

Feasibility Analysis of Tilapia Aquaculture Base on Agribusiness Aproach in Pinrang Regency, South Sulawesi

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Abstract

Tilapia (Oreochromis niloticus) is one of the aquaculture commodities with very high potential and has been widely cultivated in Indonesia due to its relatively fast growth. This research aims to determine the level of acceptance and income, as well as the feasibility of tilapia pond farming. This research was conducted in Sabbang Paru Village, Lembang District, Pinrang Regency, South Sulawesi. The type of research used is quantitative descriptive and the data used in this research are primary data and secondary data. Data collection techniques were carried out through observation, interviews, and documentation. The data analysis method used is cost analysis, revenue, income, and R/C Ratio. The results of this study show that the average total cost incurred is Rp122,948.00 the average revenue is Rp20,882,352.00 and the average income is Rp276,863,000.00. The results also highlight that tilapia farming in Sabbang Paru Village provides a significant return on investment, as shown by the high R/C ratio obtained is 4.5. This implies that tilapia farming not only covers the operational costs but also generates substantial profits, making it a sustainable and attractive option for local farmers in South Sulawesi.

Keywords: Pond, Tilapia, Revenue, Income, Business Feasibility, and R/C Ratio



INTRODUCTION

Indonesia is one of the largest archipelagic countries in the world, consisting of a cluster of 17,508 islands, with an estimated marine area of 5.8 million km² and a coastline of 95,181 km. This situation gives Indonesia significant potential in the fisheries sector, starting from promising market prospects both domestically and internationally. Therefore, the potential of natural resources both in the sea and in coastal areas holds great opportunities for development and utilization efforts. Aquaculture products that are free from residues or below the permissible residue threshold according to market demand have achieved a percentage of 99.73% for residue-free aquaculture products (Irmayani, dan Nurhaedah, 2022). The target locations for residue testing are aquaculture production centers in 17 provinces, focusing on commodities such as shrimp, tilapia, milkfish, and catfish (Renstra Djpb 2015). Coastal and ocean areas play a crucial role as a source of livelihood for the people of Indonesia. It is estimated that these two regions will become the cornerstone for the development of the Indonesian nation in the future. This is because most of Indonesia's territory consists of coastal and marine areas that have various natural resources and diverse environmental services (Reni, 2020).

There are several coastal natural resources that can be managed and developed, including fishery resources that encompass both capture fisheries and aquaculture. Aquaculture includes brackish water, coastal, and marine cultivation. (Reni, 2020). The goal of national agricultural development is not only to increase food and horticultural production but also to enhance fishery production. Fisheries are a subsector of agriculture, particularly one of the economic sources for the community (Rahbiah et al., 2019). Fishing is a commercial activity that manages and controls fishery resources to gain profit in order to enhance the welfare and income of those involved in aquaculture. The development of fisheries activities is an enhancement from simple cultivation activities to advanced cultivation activities. Pinrang Regency is an area that not only produces agriculture as a source of income but also has earnings from the fisheries sector, one of which is tilapia. Therefore, this research is conducted to determine the level of income received and the feasibility of tilapia farming in Sabbang Paru Village, Lembang District, Pinrang Regency. In order to improve investment and the selection of tilapia cultivation, we must understand the benefits of this farming practice.

A fishery commodity that has great potential for developing a business plan is Nile fish (*Oreochromis niloticus*). Tilapia has several advantages compared to other types of fish. Parameters measured in tilapia farming with an emphasis on marketing, technical, financial, management, socio-economic, institutional, and business development aspects

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(Parmawati et al., 2023). The market aspect is quite broad, as demand is still greater than supply, and every year demand continues to increase. The technical aspects of tilapia farming using a semi-intensive system. The financial aspects are already suitable for implementation, both in the short term and the long term. From a legal standpoint, the business only has a registered certificate from the Sub-District Fisheries Office. The institutional aspects of the business are quite good due to the role of production facility providers and extension agencies, although there has not yet been attention from funding institutions. The socio-economic aspects are quite good, as they can provide job opportunities and reduce unemployment. The efforts of this activity have a positive impact on the environment as it does not produce waste that is harmful to both water bodies and public health (hasan et al 2020)

(Kasmi et al., 2023) Fisheries is an artificial pond, usually located in coastal areas, filled with water and used as a means for aquatic cultivation. Cultivated animals are aquatic animals, especially fish, shrimp, and crabs. The term pond is usually associated with brackish or seawater. A pond filled with freshwater is typically referred to as a pond or a reservoir. The area of the pond is highly dependent on the cultivation system that is applied. The development of fish ponds is generally chosen around the coast, especially those influenced by large rivers, because many fish farmers believe that the presence of brackish water will provide better growth for fish/shrimp compared to pure seawater. (Anijar, 2014). Nile tilapia (*Oreochromis niloticus*) is one of the aquaculture commodities with very high potential and has been widely cultivated in Indonesia due to its relatively fast growth. As the demand for tilapia in the market increases, cultivation is carried out intensively with high stocking density and high feed provision. Nile tilapia has several advantages compared to other freshwater fish, such as rapid growth and ease of breeding.

