

## **Capital Budgeting Analysis in Assess the Feasibility of Vaname Shrimp Cultivation Investment**

**Gusni\*, Siti Komariah, Lia Amaliawiati**

Widyatama University, Economics and Business Faculty, Bandung

\*Correspondence: [gusni.tanjung@widyatama.ac.id](mailto:gusni.tanjung@widyatama.ac.id)

**Abstract.** *Vannamei shrimp cultivation business is one type of business that has the potential to be profitable considering the high level of demand every year and of course also requires a fairly large investment. A true investment is an investment made through a feasibility analysis process to determine whether the business activity to be carried out is profitable or harmful. Good investment decisions will result in good business even though the financial decisions taken are not good, on the contrary the wrong investment decisions will be the wrong decisions that will be detrimental even with the best financial policies. The purpose of this study is to determine the feasibility of investment in vaname shrimp farming located in South Lampung Regency, both traditionally, semi-intensively and intensively. This study uses primary data and secondary data. Primary data is obtained from the results of field surveys, while secondary data is obtained from related agencies. The analytical method used in this research is the capital budgeting technique with the approach of NPV, IRR, Gross B/C, and PI. The results of the study using the four methods of capital budgeting above show that investment activities in vaname shrimp farming, both traditional, semi-intensive and intensive, are feasible. The most feasible and profitable method of vaname shrimp cultivation is intensive, which of course also requires the largest investment.*

**Keywords:** *Vaname Shrimp; Investment; Feasibility Study; Capital Budgeting*

### **INTRODUCTION**

Indonesia is one of the countries that have the natural resources potential in the field of marine and fisheries which are very large with a sea area reaching 5.8 million KM<sup>2</sup> and potential fishery resources reaching 53.9 million tons per year consisting of capture fisheries, marine aquaculture, freshwater fisheries, and fisheries pond cultivation. One type of aquaculture business that has great opportunities to grow and develop is vaname shrimp pond cultivation. Vannamei shrimp is also one of the mainstay commodities that have high economic value because it is quite resistant to disease, its growth is quite fast, usually around 100 days, and is known to have a fairly low feed conversion value. Vannamei shrimp is not yet optimal in its production level, while the demand is very high, both locally and internationally. The Central Statistics Agency data shows that local demand for shrimp is quite high, reaching 463,777 thousand tons (Central Statistics Agency, 2018), while for exports the opportunities are still very large, with an average demand increasing by 5.34% per year. Global shrimp demand reached 2.7 million tons in 2018 and is expected to reach more than 3.3 million tons by 2022 (Ministry of Marine Affairs and Fisheries, 2019). This condition shows that investment in vaname shrimp cultivation is quite attractive and has a large profit opportunity, however, it would be better before making an investment decision, a capital budgeting analysis should be carried out first to assess whether the vaname shrimp farming business to be run is feasible or not, until investment that is implanted on target and benefits business actors.

Investment has an important role in determining the progress of a business. Investment can be interpreted as a commitment to use funds for a certain period to obtain payments in the future that will compensate investors with the timing of the use of the funds submitted, the expected inflation rate during the investment period, and the uncertainty of future payments (Reilly and Brown, 2012). ). The right investment decisions can help improve a company's financial health. A true investment is an investment made through a feasibility analysis process to determine whether the business activity to be carried out is profitable or detrimental. Brealey, et. al. (2015) said that good investment decisions will result in good business even though the financial decisions taken are not good, on the contrary, the wrong investment decisions will be the wrong decisions, which will be detrimental even with the best financial policies. Therefore, it is necessary to do a capital budgeting analysis to assess whether or not a business will be carried out.

Capital budgeting decisions are related to investment decisions in long-term projects. Capital budgeting is often used interchangeably with capital expenditure or capital investment. Any expenditure that generates cash flow benefits for more than one year, it is a capital expenditure. For example, the purchase of new equipment, expansion of production capacity, purchase of other companies, research & development, and so on. Capital budgeting involves spending large amounts of cash to generate future returns on investments that have been made. Once, capital budgeting decisions are made, they are often difficult to reverse. Therefore, it is very necessary to carefully analyze and evaluate the proposed capital budgeting decisions (Goel, 2015).

