



Feasibility study of catfish cultivation business using independent feed using maggot

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ABSTRACT

This research was conducted with the aim of determining the financial feasibility of cultivating catfish using an artificial feed using maggot as source of protein. The indicators used in analyzing financial feasibility are Net Present Value (NPV), Internal Rate of Return (IRR), Break Event Point (BEP), Payback Period (PP), and Benefit Cost Ratio (B/C Ratio). The results of the business feasibility analysis on catfish cultivation are feasible because they meet the criteria that have been applied, namely the NPV with a value of IDR. 3,253,672, an IRR value of 94.58%, a net B/C value of 2.81, a payback period of 1 year and 1 month, and a BEP of 171 kg. The results of the analysis show that cultivating catfish using artificial feed is feasible in all indicators. Therefore, the recommended strategy to increase the advantages of using artificial feed with maggot as source of protein is to provide education and training to the public on how to make and produce artificial feed with maggot as protein source.

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1. INTRODUCTION

Feed is an important component to support the survival and growth of fish in aquaculture activities (Herawati et al., 2020). Fish will obtain energy through the feed they consume, so feed plays a primary role as a necessity for fish in their growth. As the production of fish farming increases, so does the need for feed for fish consumption (Tugiyono et al., 2020). On the other hand, feed also becomes a dominant component in production costs in aquaculture, amounting to 50-70% (Vita, 2017). The high expenditure on feed in aquaculture can affect the interest of farmers in developing their businesses. This is due to the increasing feed prices not being accompanied by the selling price of the fish, causing the profits obtained by the breeders to decrease. In determining the feed to be consumed, it should not only be based on quantity but also consider the nutritional balance that can support growth.

Fish require a higher amount of protein compared to other nutrients. This is because the dry matter of fish bodies is dominated by protein, which makes up 65%-75% (Makinde and Olayinka John, 2015). It can be known that protein plays an important role in fish growth. In feeding fish, especially during the growth phase, a high amount of

protein is needed to support the survival and growth of the fish. The use of high-protein sources must be considered to meet the protein needs of catfish, which range from 20-60%.

Feed often becomes a problem faced by farmers due to its role in supporting cultivation activities and as an input in production. On the other hand, the price of factory feed is getting more expensive, causing the income of fish farmers to decline due to the uncontrollable selling price of fish. In 2022, the price of 781 catfish feed 310.000 IDR / 30 kg and in 2025 the price rise become 345.000 IDR. The issue of rising feed prices necessitates that farmers have alternative feed that can support the survival and growth of fish effectively. Fish feed can basically be obtained at a low price based on the materials used without reducing the nutritional quality of its content and the ease of obtaining it. Independentfeed can be a solution to the problem of high feed prices to support the needs in aquaculture activities (S. Y. P. K. Hardini & Gandhi, 2021). However, in producing artificial feed independently as an alternative feed, in addition to paying attention to quality, the feed must also be efficient (Wardhani et al., 2011).

Fish meal, which is commonly used as an animal protein source in feed, often fluctuates in availability and has a high price. This necessitates the need for alternative animal protein sources as a substitute for fish meal. Maggots can be used as a source of animal protein in the production of Independentfeed. Feed ingredients containing more than 19% crude protein can be categorized as protein sources (Prajayati et al., 2020). Maggots are larvae that come from the Black Soldier Fly and are known as decomposers of organic waste. It is known that maggots have a high protein content, making them suitable as a protein source in animal feed, particularly for fish (Barragan-Fonseca et al., 2017).

The advantage of maggots compared to other protein sources is that they are easy to obtain and not expensive. In addition, maggots have a protein content of 43-64%, which can meet the protein needs of fish and serve as a substitute/alternative to other protein sources (Makinde and Olayinka John 2015). From the perspective of its cultivation process, BSF is easy to manage and does not require special technology, making it suitable for development on a mass production scale. At the final stage (prepupa), BSF will move on its own to find a place/media to lay its eggs, making the egg harvesting process easier for subsequent cultivation (Purnamasari et al., 2023).

Research conducted by (S. Y. P. K. Hardini & Gandhi, 2021) states that the use of maggots as a protein source in Independentfeed can reduce production costs in the cultivation of Sangkuriang catfish. The Cost of Production for farming Sangkuriang catfish using Independentfeed with maggot protein source is 16.97% lower and cheaper compared to using factory feed. Thus, the profits obtained by catfish farmers will increase if they use Independentfeed with a protein source from maggots.

The use of maggots as a source of animal protein can also be applied to catfish. Catfish is a cultivated fish that is highly favored by consumers, and its demand tends to increase every year. Catfish is a type of fish consumed for its meat, which is favored by consumers in Indonesia (Dewi & Sylvia, 2022). Catfish are also classified as fish that are easy to cultivate (Pratiwi et al., 2020). This is due to the relatively fast adaptation and growth rate of catfish. Previous research has mostly focused on the direct provision of maggots for the growth of catfish (Purnamasari et al., 2023), (Apriyanto et al., 2023)(Dewi & Sylvia, 2022)(Belghit et al., 2019). However, very few studies discuss the impact of applying self-feeding with maggot protein sources on fish growth and its effect on the production cost efficiency for farmers. Therefore, the research to be conducted will discuss the impact of implementing self-feeding with maggot as an animal protein source on the growth of catfish and the resulting cost efficiency. Thus, the income obtained by the farmers can increase due to the reduction in production costs for feed.

