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Original Research

Potential Development of Mini-Scale Shrimp Aquaculture in Plastic Ponds in Pasuruan Regency, Indonesia

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Abstract

Vannamei shrimp farming on a mini-scale plastic pond ("busmetik") in Pasuruan Regency has been implemented since 2015. This study aims to analyze financial feasibility and potential for busmetik development in this region. The research was conducted in three sub-districts with a population of 120 farmers. Sample was determined by simple random sampling and 37 farmers were selected. Data collected through interviews, and analyzed by financial feasibility and SWOT. The results showed that busmetik vannamei shrimp farming in Pasuruan Regency was feasible to be developed based on investment criteria: R/C and B/C greater than one, short payback period, BEP price and production lower than real price and production, positive NPV, and IRR is higher than bank interest rate. Sensitivity analysis on the decline in production and prices by 20% resulted in the conclusion that this business is just feasible. Analysis of internal factors (IFE) and external factors (EFE) resulted in six strategies for developing vannamei shrimp farming business with busmetik technology. Those strategies were to classify product sizes based on quality; increase production volume with optimal land use; integrated production management; product differentiation; training program planning; and work with third parties for assistance. Government and investors can promote the business by supporting financing, providing integrated production management training in order to increase production and income of farmers.

Keywords: Business feasibility, vannamei shrimp, strategy, busmetik

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Introduction

Development of national marine and fisheries in the era of globalization aims to create a healthy, productive and creative society through strong fisheries based on local resources. Fisheries sector development is a priority because it is a main source of livelihood for people in coastal areas, especially fishermen and rural communities who work as fish cultivators, including shrimp. The sector is also a foreign exchange earner whose number is increasing from year to year. According to (Rumaijuk & Lubis, 2020), export potential of shrimp commodities was able to provide the country's foreign exchange from fishery products of more than 50%.

Increasing demand for exports illustrates improvement in development and business in the fisheries sector. However, export of this commodity must pay attention to domestic needs so as not to cause a negative trade balance (Pudjiastuti, 2014; Pudjiastuti et al., 2013; Pudjiastuti & Kembauw, 2018). It is a potential of the fisheries economy that must be developed, but remains in the blue economy corridor. The implication is that an economy that is focused on the marine and water sector must also emphasize balance between economic development and environment carrying capacity. It is hoped that this activity will not only affect the welfare of wider community, but also sustainable economic development (Ervianto, 2018; Saksono, 2013).

Vannamei shrimp cultivation benefits farmers based on the empirical studies that have been carried out in Lamongan Regency (Chusnul et al., 2010), Purworejo (Utomo et al., 2012), Pemalang (Pasaribu et al., 2017), Pekalongan (Untara et al., 2018), Serdang (Nainggolan et al., 2018), Parangtritis DIY (Khatimah, 2019), Kolaka (Kasmin et al., 2020). On the other hand, income of vannamei shrimp cultivation is higher than that of tiger shrimp (Tobing et al., 2021) and smallholder shrimp (Saragih et al., 2015). Government is just trying to increase capacity of vannamei shrimp ponds through various technologies, including cultivation of mini-scale plastic shrimp ponds (busmetik = budidaya udang skala mini empang plastik) that are environmentally sound (ecoshrimp). Several studies on the shrimp business feasibility had also been carried out by (Makalingga et al., 2018) in Purworejo Regency, (Ariadi et al., 2019) in low salinity cultivation systems, (Aprilia et al., 2020) in supra-intensive ponds, (Amsari et al., 2021) in cultivation through demonstration farming, (Amri & Haris, 2022) on various shrimp culture technologies, all of them stated that the aquaculture is financially feasible. However, no one had studied financial feasibility of busmetik technology.

Busmetik is a technology that has been the result of empirical studies since 2009 and is currently at the stage of accelerating adoption to the level of shrimp cultivators. This technique was developed because it has advantages: 1) easy to manage because the plot is not too wide (≤ 1000 m^2), 2) operational costs incurred for one cycle are just affordable for middle to lower class cultivators, 3) soil quality is not a factor barriers in the application of technology because pond construction is coated with plastic (HDPE), 4) pest and disease control is easier so that it can reduce risk of disease attacks, because it applies biosecurity measures and probiotic applications, 5) maintains balance of the ecosystem through a growth of mangrove vegetation in the cultivated area which functions as a biofilter, 6) is very suitable for cultivation of Litopeneus vannamei because

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it can be reared in high density, above 100 shrimps/m^3, 7) vannamei has faster growth, is more resistant to disease, and has a flexible market segment (Aisyah et al., 2022; Fatalattof et al., 2022; Suriawan et al., 2019).

