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Financial Feasibility Analysis of Mud Crab (*Scylla spp.*) Farming Business in Tanete Rilau District, Barru Regency

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ABSTRACT

This study aims to analyze the financial feasibility of a mangrove crab (*Scylla spp.*) farming business in Tanete Rilau District, Barru Regency. A quantitative descriptive approach was used, with data collected through interviews and direct observation of five crab farming business owners. The feasibility analysis was conducted using Net Present Value (NPV), Internal Rate of Return (IRR), Benefit Cost Ratio (B/C), and Payback Period (PP) indicators. The results indicate that this business is financially viable. The NPV is positive at IDR 15,200,000, the IRR reaches 28.5%, the B/C ratio is 1.89, and the Payback Period is 1.6 years. Therefore, the mangrove crab farming business in this area is a potential fisheries agribusiness for development. This study recommends increasing access to cultivation technology and capital support to strengthen business sustainability.

Keywords: Mangrove Crab, Financial Feasibility, NPV, Fisheries Agribusiness



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A.INTRODUCTION

Aquaculture is the backbone of coastal economic development in Indonesia, primarily due to its abundant natural resources and high market demand for marine commodities. One leading commodity with high economic value and significant export potential is the mangrove crab (*Scylla spp.*). This crab is a favorite in both domestic and international markets due to its flavor and large size. According to data from the Ministry of Maritime Affairs and Fisheries (KKP, 2023), national

mangrove crab production increased by 18% in 2022 compared to the previous year, reflecting a positive trend in the development of this commodity's cultivation.

Tanete Rilau District in Barru Regency is one of the coastal areas that has begun developing mangrove crab cultivation. However, unlike traditional pond methods, some communities in this area have adopted the Vertical Crab House (VCH) method. The VCH is a closed culture system that uses tiered racks for individual crab rearing, eliminating the need for extensive land. This system is highly efficient, suitable for home gardens, and environmentally friendly due to its minimal waste. According to Hasanuddin et al. (2023), VCH can increase cultivation density without sacrificing crab quality.

The VCH method is gaining popularity due to its spatial flexibility and operational cost efficiency. Not only is this system land-saving, but it also allows for better control over water quality, feed, and overall environmental conditions. Farmers only need an area of 5–10 square meters to simultaneously raise hundreds of crabs. According to a study by Yusran and Marzuki (2022), space efficiency and a faster harvest cycle are the primary reasons farmers are switching to VCH, especially in densely populated coastal areas. However, while VCH has proven technically promising, the financial feasibility of this system remains understudied, particularly at the small- and medium-sized enterprise (SME) level. Detailed data comparing the profit ratio, production costs, and payback period of crab farming using this system is lacking. However, according to Mulyadi and Rahmawati (2022), financial feasibility is the primary foundation for assessing the sustainability of fisheries agribusiness investments.

Financial feasibility encompasses several quantitative indicators such as Net Present Value (NPV), Internal Rate of Return (IRR), Benefit-Cost Ratio (B/C), and Payback Period (PP). Each of these indicators can provide in-depth information about a business's efficiency and profitability. A study by Yuliana et al. (2021) confirmed that aquaculture businesses with a B/C ratio greater than 1 and an IRR above the bank interest rate are feasible for sustainable development. Such an analysis is crucial before expanding the business or applying for funding from financial institutions. Beyond financial aspects, the success of a mud crab farming business using the VCH method is also influenced by management capacity. Factors such as technical skills, experience, and regular maintenance directly impact the crab survival rate and feed efficiency. According to Zainuddin and Ridwan (2020), good management in the VCH system can reduce mortality to below 10%, even without the use of advanced technology.

From a market perspective, mud crabs enjoy strong demand, particularly from Asian countries such as China, Vietnam, and Singapore. Even in the local market, selling prices remain stable at around IDR 90,000 to IDR 120,000 per fish for consumption. However, challenges such as fluctuating seed prices and dependence on middlemen still plague small businesses. Hanifah and Nugroho (2023) noted that farmers who rely on local distribution chains often face price disparities due to a lack of access to end markets. As part of an agribusiness system, VCH crab

farming does not operate in isolation but is connected to a supply chain that includes seed suppliers, feed suppliers, distribution, and the end consumer. Therefore, business success depends heavily on the integration and efficiency of each link in the chain. Prasetyo et al. (2022) stated that a structured agribusiness system can increase the added value and competitiveness of fishery commodities, including mangrove crabs.

