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FEASIBILITY EVALUATION STUDY OF VANAME SHRIMP (*Litopenaeus vannamei*) CULTIVATION BUSINESS WITH TWO TYPES OF CAPITAL IN THE BUMI DIPASENA FISHING AREA, RAWAJITU TIMUR DISTRICT

Kajian Evaluasi Kelayakan Usaha Budidaya Udang Vaname (*Litopenaeus vannamei*) Dengan Dua Jenis Permodalan Di Kawasan Pertambakan Bumi Dipasena Kecamatan Rawajitu Timur

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ABSTRACT

The research aims to determine the evaluation of the financial feasibility and sensitivity of the vannamei shrimp cultivation business in the Dipasena Earth Farming Area, East Rawajitu District on two types of capital, namely independent and borrowed capital. The research was carried out in the Dipasena Earth Farming Area, East Rawajitu District in April – May 2024. The total cost of the vaname shrimp cultivation business was IDR 72,454,423 in independent capital and IDR 80,003,175 in borrowed capital with business profits of -Rp 9,915,373 in independent capital and - IDR 20,596,075 in borrowed capital for 3 harvest periods in one year. Based on the calculation results *Net Present Value* (NPV), B/C Rasio, R/C Rasio, *Internal Rate of Return* (IRR), and *Payback Period* (PP) in both types of capital, the business is included in the criteria of not being feasible. Sensitivity analysis shows that businesses with both types of capital are sensitive to changes in conditions, in this case an increase in operational costs of 2.75% and a decrease in production of 10%.

Keywords: *Business feasibility, sensitivity, cultivating vaname shrimp*

ABSTRAK

Penelitian bertujuan untuk mengetahui evaluasi kelayakan finansial dan sensitivitas usaha budidaya udang vanname di Kawasan Pertambakan Bumi Dipasena Kecamatan Rawajitu Timur pada dua jenis permodalan, yaitu permodalan mandiri dan pinjam. Penelitian dilaksanakan di Kawasan Pertambakan Bumi Dipasena Kecamatan Rawajitu Timur pada bulan April – Mei 2024. Total biaya usaha budidaya udang vaname sebesar Rp72.454.423 pada modal mandiri dan Rp80.003.175 pada modal pinjam dengan keuntungan usaha sebesar -Rp9.915.373 pada modal mandiri dan -Rp20.596.075 pada modal pinjam selama 3 periode

panen dalam satu tahun. Berdasarkan hasil perhitungan *Net Present Value* (NPV), B/C Rasio, R/C Rasio, *Internal Rate of Return* (IRR), dan *Payback Period* (PP) pada kedua jenis permodalan, usaha tersebut termasuk dalam kriteria tidak layak. Analisis sensitivitas menunjukkan usaha dengan kedua jenis permodalan tersebut sensitif terhadap perubahan kondisi, dalam hal ini kenaikan biaya operasional 2,75% dan penurunan produksi 10%.
Kata Kunci: *Kelayakan usaha, Sensitivitas, Budidaya udang vaname*

INTRODUCTION

Indonesia as one of the countries producing fishery commodities contributes to the world's food needs. Based on data from the Ministry of Maritime Affairs and Fisheries (2022), fishery exports reached a value of USD5.719 billion in 2021 with the largest export commodities being Shrimp, Tuna-Tongkol-Skipjack, Squid-Cuttlefish-Octopus, Swimming Crab, and Seaweed. Shrimp was the highest export commodity in 2021 with an export volume of 250,715 tons and a value of USD2,228,947,835. Shrimp exports increased throughout 2017-2021, an average of 8.63% (KKP, 2022). Meanwhile, based on data from the Central Statistics Agency (2024), in 2021-2023 the volume and value of shrimp exports decreased. In 2023, the volume of shrimp production will be 151,900 tons and the production value will be USD 1,198,500,000.

According to the Situbondo Brackish Water Aquaculture Center or hereinafter referred to as BPBAP, vannamei shrimp cultivation is growing rapidly, replacing tiger shrimp cultivation. Vannamei shrimp has several advantages compared to other types of shrimp, including a growth rate of 1-1.5 grams/week, can be cultivated with high stocking density, lower feed protein requirements, and lower size variations (BPBAP Situbondo, 2021).

The vaname shrimp farming business has developed in many regions in Indonesia, one of which is in Lampung Province, precisely in Rawajitu Timur District, Tulang Bawang Regency. The Bumi Dipasena shrimp farming area in Rawajitu Timur District, Tulang Bawang Regency covers an area of 16,250 Ha. In the 1990s, Bumi Dipasena became the largest shrimp farming area in Southeast Asia, managed by PT. Dipasena Citra Darmaja and then continued by PT. Aruna Wijaya Sakti. Until 2014, Bumi Dipasena became an independent shrimp farming area (P3UWL, 2023).