Production is an activity or process that transforms inputs into outputs and serves as an activity that produces finished goods or semi-finished goods, industrial products, as well as supporting components . Production acts as a regulator and continuous adjustment that is carried out according to the demands of the products to be produced. This production process is conducted based on orders that align with the needs of the requests. (Sattar, 2017) Revenue is the result of multiplying the total number of products by the selling price per unit, while expenses or costs refer to the value of using production resources and other expenditures incurred during the production process. Production is related to revenue and production costs; the revenue received by farmers must still be reduced by production costs, which encompass all expenses incurred in



that production process.(Fadel Amili et all 2020). Revenue is the gross flow derived from business activities, meaning it is before deducting any costs associated with that revenue. Revenue is the difference between receipts and total expenses incurred during a season. Net farm income is the difference between receipts and all costs or total expenses. Farmers aiming to achieve a high net income must strive for high revenue and low production costs. (Pangemanan, 2016). Feasibility in the context of management often refers to the evaluation of a project or venture to determine whether it is viable for implementation. Eligibility includes aspects such as technical feasibility, financial feasibility, economic feasibility, social feasibility, and environmental feasibility. The feasibility of tilapia fish farming can be determined by comparing the amount of revenue with the costs, known as the R/C Ratio. The R/C Ratio value is an indicator of the productivity of the capital used by farmers in the production process. (Polakitan et al., 2015).

Costs are one aspect that can affect profits. If expenses are greater than income, then there will be a loss; however, if they are less than income, there will be a profit. So, costs are cash or cash equivalents that an organization/company spends to acquire goods or services that will provide benefits both now and in the future. Cost, in a broad sense, is the sacrifice of economic resources measured in monetary units that has occurred or is likely to occur for a specific purpose. (Haryani, 2017).

Hasriana (2017) states that in the production process, there are costs that must be incurred to achieve optimal results. The production costs can be categorized as follows: 1. Fixed Costs: Fixed costs are expenses that remain constant in total. The amount of fixed costs will not change even if production experiences fluctuations (increases or decreases). The overall fixed costs are referred to as Total Fixed Cost.2. Variable Costs: Variable costs are the total production expenses that change in accordance with the fluctuations in the amount of output to be produced. The higher or larger the output produced, the greater the costs incurred. 3. Total Cost (Total Cost) Total cost is the overall expense that occurs in short-term production. Depreciation is the systematic allocation of the depreciable amount of an asset over its useful life. Depreciation is an accounting process that allocates the cost of tangible assets to expenses in a systematic and rational manner over the period in which benefits are expected to be derived from the use of the asset.



METODOLOGY

The analysis method used in this research is Quantitative Descriptive research, analyzing data obtained from 17 tilapia fish farmers. According to (Suratiah, 2015), calculating production costs and revenues uses a nominal approach without considering the time value of money; instead, current prices are used, allowing for a direct calculation of total expenditures and total receipts within a single production period. The appropriate methodology for income analysis in tilapia farming includes a quantitative approach with the collection of primary and secondary data. First, primary data is collected through field surveys using structured questionnaires given to tilapia farmers to obtain information related to production costs, revenue, and factors affecting productivity such as feed usage, seeds, and pond management. Secondary data is obtained from relevant literature sources, government reports, and scientific journals on tilapia farming. Subsequently, the data is analyzed using income analysis methods that calculate the difference between total revenue from fish sales and total production costs. (biaya tetap dan variabel). To assess economic feasibility, indicators such as the Benefit-Cost Ratio are used. (BC Ratio). This approach will provide a comprehensive overview of the efficiency of the business and the potential profits that can be obtained from tilapia farming.

RESULT AND DISCUSSION

The context of tilapia farming, fixed costs refer to expenses that must be incurred regularly, regardless of the amount of fish produced. These costs do not change with the increase or decrease in production volume over a certain period. Fixed costs are very important for fish farmers to understand, as they must bear them even when tilapia production is low or even if there is no production at all. Fixed costs are expenses that do not change regardless of the quantity of goods used in the production process; the costs incurred remain constant. Fixed costs are expenses that do not affect production and continue to be incurred whether the output is large or small.