Capital budgeting is a very important process, so it can help in making investment decisions. A good capital budgeting decision for business actors has an important role because it is inappropriate with the main purpose of investment, namely maximizing profits which of course require large resources and long-term commitment. The decision-making process cannot be manipulated, because it will cause losses after the decision is made (Hall and Millard, 2010). Capital budgeting cannot stand alone but is a process called the capital budgeting process. Capital budgeting is a step-by-step process of evaluating and selecting long-term business investments that are consistent with the goals of business actors to maximize wealth (Gitman, et. al., 2015). The capital budgeting process is a gradual activity designed to assist in selecting a feasible and profitable investment project proposal to do (Mollah, Rouf, and Rana, 2021). Leon et. al. (2008) said that capital budgeting is a process of evaluating cash flows for the proposed project by considering risks & uncertainties and making decisions on proposed investment projects. Therefore, more careful action is needed in selecting proposed investment projects so that they can provide benefits and not cause losses.

This research was conducted to determine the feasibility of vaname shrimp farming business, using a capital budgeting analysis technique consisting of the Net Present Value (NPV), Internal Rate of Return (IR), Gross Benefit Cost Ratio (Gross B/C), and Profitability Index (PI) approach. Although there are many approaches to capital budgeting analysis, the four approaches above are considered the most appropriate for conducting a feasibility analysis of investment in vaname shrimp farming and are widely used by experts compared to other approaches (Maroyi and van der Poll, 2012; Ryan and Ryan, 2002). ; Arnold and Hatzopoulos, 2000; Graham and Harvey, 2002; Dedi and Orsag, 2007; Verma et al., 2009; Batra & Verma, 2017).

## **METHODS**

This research is applied research with a quantitative approach. Applied research is research whose findings are used to solve problems in an organization on time (Sekaran & Bougie, 2016). A quantitative approach is an approach that is based on the philosophy of positivism, used to research a particular population or sample, and data collection using research instruments, data analysis is quantitative or statistical, to describe and test established hypotheses. This research was conducted in South Lampung Regency in 2022 using survey methods, interviews, and direct field observations. The data used in this study are primary and secondary. Primary data were obtained by conducting direct observations and interviews with vaname shrimp farming business actors in the Sragi and Ketapang Districts, while secondary data were obtained from the Department of Marine Affairs and Fisheries of South Lampung Regency and the Department of Maritime Affairs and Fisheries of Lampung Province.

For additional information, researchers also use existing information such as articles, journals, books, and websites. To assess the feasibility of investing in vaname shrimp aquaculture related to the research objectives, several capital budgeting methods are used, namely NPV, IRR, Gross B/C, and PI. Goel (2015); Witoko, et al. (2018), explains the concepts and each of these methods' criteria: (1) NPV is the difference between profits and costs that have been calculated at their current value and a certain interest rate. NPV is calculated by discounting future cash flows (both cash inflows and outflows) using a target cost of capital and looking at the difference between the present value of net cash inflows and cash outflows. A positive NPV value indicates that the proposed investment project is profitable and feasible; (2) IRR is an interest rate that shows the total net present value (NPV) equal to the total investment cost of the project. IRR is calculated by finding the discount rate that equates to the present value of cash outflows and cash inflows. This rate of return is then compared with the rate of return required to determine the feasibility of an investment project. The IRR value which is greater than the interest rate illustrates that the proposed investment project is profitable and feasible; (3)

Gross B/C is a comparison between the receipts or benefits of an investment with the costs that have been incurred. A Gross B/C value greater than 1 point that the proposed investment project is profitable and feasible; and (4) PI is a method that compares the value of future net cash flows with the current investment value. PI values greater than 1 tell that the proposed investment project is profitable and feasible.

All of the capital budgeting methods in table 1 above will be used to determine whether the investment in vaname shrimp farming in South Lampung Regency is feasible or not to be carried out according to the criteria that have been set for each method.

**Table1**  
**Research variables description**

Variables	Symbol	Measurement	Description
Net Present Value	NPV	$NPV = \sum_{t=0}^n \frac{CF}{(1+r)^t}$	NPV= Net present value CFt = Expected cash flow in period t r= Project cost of capital/discount rate n= Investment period
Internal Rate of Return	IRR	$IRR = rr + \frac{NPV_{rr}}{TPV_{rr} - TPV_{rt}} \times (rt - rr)$	NPV1= Positive present value NPV2= Negative present value rr= compound factor, if NPV > 0 rt=compound factor, if NPV < 0
Gross Benefit Cost Ratio	Gross B/C	$Gross \frac{B}{C} = \frac{\sum_{t=0}^n \frac{B_t}{(1+i)^t}}{\sum_{t=0}^n \frac{C_t}{(1+i)^t}}$	Bt= Benefit or net income year t Ct= Cost in year t i= Interest rate t= Year (economy time)
Profitability Index	PI	$PI = \sum \frac{PV}{I}$	PV= Present value of cash flow I= Investment value

Source: Brigham & Daves (2019); Brigham & Ehrhardt (2020)