Vaname shrimp production in Tulang Bawang Regency is one of the largest in Lampung Province. However, the amount of production fluctuates every year. In 2021, the amount of production was 38,397.5 tons and decreased in 2022 to 34,748.7 tons (Tulang Bawang Regency Fisheries Service, 2022). The decline in the number of vannamei shrimp production in East Rawajitu District is caused by natural disturbances, including disease, rainfall and extreme hot weather. Not a few farmers have suffered losses in the last four years due to these problems, this can affect the turnover of the business being run.

In general, there are two types of capital commonly used by vaname shrimp farmers in Bumi Dipasena, Rawajitu Timur District, namely personal (independent) capital and loan capital. Farmers with independent capital have the flexibility to regulate the cultivation method and sales of production results. Meanwhile, farmers with borrowed capital, some of the cultivation methods are regulated by the capital owner, the sale of production results must be to the capital provider, and the price of operational materials for cultivation is higher than the market price.

From the problems that occur in vaname shrimp farming activities in Rawajitu Timur District, farmers do not yet know whether the business activities being carried out are still economically feasible or not and to what extent the impact of the existing problems is on farmers with capital from the mentor. Based on this, it is necessary to study economically the feasibility of vaname shrimp farming with two types of capital that are generally used by

shrimp farmers in Bumi Dipasena, Rawajitu Timur District. According to Diana (2016), the feasibility study of vannamei shrimp cultivation is expected to avoid the risk of loss, facilitate planning, facilitate work implementation, facilitate supervision and facilitate control.

RESEARCH METHODS

Time and Place

Research on the feasibility of vannamei shrimp farming with two types of capital was conducted in the Bumi Dipasena Aquaculture Area, Rawajitu Timur District, Tulang Bawang Regency. The research was conducted from April to May 2024.

Research Data

This study uses primary and secondary data. Primary data is data obtained directly from the research object. Primary data includes data that describes legal, environmental, marketing, technical, human resource management, and financial aspects. Secondary data is data that supports primary data. The sample in this study was selected using the purposive random sampling method where sample selection is based on certain criteria. The sample criteria include:

- Farmers who have been running a vaname shrimp cultivation business for at least 10 years;
- Farmers who have completed one cultivation cycle;
- Farmers who carry out cultivation businesses with independent capital and from the Supervisor.

The determination of the number of samples in this study used the Slovin formula with an error rate of 15% (Gunawati and Sudarwati, 2017), so that the number of samples was obtained as in Table 1:

Table 1. Details of research respondents

No.	Respondents	Number of people)	Information
1.	Independent capital farmers	20	Businessmen
2.	Loan capital for farmers	20	Businessmen
3.	Extension worker fishery	1	Companion
Total respondents		41	

Data Collection Methods

In this study, data collection was carried out using several methods as follows:

- Interview

In this study, the interview process was carried out in a semi-structured manner, where the interview process was not structured as in the interview guidelines that had been prepared previously (Hermawan and Amirullah, 2016).

- Observation

This study conducted direct and indirect observations. Direct observation means that the researcher directly observes the research object at the place and time of the event. While indirect observation is carried out through the intermediary of certain tools, such as photos (Rahmadi, 2011).

- Questionnaire

The questions in the questionnaire have several components, namely filling instructions, the respondent's identity section (name, address, gender, occupation, age, and others), and a list of questions that are arranged systematically.

Data Analysis

The data on the feasibility aspects of the business were analyzed through data processing on Microsoft Office Excel software in 2013. Financial projection analysis was carried out using the cash flow method (Witoko *et al.,* 2019). Financial data analysis was calculated through the following calculations:

- *Net Present Value* (NPV)
  NPV is the difference between the present value of cash inflows and the present value of cash outflows in a given time period. NPV is calculated using the formula $NPV = \sum_{t=1}^{n} \frac{Bt-Ct}{(1+i)^t} - Ko$. Bt is the benefit in year i, C is the cost in year i, N is the project age (year), t is Year 1,2,3 etc., i is the Discount Rate, Ko is the initial investment. The NPV criteria are: If NPV > 0, the shrimp farming business is feasible; If NPV < 0, the shrimp farming business is not feasible; If NPV = 0, the shrimp farming business breaks even (break event point) (Hilal & Fatmawati, 2019).

- *Gross Benefit/Cost Ratio* (*Gross* B/C)
  Gross Benefit/Cost Ratio (*Gross* B/C) is a comparison between the amount of present value benefit (PvB) or profit at a certain time with the present value cost (PvC) or profit at a certain time. The Gross B/C value can be obtained through calculations (Sari *et al.,* 2016): $Gross\ B/C = \frac{\sum Present\ Value\ Benefit}{\sum Present\ Value\ Cost}$. The criteria for the Gross Benefit Cost Ratio (Gross B/C) value are as follows: If Gross B/C has a value of >1 then the business is declared feasible; If Gross B/C has a value of <1 then the business is declared not feasible to continue.