2. RESEARCH METHOD

Type of the data used are quantitative and qualitative data. The sources of data used are primary and secondary data. Primary data is data collected directly by the researcher to address the research problem and objectives, whether through surveys or observations. On the other hand, secondary data is a data collection technique that involves gathering research or information that has been published or conducted by others. The data in this study consists of primary data and secondary data. Primary data sources are obtained by recording the growth of catfish using factory-made feed and using Independentfeed with maggot protein sources. According to Sugiyono (2011), secondary data is data that is not obtained directly, but rather through other people or documents. Secondary data serves as supporting data for research, obtained from reports of related institutions, literature reviews from journals, books, news articles, and other library sources.

Quantitative data is used to analyze financial aspects. In processing the data, computer software such as Microsoft Excel is used. The issue of inflation in this study is anticipated by using the inflation rate as a discount factor in the calculation process for all financial feasibility indicators. Here is a further explanation of quantitative data and its processing methods.

2.1 NPV (Net Present Value)

A business is considered feasible if all the benefits received are greater than the costs required to run the business. The difference between benefits and costs is called net benefit. A business is considered feasible if the NPV exceeds zero, which means the business provides benefits or profits. The formula used is (Gandhy & Sutanto, 2017):

$$NPV = \sum_{t=1}^n \frac{Bt - Ct}{(1 + i)^t}$$

Explanation:

Bt = Benefits of the farmer group in year t

Ct = The costs incurred by the farmer group in year t

t = Year of the farmers' group's business activities, with the first year being year 1

i = Discount Rate

2.2 IRR (Internal Rate of Return)

The magnitude of the return on the invested capital is one of the factors that need to be considered in determining the feasibility of a business. The IRR is usually obtained based on interpolation between a lower Discount Rate (resulting in a positive NPV) and a higher Discount Rate (resulting in a negative NPV). This venture is considered feasible if its IRR is greater than the Discount Rate. The formula used is:

$$IRR = i_1 + \frac{NPV_1}{NPV_1 - NPV_2} \times (i_2 - i_1)$$

Explanation:

i_1 = Discount Rate resulting NPV positive

i_2 = Discount Rate resulting NPV negative

NPV_1 = NPV positive

NPV_2 = NPV negative

2.3 Net B/C

Net B/C is the ratio between net benefits that are positive and net benefits that are negative. The net benefits that favor the business are generated against each unit of loss from the business. This business is considered viable if the Net B/C Ratio is greater than one. The formula used is:

$$\text{Net B/C} = \frac{\sum_{t=1}^n \frac{B_t - C_t}{(1+i)^t}}{\sum_{t=1}^n \frac{B_t - C_t}{(1+i)^t}} \quad (B_t - C_t) > 0$$

$$(B_t - C_t) < 0$$

Explanation:

B_t = Benefit at t
 C_t = Cost at t
 i = Discount rate
 t = Period

2.4 Pay Back Period

Payback period is used to measure how quickly the investment made in a business can be recouped. The faster the return on investment for a business, the more likely that business will be chosen. The Minapolitan farmers' group business can be considered viable if the payback period analysis is shorter than the project lifespan.

$$\text{Payback period} = \frac{I}{Ab}$$

Explanation:

I = The amount of investment cost required
 Ab = The net benefit that can be obtained each year

2.5 Break Evenpoint (BEP)

Break Even Point is a tool used to analyze or understand the relationship between several variables within a business or enterprise. Like production area, production level carried out by a business, costs incurred during the business operation, as well as the revenue/income received from the implementation of the business activities (S Hardini & Gandhi, 2020).

3. RESULTS AND DISCUSSIONS

3.1 Net Present Value (NPV) Using Independent Feed

In the catfish farming business with Independent feed, the current value of future income is calculated by determining the Net Present Value (Yan & Zhang, 2022). The economic lifespan of the circular pond and water pump determines the lifespan of this project or business. The maggots produced are assumed to be stable due to abundant and sustainable availability so that the price of maggots as a raw material is stable. The fixed and variable costs incurred over one year are the fixed and variable costs over six cultivation cycles. By using a Independentfeed composition for catfish farming in a round pond with a diameter of 1 meter, it generates a net present value (NPV) of Rp3,253,672, which is an NPV greater than 0, meaning that catfish farming with Independentfeed is feasible.