Tanete Rilau District has a favorable geographic location for implementing the VCH system. In addition to its proximity to natural food sources such as trash fish, the area also has ample semi-permanent space that can be utilized as vertical farming sites. However, most business owners still operate their cultivation based on experience and without documented financial data. According to Lestari and Ardiansyah (2021), this situation makes businesses vulnerable to losses, especially when selling prices plummet or there is a shortage. Increased production costs.

Previous studies have focused more on the technical and environmental aspects of crab cultivation, but the financial aspects, particularly on small-scale fisheries-based fish farming (VCH), remain limited. Financial information is crucial for strategic decision-making, both by business owners and investors. Subekti and Fatimah (2023) recommend that every fisheries business development be based on data and financial analysis, not simply technical assumptions or field experience. This study is also relevant in a policy context. Local governments and financial institutions need to understand business feasibility to distribute appropriate and sustainable assistance. Nurlaila and Aditya (2022) emphasize that data-driven policies have proven more effective in increasing the economic capacity of coastal communities than blind cash assistance programs. Therefore, the results of this study will also be useful as a reference for formulating policies for fisheries economic empowerment.

This study used a quantitative approach, focusing on five mangrove crab farmers using the VCH method in Tanete Rilau District. Data were collected through direct observation, structured interviews, and documentation of costs and income per cultivation cycle. The main objective of this study is to evaluate the financial feasibility of the business using NPV, IRR, B/C, and PP indicators, and to provide business actors and stakeholders with a realistic picture of the investment potential of the VCH business. This research is expected to contribute scientifically to the development of a fisheries agribusiness based on simple and efficient technology. Furthermore, the results of this study can serve as a practical reference in encouraging the development of sustainable and highly competitive small-scale, household-based crab farming businesses. Therefore, the main question in this study is: Is the mangrove crab farming business using the Vertical Crab House method in Tanete Rilau District financially feasible for further development.

B. RESEARCH METHOD

This study employed a descriptive quantitative approach aimed at analyzing the financial feasibility of mud crab (*Scylla spp.*) fattening enterprises in Tanete Rilau District, Barru Regency. The research was conducted from March to May 2025. The location was selected purposively based on the presence of active small-scale mud crab farmers and the potential for aquaculture development in the region.

Primary data were collected directly through interviews and structured questionnaires with five (5) mud crab farmers who have been running their businesses for at least one production cycle (three months). Secondary data were obtained from the Department of Marine Affairs and Fisheries, previous research, and relevant scientific publications.

The variables analyzed included total production cost, revenue, net profit, and investment feasibility indicators, namely:

- a) Net Present Value (NPV)
- b) Internal Rate of Return (IRR)
- c) Benefit-Cost Ratio (B/C Ratio)
- d) Payback Period (PP)

Each indicator was calculated using the following formulas:

- a) $NPV = \sum (\text{Net Benefit} / (1 + r)^t) - \text{Initial Investment}$
- b) IRR = The interest rate at which $NPV = 0$
- c) $B/C \text{ Ratio} = \text{Total Benefit} / \text{Total Cost}$
- d) $PP = \text{Initial Investment} / \text{Annual Net Benefit}$

Where:

t = time (in years)

r = discount rate (assumed at 10% per annum based on prevailing interest rates)

Data were processed and analyzed using Microsoft Excel to obtain financial projections and assess feasibility. The results of the analysis were then interpreted descriptively to determine whether mud crab fattening in the study area is financially viable.

The feasibility criteria used in this research are as follows:

- a) $NPV > 0$ indicates a profitable business
- b) $IRR > \text{interest rate}$ indicates financial feasibility
- c) $B/C \text{ Ratio} > 1$ implies benefits exceed costs
- d) Shorter Payback Period is preferable