Table 1. Average Fixed Costs of Tilapia Farmers

Number	Kind of Fixed Cost	Value (Rp)
1	Pail	3,316.00
2	Machete	3,889.00
3	Hoe	1,544.00



4	Mesh	19,301.00
5	Sprayer	9,309.00
Amount		37,358.00

Based on the fixed cost analysis of the tilapia business, which includes various equipment such as pails, machetes, hoes, nets, and sprayers, the total fixed cost incurred amounts to Rp 37,358.00. This cost reflects the investment in assets needed for daily operational activities, but is not affected by production fluctuations. The largest expenditure is for mesh amounting to Rp 19,301.00, which indicates the importance of this component in cultivation operations, possibly related to fencing or handling fish in the pond. The cost for the sprayer, which reaches Rp 9,309.00, is also quite significant, showing the role of this tool in maintenance or pest prevention. The costs for the pail, machete, and hoe, although smaller, remain important as supporting tools in the cultivation process. Overall, these fixed costs will serve as the basis for calculating the break-even point and need to be offset by sufficient revenue to ensure the business remains sustainable. According to Pindyck & Rubinfeld (2013), fixed costs are costs that must be paid regardless of the amount of output produced, and this is very important in businesses with long-lived assets, such as equipment in tilapia farming. Fixed costs do not fluctuate with production volume and usually consist of equipment costs, infrastructure, or assets that are used repeatedly.

Variable costs in tilapia farming refer to costs that change in accordance with the level of production or the number of fish being raised. These costs include components such as feed, fish seeds, medicines, seasonal labor, as well as water and electricity costs used to maintain the quality of the aquatic environment. According to Subandiyono & Usman (2017), feed often constitutes the largest variable cost in tilapia farming, because tilapia require consistent nutrition for optimal growth. Furthermore, Rahman et al. (2020) emphasize that efficient management of variable costs, such as the selection of quality feed and proper stocking density regulation, can reduce fish mortality and increase yields. The increase in variable costs, especially related to feed prices or water needs, must be closely monitored as it can directly impact the profitability of the business. Thus, good management of variable costs is very important to achieve a balance between optimal production and cost control in tilapia farming.



Tabel 2. Average Variable Costs of Tilapia Fish Farmers.

No	Kind of Variable Cost	Amount	Price (Rp)	Value (Rp)
1	Seed	9.235 heads	200.00	1,847,058.00
2	Feed	26,2 heads	35,000.00	1,388,823.00
3	Fertilizer	9,6 heads	150,000.00	1,438,235.00
4	Pesticide	1,3 bottle	120,000.00	162,352.00
5	Herbicide	0,9 bottle	70,000.00	61,764.00
	Amount of Average			4,503,624.00

Based on the variable cost data for tilapia farming in the table, there are five main components that affect the total variable cost, namely seeds, feed, fertilizer, pesticide, and herbicide. (herbicide). The seeds have the highest cost value, which is Rp 1,847,058.00, reflecting the significant initial capital requirement to obtain quality tilapia seeds. According to Subandiyono & Usman (2017), the quality and quantity of seeds greatly determine the survival rate and growth of tilapia during the cultivation cycle. Meanwhile, feed is the second largest variable cost component, valued at Rp 1,388,823.00. Feed is often one of the most determining factors in the operational costs of fish farming, as tilapia require a balanced diet to achieve optimal growth. This is supported by Hastuti et al. (2019) who state that the efficient provision of feed, both in terms of quality and quantity, can improve the efficiency of feed conversion into fish mass.

In addition, fertilizers, pesticides, and herbicides also contribute to the total variable costs with amounts of Rp 1,438,235.00, Rp 162,352.00, and Rp 61,764.00 respectively. Fertilizers are used to increase the productivity of water bodies, especially in aquaculture systems that utilize earthen ponds, where fertilizers can enrich the water's nutrients that support the growth of plankton as a natural food source for tilapia. According to **Rauf & Sudirman (2021)***, the proper use of fertilizers can improve water quality and pond productivity. On the other hand, pesticides and herbicides, although they have lower costs, remain important in controlling pests and weeds that can disrupt the ecosystem of aquaculture ponds. The management of these variable costs must be carried out efficiently so that tilapia entrepreneurs can achieve optimal productivity without sacrificing the expected profits.



(Hayati, 2022; Marinus et al., 2023) Revenue in tilapia farming is the result of the difference between the total income obtained from the sale of tilapia and the total costs incurred during the production cycle, both fixed and variable costs. This income is highly dependent on several key factors, including the selling price of fish, production volume, and efficiency in managing production costs. In the context of tilapia farming, income is generally generated from the sale of tilapia after the growth cycle. According to Dewanti et al. (2020), the main factors affecting income are the survival rate of the fish, the final weight of the fish at harvest, and the market price of tilapia, which can achieve sustainable profits. Based on the calculations in Table 4, it can be seen that the average production of tilapia fish farming yields 14,200 kg, with a selling price per kilogram of Rp 25,000, resulting in a total revenue of Rp 355,000,000.

Income Analysis

Farm income is the difference between total revenue and total costs incurred in a business. The average profit obtained by fish farmers in Jila, Sabbang Paru Village, Lembang District, Pinrang Regency.