Busmetik in Pasuruan Regency has continued to expand from 2016 to 2020. In 2016, this area had a pond of 4.06 ha, which increased in 2017 to 9.52 ha. In the following year (2018) those area decreased to 8.40 ha, and in 2019 it decreased by 1.63 ha. But in 2020, busmetik pond area would increase again to 15.41 ha. The development shows that busmetik vannamei shrimp is able to improve regional economy (Nardianto et al., 2019). The purpose of this study was to analyze the potential for busmetik vannamei shrimp development in Pasuruan Regency in order to support government policies so that aquaculture develops from year to year.

Methodology

We carried out this research in Pasuruan District, precisely in Kraton District, Rejoso District and Lekok District. Population in the three sub-districts was recorded at 120 vannamei shrimp farmers who apply busmetik system with an operational area of 400 m^2 per plot. Sample was randomly selected and consisted of 37 farmers. Data were collected through interviews with farmers using a questionnaire. After data was compiled, it was then tabulated and analyzed quantitatively with two approaches, i.e. feasibility study for busmetik business and its development strategy using SWOT analysis. Financial feasibility was carried out using following parameters: R/C, B/C, payback period, BEP (unit and price), NPV and IRR, and their sensitivity if prices and production fall by 20%.

1. Return Cost Ratio (R/C) according to (Anindita et al., 2015) is calculated by formula:

$$R/C = \frac{\text{Return}}{\text{Total cost}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

where: R/C > 1, it means that the business is feasible; R/C = 1, it means that the business is in break-even condition, and R/C < 1, it means that the business is not feasible.

2. Benefit Cost Ratio (B/C) is a comparison between total revenue and total cost, which shows the value of revenue obtained from each rupiah spent. A business is said to be feasible if this parameter ≥ 1. The formula used is:

$$B/C\ Ratio = \sum_{t=1}^{n} \frac{(Bt-Ct)}{(1+IRR)^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

where: Bt = gross profit of t-month; n = economic age; Ct = gross cost of t-month; t = 0, 1, 2, 3, ...

3. *Break Even point* (BEP), were classification into BEP price and BEP unit. They were calculated by formula:

$$BEP_{price} = \frac{FC}{P-VC} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

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$$BEP_{unit} = \frac{\text{Total cost}}{\text{Selling price}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

where: FC = fixed costs; P = selling price per unit; VC = variable cost per unit

4. *Payback Period* (PP) is the estimated payback period for the busmetik business investment which is determined by formula:

$$PP = \frac{\text{Initial investment}}{\text{Revenue}} x \text{ time period (month)} \ldots\ldots\ldots\ldots\ldots \quad (5)$$

Business is said to be feasible if payback period is less than or equal to business investment age.

5. *Net Present Value* (NPV) is the difference between present value of profits and costs, calculated by formula:

$$\mathbf{NPV} = \sum_{t=1}^{n} \frac{B_t - C_t}{(1+i)^t} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (6)$$

Where: i = compound rate or interest rate (%). Criteria: NPV > 0, business is feasible; NPV = 0, business on breaks even point; NPV < 0, business is not feasible.

6. *Internal Rate of Return* (IRR) is the rate of return of busmetik business which shows the present value (NPV) equal to zero.

$$IRR = i_1 + (i_2 - i_1) \frac{NPV_1}{(NPV_1 - NPV_2)} x\ 100\% \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (7)$$

Where: i_1 = interest rate resulting in NPV > 0; i_2 = interest rate that generates NPV < 0; NPV_1 = NPV at interest rate i_1; NPV_2 = NPV at interest rate i_2.

Busmetik development strategy was determined by a SWOT analysis that begins with identifying internal and external factors, assessing internal and external factors, evaluating internal factors (IFE) and external factors (EFE), determining position of current strategy, and formulating a new strategy to be implemented. IFE and EFE were done by determining rating, weight and score.