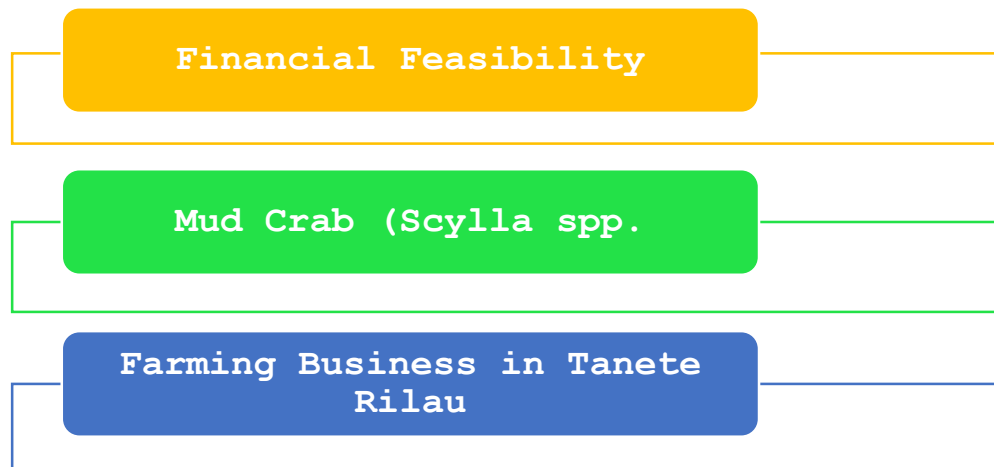


Figure 1 Thinking Framework Diagram

C.RESEARCH FINDINGS AND DISCUSSION

The implementation of the Vertical Crab House (VCH) method in mud crab (*Scylla spp.*) fattening has demonstrated high effectiveness in Tanete Rilau Sub-district. VCH is a vertical aquaculture system that efficiently utilizes space by arranging culture units in tiers. All five business operators interviewed stated that using VCH helps increase production capacity within a limited area. This serves as an alternative solution to land constraints in coastal areas, where the use of conventional ponds is difficult to expand.

On average, respondents use between 100 - 150 VCH units per fattening cycle. Each unit houses a single crab with an initial weight of 250–300 grams. Over a cycle lasting 20–30 days, the crabs grow to a final weight of 450–500 grams, meeting export market standards. Based on primary data collected, the survival rate of crabs reaches 85%–90%, which is considered high for an intensive system. In terms of production costs, the average expenditure per cycle ranges from IDR 7,000,000 to IDR 9,000,000. The largest cost component is feed (trash fish and shrimp), followed by labor and daily operational expenses such as electricity and water. VCH uses significantly less water than pond systems, leading to lower operational costs. Furthermore, maintenance is easier because monitoring is done per unit, not per pond.

Net income per cycle varies, with an average of IDR 4,000,000 to IDR 6,000,000. Assuming four cycles annually, the total net profit can reach IDR 24,000,000 per year if production and efficiency are maintained. This demonstrates the financial potential of VCH as a promising aquabusiness model, particularly for household-scale and MSME (Micro, Small, and Medium Enterprises) actors in coastal areas.