- *Net Benefit/Cost Ratio* (*Net* B/C)
  Net B/C Ratio is used to find out the comparison between the benefits obtained and the costs incurred. Net B/C Ratio is calculated using the following formula $Net\frac{B}{C} = \frac{\sum_{t=0}^{n} Bt-Ct/(1+i)^t}{\sum_{t=0}^{n} Ct-Bt/(1+i)^t}$. Bt is Benefit/Receipt in a certain year, Ct is Cost in a certain year, i is interest rate (%), t is year 1,2,3 etc., n is project age (years). The criteria for Net B/C Ratio are as follows: If Net B/C> 1, the shrimp farming business is feasible; If Net B/C < 1, the shrimp farming business is not feasible; If Net B/C = 1, the shrimp farming business breaks even (Hilal & Fatmawati, 2019).

- *Payback Period*
  Payback period (PP) is a period of time (period) for the return of the total amount of investment invested, calculated from the start of the project to the net flow of additional production, so as to reach the total amount of capital investment invested using cash flow (Maulana et al., 2022). To calculate the PP value, you can use the following equation (Utomo *et al.,* 2022): PP = $\frac{investment}{\text{Profit}}$ × 1 year

- *Internal Rate of Return* (IRR)
  Internal Rate of Return (IRR) is an interest rate that shows the amount of net present value (NPV) equal to the total cost of the project investment. The calculation of IRR is as follows (Witoko *et al.,* 2019): $IRR = i1 + \left[\frac{NPV1}{NPV1-NPV2}\right] (i2 - i1)$. NPV1 is positive Present Value, NPV2 is negative Present Value, i1 is discount rate. Here are the IRR criteria: If IRR > i, the

shrimp farming business is feasible; If IRR < i, the shrimp farming business is not feasible; If IRR = i, the shrimp farming business breaks even.

- Sensitivity Analysis

Sensitivity analysis needs to be done to identify problems in the future, so that it can minimize the possibility of results that are not in accordance with the target in an investment, where sensitivity analysis will take into account things that will hinder or opportunities from the investment to be carried out, and can be used as a guideline or direction for the business to be carried out (Nainggolan *et al.,* 2021). The sensitivity rate can be calculated using the following equation: Sensitivity Rate$= \frac{\left|\frac{xi-x0}{x}\right| \times 100\%}{\left|\frac{yi-y0}{y}\right| \times 100\%}$

Description:
xi = NPV or IRR or Net B/C or Gross B/C after the change
x0 = NPV or IRR or Net B/C or Gross B/C before the change
x = Average change in NPV or IRR or Net B/C or Gross B/C
yi = Price of business input after the change
y0 = Price of business input before the change
y = Average change in price of business input

The sensitivity analysis criteria are as follows (Sari *et al.,* 2016): (1) if the sensitivity rate > 1, then the business is sensitive to change, and (2) if the sensitivity rate ≤ 1, then the business is not sensitive to change.

RESULT

Investment Costs

The investment costs incurred by each vaname shrimp farmer in the Bumi Dipasena Aquaculture Area, East Rawajitu District, both farmers with independent capital and borrowed capital are generally the same. This is because the farmers use the same vaname shrimp farming technique, namely the semi-intensive technique. The details of the investment costs incurred by each farmer are explained in table 2.

Table 2. Details of investment costs per farmer

No.	Description	Cost (Rp)
1.	*Paddle wheel* 2 sets	10,000,000
2.	kWh electricity	4,000,000
3.	Electrical panel	1,000,000
4.	Power cable	1,000,000
5.	Water pump	2,500,000
6.	Diesel engine	3,500,000
7.	Anko	500,000
Amount (Rp)		***22,500,000***

The investment costs incurred by farmers in Bumi Dipasena, Rawajitu Timur District, are almost the same as the research results of Amri *et al.* (2022) in Manakku Village, Labakkang District, Pangkep Regency, Makassar, which is IDR 19,000,000.

Operating costs

Operational costs are incurred by farmers so that the vaname shrimp cultivation process can take place. The amount of operational costs incurred by each farmer is different. This is because there are differences in the capital systems used by farmers, where some farmers choose independent capital and others choose borrowed capital.

Operational costs are costs that change or are not fixed because they are influenced by market prices and cultivation conditions. According to Ichsan *et al.* (2019) examples of variable costs in a business include raw materials for production, production facilities such as fertilizers, feed, and medicines, auxiliary materials such as fuel, and direct labor wages. In this study, operational costs were averaged over one year for 2 ponds with a pond size of 2,000m^2 each, as explained in Table 3.