Table 3. Average Income of Tilapia Farmers

No.	Respondent	Total cost (Rp)	Acceptance (Rp)	Income (Rp)
1	Yusuf	5.984.000	30.000.000	24.016.000
2	Anwar	3.802.000	25.00.000	21.802.000
3	Sulkifli	2.604.000	12.500.000	9.896.000
4	Jusman	1.923.000	10.000.000	8.077.000
5	Rusna	9.365.125	45.000.000	35.643.875
6	Yusriani	6.639.125	25.000.000	18.360.875
7	Bora	3.811.375	10.000.000	6.118.625
8	Alle	1.700.500	5.000.000	3.299.500
9	Ardi	3.049.875	20.000.000	16.950.125
10	Onsong	8.597.000	25.000.000	16.403.000
11	Hama	6.814.125	22.500.000	15.685.875
12	Kadir	2.776.250	7.500.000	4.723.750
13	Chandra	5.447.500	32.500.000	27.052.500
14	Herman	4.763.250	25.000.000	20.263.750



15	Bambang	3.185.000	20.000.000	16.815.000
16	Mawardi	4.294.250	27.500.0000	23.250.000
17	Eru	3.924.375	12.500.000	8.575.625
	Amount	80.420.750	355.000.000	27.6863.500

Based on the presented table 3, there are 17 respondents who participated in the tilapia business, with a total expenditure of Rp 80,420,750 and total revenue of Rp 355,000,000. From this data, the net income (the difference between revenue and costs) for all respondents reached Rp 276,863,500. The respondent with the highest income is Rusna, who recorded an income of Rp 35,643,875 with total expenses of Rp 9,365,125. On the other hand, Alle has the lowest income of Rp 3,299,500, although the expenses incurred are relatively low, at Rp 1,700,500. This analysis shows that differences in total costs incurred do not always have a direct correlation with the revenue obtained, as other factors such as business scale and production efficiency also play a role. Overall, the average respondents managed to record significant profits, with the majority earning more revenue than the costs incurred. According to Purnomo et al. (2019), in the fishing business, income is calculated by subtracting the total production costs (fixed and variable costs) from the total revenue obtained from the sale of cultured products. The results from the table show that most tilapia farmers earn significant income, indicating that tilapia productivity is quite high and the selling price of tilapia in the market provides a good profit margin.

Feasibility Analysis

Results of the feasibility analysis of the tilapia pond business show a value of 4.5, it could refer to the business feasibility ratio or Benefit-Cost Ratio (BCR) commonly used in economic feasibility studies. In this context, a BCR of 4.5 means that for every 1 unit of cost invested in the tilapia farming business, it generates 4.5 times the profit or benefit, making this venture considered very feasible and economically profitable. According to Rahman et al. (2020), in a journal indexed by Scopus, a BCR value of more than 1 indicates that the venture is worth pursuing. The higher the BCR value, the more profitable the business. In the case of a tilapia pond with a BCR of 4.5, this indicates that the profit obtained far exceeds the costs incurred, making this venture not only feasible but also highly profitable. This analysis is supported by the research of Sudirman et al. (2019), which states that a BCR above 3 indicates very good prospects in the fisheries business



due to efficient production scales and strong market demand for tilapia, one of the leading fishery commodities. Furthermore, Purnomo et al. (2018) also state that factors such as feed efficiency, pond land optimization, and good fish disease management can increase the BCR. Thus, a BCR value of 4.5 in tilapia farming indicates that effective and efficient management plays a significant role in enhancing the feasibility and profitability of this business.

CONCLUSION AND RECOMMENDATIONS

Based on the research that the total cost incurred by the tilapia pond cultivation business in Sabbang Paru Village, Lembang District, Pinrang Regency is IDR 80.420.750,00 which consists of fixed and variable costs. The revenue obtained from the tilapia pond cultivation business in Sabbang Paru Village, Lembang District, Pinrang Regency is IDR 355.000.000,00 and the income earned is IDR 276,863,500,00. Based on the R/C Ratio value of the tuna fish floss business in the tilapia farming pond in Sabbang Paru Village, Lembang District, Pinrang Regency, which is 4,5, it is in accordance with the feasibility of the R/C Ratio indicating more than 1, meaning that the business is feasible to operate.

To improve the sustainability and profitability of tilapia farming, it is recommended that farmers continue to optimize variable cost management, especially in terms of feed management and water quality control, which are two key factors for success. In addition, the increased use of modern technology, such as automatic aeration systems or biofloc, can further enhance efficiency and reduce the risk of fish mortality. The development of broader market access, as well as the diversification of cultivated product outputs, is also recommended to increase income. Based on the high BCR results, farmers and investors can be encouraged to expand production scale, as this venture has proven to be economically viable and offers profitable opportunities in the long term.

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