800.000
	b. Equipment Depreciation	200.000
	c. Property taxes	250.000
	Amount of fixed cost	2.250.000
3.	Biaya variabel	
	a. Seedlings	2.100.000
	b. Fish food	22.860.000
	c. Medicine	1.200.000
	Amount of variable costs	26.160.000
4.	Total costs (TC)(2 + 3)	28.410.000
5.	Profit (1- 4)	28.290.000
6.	R/C	1,9

Source: Primary data, processed 2023

The income obtained from Fish Makmur Mrs's tilapia cultivation business was IDR 56,700,000,- with total production costs incurred of IDR 28,410,000,-, so the profit obtained was IDR 28,290,000,-. The balance between revenue and costs is Rp. 1.9, which is greater than 1. This shows that Mrs. Fish Makmur's business is worth pursuing because the cost of one rupiah can generate revenues of 1.9 rupiahs.

Financial Analysis

Analysis of the feasibility of tilapia cultivation is carried out to financially assess whether a project or business is deemed feasible to implement or not. In financial analysis, various investment criteria are measured, namely: Payback Period, Break Event Point, and Net Present Value.

Payback Period Analysis

The payback period (PP) is the time required by a business to return the amount of funds that have been invested in the business (Suyanto, 2004). If the return on investment is faster, then the business is better and worth continuing. The results of the Payback Period analysis for tilapia cultivation at Fish Makmur Mrs are 0.61 years. This shows that the average time needed to return the funds invested is 7 months and 11 days.

Break Even Point Analysis

The break-even point or break-even point, which is often called the Break Even Point (BEP), is a measuring tool to determine how many sales do not result in a profit or loss. The feasibility of a tilapia fish business can be continued if it provides economic value or is profitable. BEP is the result of sales value where the entrepreneur does not make a profit and does not experience a loss (Yudaswara et al., 2013). The Break Even Point for sales of tilapia fish is IDR 4,166,667, while the Break Even Point per unit is 132.28 kg. In this case, when it reaches the break-even point, this business makes no profit and no loss when selling 132.28 kg of fish with a value of IDR 4,166,667.

Net Present Value Analysis

The criteria for accepting or accepting an investment plan using the NPV method are as follows: (1) If $NPV > 0$, then the investment plan is accepted; (2) If $NPV < 0$, then the investment plan is rejected; and (3) If $NPV = 0$, then the investment plan can be accepted or the company value will remain if the investment plan is accepted or rejected (Winarni et al., 2022).

Net Cash for the first and second years is IDR 28,290,000, the desired interest rate of return is 20%, so you can get a Net Present Value of IDR 25,873,830,- which is positive so the investment can be accepted. This certainly makes this business worth running because the results obtained are >0 . This investment is also acceptable because it does not harm this business.

CONCLUSION

Based on the findings of a study on the feasibility of cultivating tilapia (*Oreochromis niloticus*) conducted at Fish Makmur MRS., it can be concluded that: The feasibility of cultivating tilapia from a legal aspect is not yet feasible because it does not meet the requirements of applicable legislation, but the feasibility of cultivating tilapia from an environmental aspect worth doing, because the total positive impact is greater than the total negative impact. The market and marketing aspect of tilapia is feasible. The feasibility of the tilapia cultivation business in terms of technical and technological aspects is feasible. The feasibility of the tilapia cultivation business in terms of the human resource management aspect is feasible. The feasibility of tilapia farming from a financial aspect is feasible. Based on the business assessment, the profit obtained was IDR 28,290,000,-, and the balance between revenue and costs was 1.9. The feasibility of investing in tilapia fish is worth pursuing using the Payback Period (PP) method with a time of 7 months 11 days, the Break Even Point for sales of tilapia fish is IDR 4,166,667, while the Break Even Point for a unit is 132.28 kg. The net present value (NPV) obtained was IDR 25,873,830, which is positive so the investment can be accepted. This certainly makes this business worth running because the results obtained are >0 .

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