Table 3. Details of operational costs for one year

No.	Cost Description	Operating costs Cultivators (Rp)	
		Independent	**Borrow**
1.	shrimp fry	5,985,170	6,978,825
2.	Feed	15,320,500	18,662,000
3.	Fertilizer	2,364,501	3,382,500
4.	Drugs	1,612,500	3,052,500
5.	Fuel Oil (BBM)	1,310,001	1,786,350
6.	Electricity token	3,998,751	4,278,000
7.	Work Wages	29,700,000	29,700,000
8.	Harvest Costs	3,000,000	3,000,000
Amount (Rp)		***62,691,420***	***66,248,390***

Based on table 3, the operational costs for cultivating vaname shrimp in the Bumi Dipasena Aquaculture Area, East Rawajitu District for one year with 3 harvest periods and a stocking density of ±50,000 fish are IDR 62,691,420 for independent capital farmers and IDR 66,248,390 for borrowed capital farmers. This amount is greater than the operational costs in the study by Qulubi *et al.* (2023) in East Lampung with simple (extensive) cultivation techniques, which is IDR 32,640,000 for 3 harvest periods.

Maintenance Costs

Maintenance costs are needed to maintain the system used during the production process, in this activity is the supporting machine equipment for the vaname shrimp cultivation process. The details of maintenance costs are explained in table 4.

Table 4. Details of maintenance costs for supporting cultivation equipment

No.	Description	Cost (Rp/ year)
1.	*Paddle wheel* (aerator wheel)	600,000
2.	Machine water pump	600,000
3.	Diesel engine	900,000
4.	Pond	3,000,000
Amount (Rp/ yr)		***5,100,000***

Maintenance costs include hardware maintenance (repair, service), software maintenance (program modification, addition of program modules), and equipment and facility maintenance (Ichsan *et al.,* 2019). Based on this statement, the maintenance in vaname shrimp cultivation activities is included in the maintenance of cultivation equipment and facilities.

Depreciation Costs

The supporting equipment for cultivation used by the majority of vaname shrimp farmers in the Bumi Dipasena Aquaculture Area, East Rawajitu District currently consists of water

pumps, paddle wheels, diesel, electrical panel boxes, and electrical cables. According to Utomo *et al.* (2022), the depreciation value is obtained from the price of investment goods divided by their economic life. Details of the depreciation value of physical assets supporting vaname shrimp cultivation are explained in table 5.

Table 5. Depreciation value of physical assets supporting cultivation

No.	Physical Assets	Age Economic (yr)	Depreciation Value (Rp/ yr)
1.	*Paddle wheel* 2 sets	10	1,000,000
2.	Electrical panel box	25 – 40	40,000
3.	Power cable	25	40,000
4.	Water pump	10	250,000
5.	Generator	15	233.333
6.	Anko	5	100,000
Amount (Rp/ yr)			***1,663,333***

Each physical asset will experience a decline in condition over time. This decline in condition affects the value of the fixed asset, which in a certain period of time the asset value will experience depreciation. This is as stated by Renanda *et al.* (2019), each piece of equipment used has its own economic life and depreciation value.

Total Cost

Total cost in this case is the total cost required by the farmer to carry out vaname shrimp farming business activities. The total cost required by vaname shrimp farmers with independent capital and borrowed capital is different because the operational costs required by the two types of farmers are different. The total cost incurred by each farmer during the year or 3 cultivation periods for two cultivation ponds with each pond area of 2,000m2 is explained in table 6.

Table 6. Total cost required by vaname shrimp farmers for one year

No.	Cost Description	Total Cost (Rp/ yr)	
		Independent	Borrow
1.	Maintenance costs	5,100,000	5,100,000
2.	Depreciation expense	1,663,000	1,663,000
3.	Operating costs	65,691,423	73.240.175
Amount (Rp/ yr)		***72,454,423***	***80,003,175***

Profit

In this study, the profits obtained by independent capital farmers are greater than those with borrowed capital, where farmers with independent capital gain greater profits. This is because the operational costs borne by borrowed capital farmers are greater than the operational costs incurred by independent capital farmers. The value of the profits obtained by farmers is explained in table 7.

Table 7. Value of vaname shrimp farming business profits in East Rawajitu District

No.	Description	Independent Capital	Loan Capital
1.	Total Cost	Rp72,454,423	Rp80,003,175
2.	Reception	Rp62,539,050	Rp59,407,100
3.	Profit	-Rp9,915,373	-Rp20,596,075

Based on the calculation results, the profit value obtained by farmers, both independent capital and borrowed capital, shows a negative value, so the business does not generate profits for the farmers. This is one of the impacts of the rampant diseases that attack shrimp, as shown in the results of laboratory tests conducted by the Lampung Fish Quarantine, Quality Control, and Fishery Product Safety Agency in 2022. Tests were carried out on shrimp, water, and mud samples, the sampling of which was carried out randomly. The test results stated that the samples were affected by several viruses that caused mass deaths in shrimp, namely White Spot Syndrome Virus (WSSV), Acute Hepatopancreatic Necrosis Disease (AHPND), Enterocytozoon hepatopensei (EHP).