Table 1. NPV of Catfish Cultivation Business

Year	Benefit (Bt)	Cost (Ct)	Value	NPV
0	-	1.800.000	- 1.800.000	- 1.800.000
1	7.500.000	5.530.154	1.969.846	1.819.719
2	7.500.000	5.530.154	1.969.846	1.681.034
3	7.500.000	5.530.154	1.969.846	1.552.918

NPV Project

3.253.672

Source: Processed Primary Data, 2025

Positive NPV indicates that the catfish farming business using maggot protein as a source is feasible to undertake. According to the research conducted by (Saleh et al., 2021), which states that the NPV of catfish must be positive ($NPV > 0$), if the NPV of catfish is < 0 , then the business is not feasible to undertake. The NPV of the maggot feed for catfish is Rp3,253,672, meaning that the investment made will yield a current profit of Rp3,253,672 over the next 3 years.

3.2 Internal Rate of Return

The calculation of the Internal Rate of Return (IRR) is an investment criterion that indicates a project's ability to generate returns or the level of profit achieved. If the IRR is greater than the prevailing interest rate, the project is considered feasible to develop or profitable. The catfish farming business with self-made feed has a Lelei IRR of 94.58%.

Table 2. IRR of Catfish Cultivation Business

Year	NPV	NPV (i=90%)	NPV (i=100%)
0	- 1.800.000	- 1.800.000	- 1.800.000
1	1.819.719	1.036.761	984.923
2	1.681.034	545.664	492.462
3	1.552.918	287.191	246.231
NPV project	3.253.672	69.616	- 76.385

Source: Processed Primary Data, 2025

The IRR of Catfish Cultivation is higher than the prevailing interest rates, which is 9.24% at several banks in Indonesia. This shows that the catfish farming business with self-made feed is worth pursuing. The results of this study are consistent with the research conducted by (Huang et al., 2022), which states that the Internal Rate of Return (IRR) for Catfish Cultivation is the highest interest rate that can be paid by farmers for the capital used per year. Lelei IRR greater than the discount rate indicates that the catfish farming business using self-made feed with maggot protein sources is feasible to implement (Dai et al., 2022).

3.3 Net B/C

The calculation results show that the net B/C ratio for catfish farming with self-made feed is 2.81 and greater than 1. This means that for every expenditure of Rp. 1, there will be a profit of Rp. 2.81. Therefore, this venture is worth pursuing. The results of this study are consistent with the research conducted by (Kim et al., 2021), which analyzed the financial aspects of intensive catfish farming using the biofloc system. The Net B/C ratio obtained is positive at 2.19, meaning that for every expenditure of Rp1.00, a profit of Rp2.19 will be gained. A positive Net B/C ratio indicates that the venture is worth continuing (Kim et al., 2021).

3.4 Pay Back Period

The method for determining the payback period is by calculating the investment criteria of the Payback Period (Al-Ani, 2015). This is based on the result of dividing the investment cost by the profit obtained from catfish farming over one year. Based on the information in Table 3, the Payback Period for the catfish farming business using self-made feed is 1 year and 1 month, indicating that the invested capital will be recovered in 1 year and 1 month.

Tabel 3. Pay Back Period of Catfish Cultivation Business

Year	NPV	Impact on initial Investment
0	- 1.800.000	(1.800.000)
1	1.819.719	19.719
2	1.681.034	1.700.753
3	1.552.918	3.253.672

Source: Processed Primary Data, 2025

Payback Period is the time frame used to recover the initial investment and the business through the profits obtained. According to (Sri Hardini & Gandhy, 2021), the greater the profit obtained, the shorter the payback period for the investment used.

3.5 Break Even Point

Investment criteria Break Even Point (BEP), also known as the break-even point, is a calculation used to determine the amount of production a company must achieve to avoid making a profit or a loss (Morano & Tajani, 2017). The note in Table 4 shows that the total cost used for the catfish farming business with artificial feed is Rp 2,175,000. The variable cost incurred per kilogram is Rp 12,306. The price of catfish per kilogram is Rp 25,000. Thus, the Break Even Point for catfish farming using maggot protein occurs at 171 kg. Farmers will gain profit after producing catfish beyond the Break Even Point.

Table 4. Break Even Point of Catfish Cultivation Business

Total Fixed Cost	2.175.000
Variable Cost	12.306
Price Of Catfish Per Kg	25.000
BEP	171

Source: Processed Primary Data, 2025

Based on the financial feasibility indicators obtained, the use of artificial feed produces good Lelei. This indicates that the use of artificial feed with maggot protein sources is suitable for use by catfish farmers. The use of artificial feed will reduce feed costs in the catfish farming process, thereby ultimately increasing the profits obtained by the farmers (Mayulu et al., 2024).

4. CONCLUSION

The results of the feasibility analysis on catfish farming using self-made feed yield an NPV of Rp. 3,253,672, an IRR of 94.58%, a Net B/C ratio of 2.81, a Payback Period of 1 year and 1 month, and a BEP of 171 kg. The analysis results show that catfish farming using self-made feed is more feasible across all indicators. Based on the advantages of using artificial feed with maggot protein sources, the recommended strategy is to conduct education and training for the community on how to make and produce artificial feed with maggot protein sources. One way is to collaborate with the fisheries service to conduct training in cultivating feed production with maggot protein sources, so that more catfish farmers can apply feed with maggot protein sources.

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