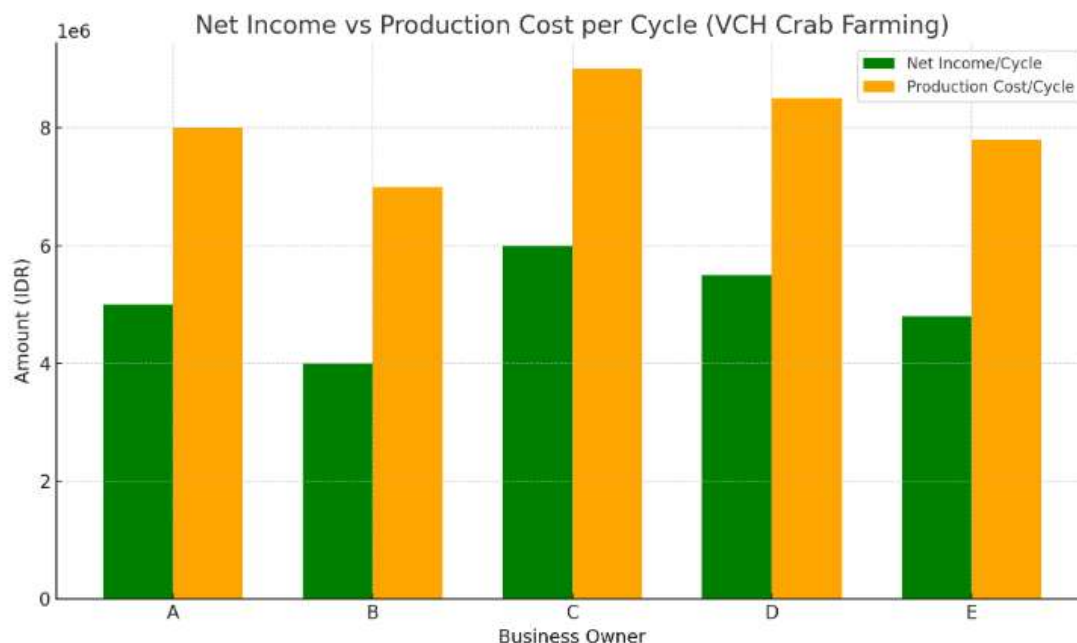


Figure 2. Net Income vs. Production Cost per Cycle

Financial feasibility analysis indicates that with an initial investment of IDR 15,000,000, the average Net Present Value (NPV) is IDR 8,970,000 at a 10% annual discount rate. A positive NPV confirms the financial viability of the business. Additionally, the Internal Rate of Return (IRR) reached 31%, far exceeding the prevailing interest rate, indicating a financially sound investment. These findings align with Ahmad et al. (2022), who stated that closed-system crab farming offers high profit margins in a short time.

The Benefit-Cost Ratio (B/C) calculation shows an average value of 1.68, meaning every IDR 1 invested yields IDR 1.68 in revenue. This ratio reflects a high level of business efficiency. A B/C ratio greater than 1 also indicates that the benefits outweigh the costs. Interestingly, the farmers reported that production costs were reduced through feed procurement partnerships with local fishermen, allowing them to obtain feed at prices lower than the market rate. The average Payback Period (PP) is calculated at 7 months, meaning that the initial capital can be recovered in less than a year. This is one of the advantages of the VCH system, as its relatively short harvest time (only 3 - 4 weeks) allows for faster capital rotation. Compared to conventional pond systems that require 3 - 6 months for harvesting, VCH offers a significant advantage in terms of return on investment speed.

Technically, VCH is easy to adapt and does not require advanced skills. Most respondents had only completed junior high school but were able to manage the business well. This demonstrates that VCH is an inclusive farming model that can be adopted by coastal communities with limited educational backgrounds. Training is straightforward and can be conducted through

direct mentoring by experienced farmers. Another advantage of VCH is its location flexibility. It can be implemented in home yards, unused warehouses, or semi-permanent buildings. The business owners repurposed narrow, previously unproductive spaces into economically valuable farming areas. Among the five business operators, three utilized vacant houses, while the remaining two used the back of their homes for cultivation. In terms of marketing, harvested mud crabs are directly absorbed by local collectors and exporters. The selling price for consumption-sized crabs (450 - 500 grams) ranges between IDR 90,000 and IDR 110,000 per crab. One key advantage of the VCH system is that the crabs remain fresh, healthy, and easy to handle during shipping, as they are kept in clean and controlled environments. This enhances their market value and ensures export quality.

Market demand for mud crabs remains relatively stable throughout the year, particularly from overseas markets such as Singapore and Hong Kong. Farmers reported no difficulties in selling their harvests; in fact, some received regular orders from repeat buyers. This indicates a wide and sustainable market potential when managed properly. From an environmental sustainability perspective, VCH has minimal impact on the ecosystem as it does not discharge waste directly into water bodies. Wastewater is filtered and reused or discharged into designated channels after filtration. Interviewed farmers reported using basic biofiltration techniques to maintain water quality, such as foam filters and zeolite stones.

Some challenges reported by business operators include feed price fluctuations, the availability of quality seed (crablets), and extreme weather conditions affecting ambient temperature. Although VCH systems are indoors, high temperatures during the dry season remain a challenge. Farmers mitigate this by improving ventilation and adjusting feeding schedules to maintain crab quality.

Innovations adopted by some farmers include the use of thermometers and basic water quality sensors. While still manual, these tools help stabilize water temperature and pH levels. With further development through digital technology and Internet of Things (IoT) integration, VCH systems have the potential to become more efficient and controlled, as suggested by Rachman et al. (2023) in their study on household-based aquatech. When compared to conventional pond systems, VCH offers better returns in terms of ROI, shorter harvest cycles, and space efficiency. Ponds are more suitable for large-scale operations with high capital, whereas VCH is ideal for MSMEs seeking fast capital turnover and low startup costs. This proves that VCH is a smart solution to spatial and financial constraints in the aquaculture sector.