## RESULTS

In the interest of performing a capital budgeting analysis to assess the feasibility of investing in vaname shrimp farming, it is necessary to first identify the investment needs and income from the harvest of vaname shrimp farming business. Vannamei shrimp farming business which is the basis or primary commodity in South Lampung Regency requires various business investment costs, including fixed costs consisting of pond building investment, pond equipment costs, employees, transportation services, pond maintenance, land rent, and variable costs incurred consists of feed, lime, seeds, probiotics, vitamin C, molasses and so on. The vaname shrimp aquaculture business system consists of three forms, namely traditional, semi-intensive and intensive. Each of these vaname shrimp farming systems requires different investment costs which of course will provide different results and benefits as well. Based on the results of interviews with business actors and managers of vaname shrimp cultivation in South Lampung Regency, as well as assistant officers from the Department of Maritime Affairs and Fisheries of South Lampung Regency, it can be concluded that investment needs for vaname shrimp cultivation systems are traditional, semi-intensive and intensive, as shown in the following Table 2-4.

**Table 2**  
**Investment needs for traditional vaname shrimp cultivation per hectare/year in South Lampung Regency in 2022**

No.	Investment needs	Unit	Average amount	Total (IDR.)
1	Fishpond Building Investment			
	Fishpond Preparation	Swath	2	30,000,000.00
	Guard house	Unit	1	3,000,000.00
	Sub total			33,000,000.00
2	Equipment Investment			
	Hoe	Unit	2	110,000.00
	Waring	Unit	3	51,600.00
	thermometer	Unit	1	116,000.00
	PH meter	Unit	1	112,000.00
	Boreholes	Unit	1	2,500,000.00
	Well machine and cable	Unit	1	2,200,000.00
	Big Paralon and Elbow	Unit	3	700,000.00

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	Sub-total			5,789,600.00
3	Other Fixed Cost Investment			
	Employee	Person	1	24,000,000.00
	Transport service	Quintal	20	2,000,000.00
	Electricity	Year	1	1,200,000.00
	Pond maintenance	Swath	2	2,000,000.00
	Land lease	Swath	2	10,000,000.00
	Sub-total			39,200,000.00
4	Variable Cost Investment			
	Pellets/feed	Kg	1600	22,400,000.00
	Chalk	Kg	3000	3,300,000.00
	Seed	Tail	160000	5,600,000.00
	Saponins	Kg	800	9,400,000.00
	Probiotics	Kg	160	1,600,000.00
	Sub-total			42,300,000.00
	<b>Total Investment Requirement</b>			<b>120,289,600.00</b>

Source: Field survey results, 2022

The traditional vaname shrimp cultivation business relies more on nature and the lack of pond farmers, so the costs required are also relatively cheaper than other methods. The data in the table above explains that each hectare of vaname shrimp farming land costs approximately Rp. 120 million with an estimated yield of 5 quintals per harvest period. Every year, the harvest of vaname shrimp can reach 3-4 times with the size of the shrimp harvested ranging from 40-65 per kg and the selling price in the shrimp market not far from 75,000 to 100,000 per kg.

**Table 3**  
**Semi-intensive vaname shrimp cultivation investment needs per hectare/year in South Lampung Regency in 2022**

No.	Investment needs	Unit	Average amount	Total (IDR.)
1	Fishpond Building Investment			
	Fishpond Preparation	Swath	2	30,000,000.00
	Guard house	Unit	1	3,500,000.00
	Sub-total			33,500,000.00
2	Equipment Investment			
	Hoe	Unit	2	110,000.00
	Net	Roll	3	1,050,000.00
	Ferris wheel	Unit	4	24,000,000.00
	Power cable	Roll	1	562,000.00
	thermometer	Unit	1	116,000.00
	PH meter	Unit	1	112,000.00
	Boreholes	Unit	1	2,500,000.00
	Well machine and cable	Unit	1	2,200,000.00
	Big Paralon and Elbow	Unit	3	700,000.00
	Sub-total			31,350,000.00
3	Other Fixed Cost Investment			
	Employee	Person	1	30,000,000.00
	Transport service	Ton	8	8,000,000.00
	Electricity	Year	1	21,000,000.00
	Pond maintenance	Swath	2	4,000,000.00
	Land lease	Hectares	1	10,000,000.00
	Sub-total			73,000,000.00
4	Variable Cost Investment			
	Pellets/feed	Kg	10400	135,200,000.00
	Chalk	Kg	20800	22,880,000.00
	Seed	Tail	560000	19,600,000.00
	SP-36	Kg	635	5,000,000.00
	Saponins	Kg	1000	11,750,000.00
	Vitamin C	Kg	1000	11,000,000.00
	Probiotics	Kg	832	8,320,000.00
	Sub-total			213,750,000.00
	<b>Total Investment Requirement</b>			<b>351,600,000.00</b>