DISCUSSION

Geographical Location and Characteristics of Bumi Dipasena Community

Bumi Dipasena is a shrimp farming village located on the East Coast of Tulang Bawang Regency, Lampung, precisely in Rawajitu Timur District. Bumi Dipasena is flanked by two large rivers, namely the Mesuji River and the Tulang Bawang River. There are 8 (definitive) villages in Rawajitu Timur District, namely Bumi Dipasena Sentosa Village, Bumi Dipasena Utama, Bumi Dipasena Agung, Bumi Dipasena Jaya, Bumi Dipasena Makmur, Bumi Dipasena Mulya, Bumi Dipasena Sejahtera, and Bumi Dipasena Abadi.

Bumi Dipasena is the result of a mega shrimp farming industry project that was first built by PT. Dipasena Citra Darmaja, which then its first name became the name of the Bumi Dipasena area. The total land area of Bumi Dipasena is 16,250 Ha with 17,760 ponds and a length of irrigation channels of 1,223 Km. This area became the largest shrimp farming area in Indonesia and Southeast Asia in the 1990s (P3UW, 2023).

The Bumi Dipasena community makes a living as shrimp farmers, either with their own capital or with loans. As is the characteristic of coastal communities in general, the Bumi Dipasena community depends on their livelihoods in coastal areas, where coastal areas have great potential for various activities in the fisheries sector. The social relations of the Bumi Dipasena community are like those of rural communities in general, where upholding family, friendliness, mutual trust, and mutual cooperation in every village activity are still cultivated. This was created from one of the historical backgrounds of the Bumi Dipasena conflict which has been going on for almost a dozen years.

Business Feasibility Analysis

Cash flow from vaname shrimp farming business in Bumi Dipasena, Rawajitu Timur District with independent capital and borrowed capital for 10 years of cultivation period is presented in tables 8 and 9.

Table 8. Cash flow of vaname shrimp farming business in Rawajitu Timur District with independent capital

No.	Cost Description	The year of									
		0	1	2	3	4	5	6	7	8	9
I	**Investment Costs**										
1.	*Paddle wheel* 2 sets	10,000,000									
2.	kWh electricity	4,000,000									
3.	Electrical panel box	1,000,000									
4.	Power cable	1,000,000									
5.	Water pump	2,500,000									
6.	Diesel engine	3,500,000									
7.	Anko	500,000					500,000				
Sub total investment costs		**22,500,000**					**500,000**				
II	**Depreciation Expense**										
1.	*Paddle wheel*	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
2.	Electrical panel box	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
3.	Power cable	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
4.	Water pump	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000
5.	Generator	233,000	233,000	233,000	233,000	233,000	233,000	233,000	233,000	233,000	233,000
6.	Anko	100,000	100,000	100,000	100,000	100,000		100,000	100,000	100,000	100,000
Sub total depreciation expense		**1,663,000**	**1,663,000**	**1,663,000**	**1,663,000**	**1,663,000**	**1,563,000**	**1,663,000**	**1,663,000**	**1,663,000**	**1,663,000**
III	**Maintenance Fee**										
1.	*Paddle wheel* 2 sets	0	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000
2.	Water pump	0	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000
3.	Generator	0	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000	900,000
4.	Pond	0	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000
Sub total maintenance costs		**0**	**5,100,000**	**5,100,000**	**5,100,000**	**5,100,000**	**5,100,000**	**5,100,000**	**5,100,000**	**5,100,000**	**5,100,000**
IV	**Operating costs**										
1.	shrimp fry	0	5,985,170	5,985,170	5,985,170	5,985,170	5,985,170	5,985,170	5,985,170	5,985,170	5,985,170
2.	Feed	0	15,320,500	15,320,500	15,320,500	15,320,500	15,320,500	15,320,500	15,320,500	15,320,500	15,320,500
3.	Fertilizer	0	2,364,501	2,364,501	2,364,501	2,364,501	2,364,501	2,364,501	2,364,501	2,364,501	2,364,501
4.	Drugs	0	1,612,500	1,612,500	1,612,500	1,612,500	1,612,500	1,612,500	1,612,500	1,612,500	1,612,500
5.	fuel	0	1,310,001	1,310,001	1,310,001	1,310,001	1,310,001	1,310,001	1,310,001	1,310,001	1,310,001
6.	Electricity token	0	3,998,751	3,998,751	3,998,751	3,998,751	3,998,751	3,998,751	3,998,751	3,998,751	3,998,751
7.	Labor Wages	0	29,100,000	29,100,000	29,100,000	29,100,000	29,100,000	29,100,000	29,100,000	29,100,000	29,100,000
8.	Harvest Costs	0	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
9.	Land Rental Fee	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000