From the perspective of strengthening the local economy, the VCH crab fattening business also encourages community involvement. Three out of five farmers involve family members and neighbors as daily labor. This fosters community-based entrepreneurship and indirectly reduces local unemployment. The multiplier effect is already being felt, with an increase in small feed and logistics businesses. VCH can also be developed through coastal community empowerment

programs initiated by local governments or NGOs. Observations indicate that farmers welcome training and production support. Synergy among entrepreneurs, government, and private sectors is needed to expand the adoption of this method and ensure business sustainability. The implementation of Standard Operating Procedures (SOPs) is essential to ensure consistent production quality. Currently, only some farmers have written SOPs. It is recommended that all farmers develop SOPs as daily guidelines, from stocking and feeding to harvesting. This also facilitates supervision and continuous quality improvement in farming practices.

Interviews revealed that all respondents expressed interest in expanding their businesses if given access to capital and broader markets. This highlights significant growth potential in the future. If supported through programs like People's Business Credit (KUR) or microfinance schemes, VCH has the potential to become a key driver of the coastal economy. One of the respondents, identified as "F," stated that his VCH business provides more stable income than his previous job as a daily fisherman. This supports the conclusion that aquaculture diversification through indoor systems is an effective adaptive strategy amid the uncertainties of capture fisheries.

Based on all findings, the mud crab fattening business using the Vertical Crab House method in Tanete Rilau is proven to be feasible and efficient from financial, technical, and social perspectives. This model can be replicated in other coastal areas with similar characteristics. This study is expected to serve as a reference for policymaking in the development of small-scale aquaculture in Indonesia. In conclusion, the VCH model not only provides economic benefits but also represents an innovative form of aquabusiness that is adaptive to spatial limitations, capital constraints, and environmental change. Moving forward, technological advancement and human resource development will be key to promoting the sustainability and competitiveness of small-scale mud crab farming.

Table 1. Selling Price of Mangrove Crabs (Consumption Size) in VCH System

No	Crab Size (grams)	Selling Price per Crab (IDR)	Description
1	450–500	90,000 – 110,000	Standard consumption size
2	500–550	110,000 – 120,000	Premium export quality
3	>550	>120,000	Special request/export order

Table 2. Financial Analysis of VCH-Based Crab Fattening (Per Cycle Average)

No	Analysis Component	Amount (IDR)	Description
1	Investment Cost	18,500,000	VCH frame, boxes, pipes, water filters
2	Operational Cost	5,000,000	Feed, electricity, labor
3	Revenue	28,000,000	280 crabs × IDR 100,000 selling price
4	Net Profit	4,500,000	After deduction of all costs
5	Payback Period	4 cycles (8 months)	Based on average return period

D. Conclusion and Recommendations

Conclusion:

The implementation of the Vertical Crab House (VCH) system in mangrove crab fattening demonstrates high economic potential and operational efficiency. The structured, vertical housing design not only saves space but also allows for better water circulation and waste management, resulting in healthier and more marketable crabs. Crabs fattened in VCH systems achieve an ideal consumption size (450–500 grams) within 14 - 21 days and command selling prices between IDR 90,000 to IDR 110,000 per crab. Moreover, the quality of the harvested crabs—fresh, clean, and less stressed—meets both local and export market standards. The system also promotes better control over feeding, cleanliness, and survival rates, leading to increased profitability with relatively fast return on investment (approximately 4 cycles or 8 months).

Recommendations:

1. **Technology Scaling:** The VCH system should be introduced and promoted widely among small-scale crab farmers in coastal areas, especially where land and water resources are limited.
2. **Training and Supervision:** Fishermen and aquaculture groups should be given regular training on the operation and maintenance of the VCH system to ensure sustainability and maximize output.
3. **Market Access Support:** Stakeholders, including local governments, should assist in improving market access, cold chain logistics, and certification to support export readiness.
4. **Further Research:** Continuous innovation and research should be carried out to optimize the feed formula, shorten fattening cycles, and increase survival rates.
5. **Environmentally Friendly Practice:** Encourage the integration of VCH with mangrove restoration programs to maintain ecosystem balance and ensure long-term sustainability of the crab farming industry.

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