Source: Field survey results, 2022

The vaname shrimp culture system with the semi-intensive method requires a higher cost when compared to the traditional method which of course is also supported by greater yields because it already uses technology such as the use of waterwheels. In addition, the depth of semi-intensive ponds is also deeper than traditional shrimp ponds, which is two times which allows the stocking of shrimp seeds to be denser. For each hectare of land used with a seed stocking density of approximately 140,000 capable of producing 2 tons or more for each harvest period, assuming the shrimp cultivation period is 2½ months and is in normal conditions, meaning that it is not exposed to viruses that come from the water used. The size of shrimp harvested by this method is quite varied, ranging from 60-70 fish per kg with a selling price of around 65,000 – 85,000 per kg.

**Table 4**  
**Investment needs for intensive vaname shrimp cultivation per hectare/year in South Lampung Regency in 2022**

No.	Investment needs	Unit	Average amount	Total (IDR.)
1	Fishpond Building Investment			
	Fishpond Preparation	Swath	2	54,000,000
	Guard house	Unit	1	5,000,000
	Sub-total			59,000,000
2	Equipment Investment			
	Hoe	Unit	2	110,000
	Net	Roll	3	1,050,000
	Plastic	Roll	2	4,500,000
	Bamboo	Swath	6	4,200,000
	Dark Wood	Stem	10	400,000
	Ferris wheel	Unit	12	72,000,000
	Power cable	Roll	2	1,124,000
	thermometer	Unit	1	300,000
	PH meter	Unit	1	112,000
	Boreholes	Unit	1	2,500,000
	Well Equipment	Set	1	1,000,000
	Well machine and cable	Unit	1	2,200,000
	Big Paralon and Elbow	Unit	3	700,000
	Sub-total			90,196,000
3	Other Fixed Cost Investment			
	Employee	Person	1	36,000,000
	Plastic Mounting	Person	2	3,500,000
	Transport service	Ton	21	21,000,000
	Electricity	Year	1	37,500,000
	Pond maintenance	Swath	2	14,100,000
	Land lease	Hectares	1	10,000,000
	Sub-total			122,100,000
4	Variable Cost Investment			
	Pellets/feed	Kg	27300	354,900,000
	Chalk	Kg	54600	60,060,000
	Seed	Tail	1350000	47,250,000
	SP-36	Kg	1300	10,000,000
	Saponins	Kg	2000	23,500,000
	Vitamin C	Kg	3000	33,000,000
	Probiotics	Kg	3000	30,000,000
	Sub-total			558,710,000
	Total Investment Requirement			830,006,000

Source: Field survey results, 2022

The intensive vaname shrimp farming system requires a larger investment compared to traditional and semi-intensive systems, which is more than 830 million because it uses a larger number of windmills and also has deeper ponds than traditional and semi-intensive methods. The results obtained are also greater, which can reach 7 tons for each harvest period based on the explanations of shrimp farming business actors in South Lampung Regency with a seed stocking density of 450 thousand. The size of the shrimp harvested is also quite large, that is around 40-50 per kg with selling prices ranging from 80,000 - 100,000 per kg. The intensive system has a harvest period of 3 times in one year with a cultivation period of up to 3 months for each harvest period.

Intensive systems take a long time to clean the pool, rearrange the pool to be completely ready for reuse, usually around 1 month. Furthermore, an analysis of the income from the production of vaname shrimp will be carried out which is of course needed in conducting a capital budgeting analysis. The income from vaname shrimp cultivation is largely determined by the period of cultivation, whether traditional, semi-intensive, or intensive shrimp farming systems, seed stocking density, the size of shrimp harvested, and the price of vaname shrimp in the market. Based on estimates of vaname shrimp production per hectare per year and shrimp price data based on shrimp size obtained from various sources, it can be estimated that the total income of vaname shrimp farming business actors in South Lampung Regency, as shown in table 4 below:

**Table 5**  
**Income from vaname shrimp cultivation per hectare/year in South Lampung Regency, 2019 – 2021 Period**

Year	Revenue (IDR.)		
	Traditional	Semi Intensive	Intensive
2019	150,000,000	520,000,000	1,470,000,000
2020	160,000,000	600,000,000	1,638,000,000
2021	176,000,000	624,000,000	1,806,000,000