No.	Cost Description	The year of									
		0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Sub total operating costs		***5,000,000***	***65,691,423***	***65,691,423***	***65,691,423***	***65,691,423***	***65,691,423***	***65,691,423***	***65,691,423***	***65,691,423***	***65,691,423***
Total cost		***29,163,000***	***72,454,423***	***72,454,423***	***72,454,423***	***72,454,423***	***72,854,423***	***72,454,423***	***72,454,423***	***72,454,423***	***72,454,423***
***PV Cost**		***29,163,000***	***66,716,780***	***61,433,499***	***56,568,599***	***52,088,950***	***48,228,838***	***44,165,785***	***40,668,310***	***37,447,799***	***34,482,320***
Reception		***0***	***62,539,050***	***62,539,050***	***62,539,050***	***62,539,050***	***62,539,050***	***62,539,050***	***62,539,050***	***62,539,050***	***62,539,050***
***PV Acceptance**		***0***	***57,586,602***	***53,320,519***	***48,424,778***	***44,467,198***	***40,833,056***	***37,495,919***	***34,431,514***	***31,617,552***	***29,033,565***
Residual value											***2,467,000***
Profit		***-29,163,000***	***-9,915,373***	***-9,915,373***	***-9,915,373***	***-9,915,373***	***-10,315,373***	***-9,915,373***	***-9,915,373***	***-9,915,373***	***-7,448,373***
***PV Profit**		***-29,163,000***	***-9,130,178***	***-8,453,803***	***-7,677,599***	***-7,050,137***	***-6,735,123***	***-5,944,862***	***-5,459,010***	***-5,012,865***	***-3,457,885***
NPV		***-88,084,462***									

Table 9. Cash flow of vaname shrimp farming business in East Rawajitu District with borrowed capital

No.	Cost Description	The year of									
		0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
I	**Investment Costs**										
1.	*Paddle wheel* 2 sets	10,000,000									
2.	kWh electricity	4,000,000									
3.	Electrical panel box	1,000,000									
4.	Power cable	1,000,000									
5.	Water pump	2,500,000									
6.	Diesel engine	3,500,000									
7.	Anko	500,000					500,000				
Sub total investment costs		**82,500,000**					**500,000**				
II	**Depreciation Expense**										
1.	*Paddle wheel*	0	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
2.	Electrical panel box	0	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
3.	Power cable	0	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
4.	Water pump	0	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000
5.	Generator	0	233,000	233,000	233,000	233,000	2335000	233,000	233,000	233,000	233,000
6.	Anko	0	100,000	100,000	100,000	100,000		100,000	100,000	100,000	100,000
Sub total depreciation expense		**0**	**1,663,000**	**1,663,000**	**1,663,000**	**1,663,000**	**1,563,000**	**1,663,000**	**1,663,000**	**1,663,000**	**1,663,000**
III	**Maintenance Fee**										
1.	*Paddle wheel* 2 sets	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000
2.	Water pump	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000
3.	Diesel engine	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000
4.	Pond	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000
Sub total maintenance costs		**7,100,000**	**7,100,000**	**7,100,000**	**7,100,000**	**7,100,000**	**7,100,000**	**7,100,000**	**7,100,000**	**7,100,000**	**7,100,000**
IV	**Operating costs**										
1.	shrimp fry	0	6,978,825	6,978,825	6,978,825	6,978,825	6,978,825	6,978,825	6,978,825	6,978,825	6,978,825