IFE stages include: (1) identifying internal factors, (2) giving weights from 0.0 (not important) to 1.0 (very important) for each factor. Weight indicates importance of each factor to the overall internal factor. Total number of weights must be 1.0, (3) giving a rating of 1 to 4 for each factor to indicate whether the factor is a major weakness (rating = 1), or a minor weakness (rating = 2), a minor strength (rating = 3), or major power (rating = 4), (4) multiply each factor weight by a rating to determine weighted average for each factor, (5) add up the weighted average of each factor to determine total weighted average. Average value is 2.5. A weighted average total below 2.5 represents internal weakness, while a total score above 2.5 indicates a strong internal position.

EFE stages include: (1) identifying external factors, (2) giving a weight of 0.0 (not important) to 1.0 (very important) for each factor. Weights indicate relative importance of the factor to business success in the industry. Sum of all weights must be 1.0, (3) giving

a rating of 1 to 4 for each external factor, where 4 = superior response, 3 = above average response, 2 = average response, 1 = bad response. Ratings are based on the effectiveness of company's strategy, while weights are based on industry, (4) multiply each factor weight by its rating to determine weighted value, (5) add up weighted of each factor to determine total weighted score. Highest weighted value is 4.0 and lowest weighted is 1.0. Total weighted average is 2.5. Total weighted score of 4.0 indicates that the business responds very well to the opportunities and threats that exist in its industry. Strategy is selected based on the position of these factors in a matrix consisting of four quadrants.

Results and Discussions

Overview of Pasuruan Regency

Territory of Pasuruan Regency with an area of 1,474,015 km^2 is located between 112º33'55" to 113º05'37" East Longitude and between 7º32'34" to 7º57'20" South Latitude. In the north, it is bordered by Pasuruan City, Madura Canal and Sidoarjo Regency. In the south, it is bordered by Malang Regency. In the west, it is bordered by Mojokerto Regency and Batu City. In the east, it is bordered by Probolinggo Regency. Geologically, Pasuruan Regency is very diverse, and there are 3 types of rocks including surface rocks, sedimentary rocks, and volcanic rocks of the young and old quarters.

Geographically, several sub-districts located at an altitude of 0-12.5 masl have a potential for developing fisheries and aquaculture businesses. Potential districts for the development of the business include: Gempol, Beji, Bangil, Rembang, Kraton, Pohjentrek, Gondangwetan, Rejoso, Winongan, Grati, Lekok, and Nguling sub-districts. Implementation of busmetic technology in Pasuruan Regency had continued to increase from 2016 to 2020. Lekok District, especially in Tambak Lekok Village, has an area of 9.52 ha of shrimp ponds with the technology. Rejoso District, especially in Rarangan Village and Patuguran Village had 4.64 ha. Kraton District had Gerongan Village and Pulokerto Village, that covering an area of 10.78 ha. Farmers with busmetik technology initially have a pond area of between 400 – 2,000 m^2 per plot. But, then they changed it to an area of 400 – 700 m^2 per plot because it was considered more efficient, the profit was greater, and technically controlling water quality was also easier.

Financial Feasibility of Busmetik Vannamei Shrimp

Vannamei shrimp cultivation carried out in plastic ponds with a plot size of 400 m2 consisted of two production cycles in a year. In general, farmers have been cultivating vannamei shrimp for 4 years. Shrimp cultivation begins with operational land preparation, seed stocking and maintenance. Shrimp harvest is done two times per cycle, when it is 60 shrimps per kg which is sold for IDR 57,000 per kg and size 45 (45 shrimps per kg) with selling price of IDR 72,000. Selling price was assumed to be fixed with interest rate for small businesses is 7%. Busmetik financing comes from own capital. Feasibility analysis consists of several details about cash outflows and inflows.

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Investment Cost

Investments in shrimp cultivation generally include equipment that must be prepared at the beginning of production. Equipment used are water wheels, water pumps, tarpaulins and generators and have an economic life of five years. Investment is calculated as depreciation which was using flat method over the business life. Detailed calculation of depreciation is presented in Table 1. Equipment depreciation was IDR 4,333,333 per year. Generator functions as a provider of electricity when farmers experience problems. Wheel serves as a means of delivering air and oxygen into the pond. Oxygen carried then dissolves into the water and becomes dissolved oxygen (Amri & Haris, 2022).