Source: Field survey results, 2022

The calculation results of the income from the production of vaname shrimp above are based on the assumption that during the three years the average shrimp yield for traditional, semi-intensive, and intensive aquaculture systems is relatively the same under normal conditions, meaning that there are no viruses that attack the ponds of business actors for a long period. Shrimp harvest for each method according to the explanation above. By using data on investment needs and the value of income from the production of vaname shrimp farming as described above and the average interest rate on fishery loans set by commercial banks as stated in Indonesian banking statistics, a capital budgeting analysis can be carried out using the Net Present Value (NPV), Gross Benefit Cost Ratio (Gross B/C), Internal Rate of Return (IRR) and Profitability Index (PI) approach to assess whether vaname shrimp farming business in South Lampung Regency is feasible or not to run. Taking into the calculation of the results above, it can be seen that the most profitable vaname shrimp cultivation system is the intensive method. Although it requires a fairly large investment, it also provides much greater returns, so it is very feasible to be carried out by vaname shrimp farming business actors in South Lampung Regency.

**Table 6**  
**The results of capital budgeting analysis of vaname shrimp cultivation in South Lampung Regency**

Cultivation System and Capital Budgeting Method	Value	Assessment criteria	Conclusion
Traditional			
NPV	43,095,616	> 0	feasible
IRR	16.38%	> (9,38%)	feasible
Gross B/C	1.23	> 1	feasible
PI	1.12	> 1	feasible
Semi Intensive			
NPV	393,911,550	> 0	feasible
IRR	29.20%	> (9,38%)	feasible
Gross B/C	1.65	> 1	feasible
PI	1.37	> 1	feasible
Intensive			
NPV	1,588,867,307	> 0	feasible
IRR	41.76%	> (9,38%)	feasible
Gross B/C	1.97	> 1	feasible
PI	1.65	> 1	feasible

Source: Field survey results, 2022, processed data

Vaname shrimp is one of the most popular types of shrimp in Indonesia because almost all shrimp farming business actors cultivate vaname shrimp, including in South Lampung Regency. The focus of developing aquaculture in South Lampung Regency is vaname shrimp, especially in Ketapang and Sragi sub-districts with a large area of land for vaname shrimp cultivation. Vaname shrimp is one of the mainstay commodities that have high economic value, because it is quite resistant to disease, and its growth is quite fast, however its production is still not optimal, while the demand is quite high, both locally and internationally. Vaname shrimp cultivation business has great potential to be developed and profitable business opportunities. In the way to ensure that investment activities in vaname shrimp farming are feasible, capital budgeting analysis is carried out by using the Net Present Value (NPV), Gross Benefit Cost Ratio (Gross B/C), Internal Rate of Return (IRR), and Profitability Index (PI) approach. This analysis is important to do considering the amount of investment invested is quite large for vaname shrimp cultivation activities, especially semi-intensive and intensive ones.

The results of capital budgeting analysis using the NPV, Gross B/C, IRR, and PI approach point that investment activities in vaname shrimp farming in South Lampung Regency, in the term of traditional, semi-intensive, and intensive, are feasible. The most profitable method of vaname shrimp cultivation is the intensive system, although it requires a large investment when compared to the semi-intensive and traditional systems, the potential profit is also very large. Overall, the results of this analysis denote that investment activities in vaname shrimp farming provide great benefits if carried out properly by business actors, especially for cultivation with intensive and semi-intensive systems. Vanamei shrimp has great potential to be developed considering the increasing demand for this type of shrimp commodity both domestically and abroad. The results of this analysis can be used as information in making investment decisions for business people who are interested in vaname shrimp farming.

## CONCLUSIONS

Cultivation fishery has great potential to grow and develop considering that Indonesia is an archipelagic country that has a fairly wide sea. One type of cultivation fishery which is a mainstay commodity that has high economic value is vaname shrimp. Vanamei shrimp is the most popular type of pond-cultured shrimp in Indonesia because almost all shrimp farmers in Indonesia cultivate vaname shrimp, including in South Lampung Regency. Although the size is relatively small when compared to other types of shrimp, the taste is no less delicious and the market demand is also quite high, both domestically and internationally. In addition, vaname shrimp is also able to live in a wide range of salinity, can adapt to low-temperature environments, has a high survival rate, and has good disease resistance, making it easy to cultivate. Vanamei shrimp cultivation systems are usually grouped into three consists traditional, semi-intensive and intensive. Each cultivation system requires different investments and will also provide different yields. This study aims to determine the feasibility of investing in vaname shrimp aquaculture business located in South Lampung Regency. To be able to achieve the research objectives, a survey was conducted by using interview techniques and direct field observation of the vaname shrimp farming business actors in two sub-districts with large shrimp production, namely Ketapang and Sragi sub-districts.

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