No.	Cost Description	The year of									
		0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
2.	Feed	0	18,662,000	18,662,000	18,662,000	18,662,000	18,662,000	18,662,000	18,662,000	18,662,000	18,662,000
3.	Fertilizer	0	3,382,500	3,382,500	3,382,500	3,382,500	3,382,500	3,382,500	3,382,500	3,382,500	3,382,500
4.	Drugs	0	3,052,500	3,052,500	3,052,500	3,052,500	3,052,500	3,052,500	3,052,500	3,052,500	3,052,500
5.	fuel	0	1,786,350	1,786,350	1,786,350	1,786,350	1,786,350	1,786,350	1,786,350	1,786,350	1,786,350
6.	Electricity token	0	4,278,000	4,278,000	4,278,000	4,278,000	4,278,000	4,278,000	4,278,000	4,278,000	4,278,000
7.	Labor Wages	0	29,100,000	29,100,000	29,100,000	29,100,000	29,100,000	29,100,000	29,100,000	29,100,000	29,100,000
8.	Harvest Costs	0	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
9.	Land Rental Fee	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000
Sub total operating costs		***5,000,000***	***73.240.175***	***73,240,175***	***73.240.175***	***73.240.175***	***73.240.175***	***73.240.175***	***73.240.175***	***73.240.175***	***73.240.175***
Total cost		***29,163,000***	***80,003,175***	***80,003,175***	***80,003,175***	***80,003,175***	***80,403,175***	***80,003,175***	***80,003,175***	***80,003,175***	***80,003,175***
****PV. Fee***		***29,163,000***	***73,667,749***	***68.210.355***	***61,947,471***	***56,884,730***	***52,496,917***	***47,966,711***	***44,046,567***	***40,446,802***	***37,141,232***
Reception		***0***	***59,407,100***	***59,407,100***	***59,407,100***	***59,407,100***	***59,407,100***	***59,407,100***	***59,407,100***	***59,407,100***	***59,407,100***
***PV. Acceptance**		***0***	***54,702,670***	***50,650,232***	***45,999,670***	***42,240,284***	***38,788,140***	***35,618,127***	***32,707,187***	***30,034,148***	***27,579,566***
Residual value											***2,467,000***
Income		***-29,163,000***	***-20,596,075***	***-20,596,075***	***-20,596,075***	***-20,596,075***	***-20,996,075***	***-20,596,075***	***-20,596,075***	***-20,596,075***	***-18,129,075***
***PV. Income**		***-29,163,000***	***-18,965,078***	***-17,560,123***	***-15,947,802***	***-14,644,446***	***-13,708,777***	***-12,348,585***	***-11,339,380***	***-10,412,654***	***-8,416,368***
NPV		***-152,506,213***									

Description:

* Present value or current value calculated in 2021 - 2022 using a compounding factor of: 8.6; 8.3; 8.9 and in 2023 - 2029 using a discount rate of: 8.9

Calculation of cash flow on the cash of the vaname shrimp farming business in Bumi Dipasena, East Rawajitu District with independent capital and borrowed capital requires a discount rate (dr) and compounding factor (cf) or interest rate at a certain time to estimate the present value of an activity. Based on the cash flow of the vaname shrimp farming business with two types of capital, the value of each element of financial feasibility is included in the criteria of not feasible, both in businesses with independent capital and with borrowed capital. The results of the calculation of each element of financial feasibility are presented in table 10.

Table 10. Financial feasibility of vaname shrimp farming business with independent capital and borrowed capital

No.	Element Financial Eligibility	Independent Capital Cultivator	Eligible/Uneligible	Loan Capital Cultivator	Eligible/Uneligible
1.	*Net Present Value* (NPV)	-Rp88,084,462	Not feasible	-Rp152,506,213	Not feasible
2.	*Net B/C* Ratio	-2.02	Not feasible	-4.23	Not feasible
3.	*Gross B/C* Ratio	0.83	Not feasible	0.71	Not feasible
4.	*Internal Rate of Return* (IRR)	Not detected	Not feasible	Not detected	Not feasible
5.	*Payback Period* (PP)	More than 10 years	Not feasible	More than 10 years	Not feasible

***Net Present Value* (NPV)**

The results of the NPV calculation carried out in this study on the vaname shrimp farming business with two types of capital in the Bumi Dipasena Aquaculture Area, East Rawajitu District, namely -Rp88,084,462 for independent capital farmers and -Rp152,506,213 for borrowed capital farmers. The NPV of both types of business capital is negative. So it is not feasible to run until 2029 if the current conditions are met. According to Hilal and Fatmawati (2019), if the NPV <0 or has a negative value, the business is not feasible to run. The rampant disease that has attacked shrimp since the end of 2020 has caused farmers to reduce stocking densities, so that the resulting production value is very small. As a result, the Middlemen or Supervisors who provide capital loans to farmers have stopped all their loans in 2024.

***Net B/C* Rasio**

Based on the data in table 9, the results of the calculation of the net B/C ratio of the vaname shrimp farming business with independent capital and borrowed capital are negative, namely -2.02 and -4.23. This means that the vaname shrimp farming business carried out either with an independent or borrowed capital system is not feasible to run. The net B/C value indicates the feasibility status of a business, where if the net B/C value is less than one or negative, the business is not feasible (Hilal and Fatmawati, 2019). The greater the value of the profit to cost ratio (B/C ratio), the greater the benefits that will be obtained from the business.

***Gross B/C* Rasio**

The gross B/C value from this study was 0.83 for businesses with independent capital and 0.71 for businesses with borrowed capital. This shows that businesses that are run with cultivation conditions that currently have several problems are not feasible to implement. As stated by Sari *et al.* (2016) a gross B/C value of less than 1 (one) indicates that a business is not feasible to run.