Table 1. Investment depreciation costs

Equipment	Selling price (IDR/unit)	Total	Value of equipment (IDR)	Economic age (year)	Depreciation (Rp)	Percentage (%)
Water wheel	5,800,000	2 unit	11.600.000	5	2.320.000	53
Water pump	4,500,000	1 unit	1.000.000	5	200.000	5
Tarpaulin	16,000	400 m	6.400.000	5	1.280.000	30
Generator	24,000,000	1 unit	2.666.667	5	533.333	12
Total			**21.666.667**		**4.333.333**	**100**

Operational Cost and Income of Busmetik

Operational costs are all funds spent in the production process (Witoko, et al., 2022). The costs include variable and fixed costs incurred during the production process. Every production activity would be faced with a problem of assigning costs to facilitate necessary production factors. Costs were all cash and non-cash expenditures for busmetik process in one year with two production cycles on a business scale of 400 m^2. Based on Table 2, it can be seen that operational costs are dominated by variable costs with 69.02%. The largest fixed costs were electricity and labor wages, while the largest variable costs are feed and seeds. It is also similar to the results of previous studies, although the technology used was different.

Revenue is total harvest in one year multiplied by selling price. Shrimp production results were divided into two categories, i.e. size 60 and size 45. Revenue and income of shrimp cultivation were presented in Table 3. It is clear that the business is profitable because total costs are much smaller than revenue. It is similar to the previous studies.

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Table 2. Operational costs of the busmetik vannamei business per year per 400 m^2

No.	Component	Price (IDR/unit)	Description	Cost per cycle (IDR)	Cost per year (IDR/400 m^2)
1	Fixed cost				
	Salary	3,200,000	1 year	1,600,000	3,200,000
	Tax	2,784	1 year	1,392	2,784
	Electricity	8,023,043	1 year	3,677,228	7,354,456
	Water	183,363	1 year	84,042	168,083
	Transportation	180,040	1 year	82,519	165,037
	Fuel oil	1,061,702	1 year	486,614	973,227
	Total fixed cost			5,931,795	11,863,587
2	Variable cost				
	Shrimps seed	48	44,445 shrimps	2,133,360	4,266,720
	Shrimps feed	14,600	643 Kg	9,387,800	18,775,600
	Probiotics	22,000	11 L	242,000	484,000
	Omya	8,500	106 Kg	901,000	1,802,000
	Mineral	23,000	24 Kg	552,000	1,104,000
	Total variable cost			13,216,160	26,432,320
3	Total cost (1+2)			19,541,627	38,295,907

Table 3. Revenue and income busmetik per year per 400 m^2

No	Size (shrimps/kg)	Production (kg)	Price (IDR/kg)	Total (IDR)
1	60	328	57,000	18,696,000
2	45	702	72,000	50,544,000
Total Revenue				69,240,000
Total Cost				42,629,240
Total Income				26,610,760

Criteria of Busmetik Business Financial Feasibility

Based on the calculations of regarding investment costs, operational costs and shrimp business income, cash flow can be arranged which is feasibility analysis (Table 4). As previously explained, the analysis was carried out of one year and two cycles. Activities carried out every month: 1) land preparation, 2) stocking and maintenance, 3) maintenance, 4) maintenance and harvesting, 5) harvesting and area drying, 6) land preparation, 7) stocking and maintenance, 8) maintenance, 9) maintenance and harvesting, 10) harvesting and drying, 11) area drying, and 12) there were no activity.

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Table 4. Cash flow for vannamei shrimp busmetik (thousand IDR/month/400m^2)