The gross B/C value shows the value of income obtained from a business for each expenditure of one unit (Fika *et al.,* 2016). This is the same as the net B/C ratio value, if a number of production costs of Rp1 are incurred, the income obtained by independent capital cultivators is Rp0.83 and borrowed capital cultivators is Rp0.71.

***Internal Rate of Return* (IRR)**

The Internal Rate of Return (IRR) value indicates the ability of an activity to generate a return or level of profit to be achieved. The results of the financial analysis of the internal rate of return on investment in the vaname shrimp farming business in the Bumi Dipasena Aquaculture Area, East Rawajitu District cannot be detected. This is because in the business cash flow, both with independent capital and borrowed capital from 2020 to 2029, all NPVs are negative. Given that the IRR value is an interpolation between a lower discount rate (producing a positive NPV) and a higher discount rate (producing a negative NPV), the IRR value is between positive NPV and negative NPV (Ichsan *et al.,* 2019).

***Payback Period* (PP)**

Based on the results of the Payback Period (PP) calculation presented in table 9, it is known that the PP value for the vaname shrimp farming business in Bumi Dipasena, Rawajitu District, both with independent capital and borrowed capital, is more than 10 years. According to Ariadi *et al.* (2021), the average technical age of a shrimp farming business is 8.5 years. So, if the PP value is above the technical age of the business, the business is not feasible.

The PP value is obtained from the comparison between the investment value of IDR 22,500,000 with the benefits obtained in one year of business, multiplied by the investment age

of 1 year. The payback period (PP) analysis aims to determine the time required to cover the investment value (Nainggolan *et al.,* 2021).

Sensitivity Analysis

The changes analyzed in the sensitivity analysis are the increase in operational costs and the decrease in the amount of cultivation production. The sensitivity analysis was carried out on the vaname shrimp cultivation business in Bumi Dipasena, Rawajitu Timur District with two types of capital, namely independent capital and borrowed capital. The results of the sensitivity analysis calculation on the business are presented in table 11.

Table 11. Sensitivity rate of financial feasibility criteria in vaname shrimp cultivation business

Financial Feasibility Elementsl	Scenario		Sensitivity Rate in Scenarios	
	Operational Cost Increase 2.75%	**10% Decrease in Production Amount**	**Operational Cost Increase 2.75%**	**10% Decrease in Production Amount**
Independent Capital Cultivator				
Net Present Value	-Rp91,502,609	-Rp125,805,532	5.11	3.35
Net B/C Ratio	-2.14	-3.31	7.56	4.61
Gross B/C Ratio	0.82	0.74	1.00	1.00
Internal Rate of Return	Not detected	Not detected	Not detected	Not detected
Payback Period	Over 10 years	Over 10 years	51.35	13.22
Loan Capital Cultivator				
Net Present Value	-Rp156,965,329	-Rp188,338,215	3.26	2.00
Net B/C Ratio	-4.38	-5.46	4.02	2.41
Gross B/C Ratio	0.71	0.64	1.00	1.00
Internal Rate of Return	Not detected	Not detected	Not detected	Not detected
Payback Period	Over 10 years	Over 10 years	8.18	3.71

Based on the results of the sensitivity analysis calculation in table 11, the following can be explained:

1. Investment costs and depreciation costs remain the same, but there is a 2.75% increase in operational costs including feed, medicine, fertilizer, and fuel costs. The 2.75% increase is taken from the inflation rate in 2023. The sensitivity rate value of each financial feasibility element is more than 1 (one) in both capital systems. This explains that the vaname shrimp farming business in Bumi Dipasena Ponds is sensitive to an increase in operational costs of 2.75%;
2. Production costs including investment costs, fixed depreciation costs, and operational costs have not changed, while the amount of production has decreased by 10%, this is in accordance with shrimp production data in East Rawajitu District which decreased by 10% in 2021. The decrease in the amount of production will affect the amount of income in the vaname shrimp farming business. The amount of sensitivity rate value in this scenario is the same as point 1, where the sensitivity rate value is more than 1 (one). This explains that the vaname shrimp cultivation business in the capital system in the Bumi Dipasena Area is sensitive to changes in production volume in the form of an increase in production volume of 10%.

CONCLUSION

Based on the results and discussion of the study on the Feasibility of Vaname Shrimp Cultivation Business in the Bumi Dipasena Aquaculture Area, East Rawajitu District, the following can be concluded:

1. The financial aspect of the vaname shrimp cultivation business, whether carried out with independent capital or borrowed capital, is not feasible if the production conditions are as they are at present where the NPV value for both is negative;
2. Sensitivity analysis shows that the vaname shrimp cultivation business in this study is sensitive to changes in conditions including an increase in operational costs of 2.75% and a decrease in production volume of 10%.

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