No.	Descriptions	Month												
		0	1	2	3	4	5	6	7	8	9	10	11	12
I	**In Flow**													
	Revenue					9,348	252,720				9,348	252,720		
II	**Out Flow**													
A	Investment Cost													
1	Water wheel	2,320	193.33	193.33	193.33	193.33	193.33	193.33	193.33	193.33	193.33	193.33	193.33	193.33
2	Water pump	200	16.67	16.67	16.67	16.67	16.67	16.67	16.67	16.67	16.67	16.67	16.67	16.67
3	Tarpaulin	1,280	106.67	106.67	106.67	106.67	106.67	106.67	106.67	106.67	106.67	106.67	106.67	106.67
4	Generator	533.33	44.44	44.44	44.44	44.44	44.44	44.44	44.44	44.44	44.44	44.44	44.44	44.44
B	**Operational Cost**													
1	Shrimps seed			2,133.36					2,133.36					
2	Shrimps feed			3,129.27	3,129.27	3,129.27			3,129.27	3,129.27	3,129.27			
3	Probiotics			80.67	80.67	80.67			80.67	80.67	80.67			
4	Omya			300.33	300.33	300.33			300.33	300.33	300.33			
5	Mineral			184.00	184.00	184.00			184.00	184.00	184.00			
6	Labor (salary)		266.67	266.67	266.67	266.67	266.67	266.67	266.67	266.67	266.67	266.67	266.67	266.67
7	Tax													2.78
8	Electricity		668.59	668.59	668.59	668.59	668.59	668.59	668.59	668.59	668.59	668.59	668.59	
9	Water		15.28	15.28	15.28	15.28	15.28	15.28	15.28	15.28	15.28	15.28	15.28	
10	Transportation		15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	
11	Fuel oil		88.48	88.48	88.48	88.48	88.48	88.48	88.48	88.48	88.48	88.48	88.48	
	Total Outflow (A+B)	4,333.33	1,415.12	7,242.75	5,109.39	5,109.39	1,415.12	1,415.12	7,242.75	5,109.39	5,109.39	1,415.12	1,415.12	630.56
III	**Net Benefit (I-II)**	-4,333.33	-1,415.12	-7,242.75	-5,109.39	4,238.61	251,304.88	-1,415.12	-7,242.75	-5,109.39	4,238.61	251,304.88	-1,415.12	-630.56

Costs in the financial feasibility were calculated on monthly basis. Farmers get revenue in each cycle in the 4th month through harvesting shrimp with a size of 60 shrimps per kg, and in the 5th month through harvesting shrimp with a larger size of 45 shrimps per kg. It also applies to the second cycle. Proceeds from the first harvest turned out to be able to cover all the costs. It is a manifestation of the business efficiency so that farmers continue to exist in this mini-scale business.

Feasibility is also proven by parameters (Table 5) that meet the existing criteria. R/C and net B/C that are greater than one indicate that each unit of money invested in this business will generate greater revenues and profits. BEP price is even lower than selling price of 60 shrimps per kg. Meanwhile, BEP unit is also much lower than the number of shrimp produced (702 + 18696000/72000) = 962 kg (equivalent to 45 shrimps per kg).

Table 5. Parameters of busmetic financial feasibility and its sensitivity

Parameters	Normal conditions	Price decrease 20%	Production decrease 20%
R/C	1.6		
BEP unit (kg)	753		
BEP price (IDR/kg)	47,142		
NPV (IDR)	24,940,641	11,274,508	11,682,880
IRR (%)	251.9	133.9	137.8
Net B/C	1.4	1.37	1.38
Payback period	4 months 5 days	4 months 8 days	4 months 8 days

R/C > 1, indicating that busmetik business is feasible to develop. It is similar with the results of research by (Ariadi et al., 2021) and (Sa'adah, 2019). Time required to return investment costs is relatively fast, namely 4 months and 5 days, even compared to the age of production cycle. A positive NPV indicates that income generated in the business exceeds operational costs. It shows that busmetik business with private capital at an interest rate of 7% is feasible, provided that for one year investment in shrimp business scale of 400 m^2 generates a profit of IDR 24,940,641. Return on capital in this business is relatively very high, i.e. 251.9% compared to the bank's interest rate of 7% per year. Based on the financial feasibility analysis criteria, busmetik business in Pasuruan Regency is feasible to be developed. Even if, shrimp production and prices drop by 20%, the business is feasible to develop yet. Feasibility of shrimp with similar technology does not yet exist, but it is in line with (Khatimah, 2019) on shrimp cultivation on sandy land and (Witoko et al., 2019) on vannamei shrimp cultivation in marine floating net cages.

Development Strategy of Busmetik Business

Evaluation of Internal and External Factors

Identification of internal factors (strengths-weaknesses) and external factors (opportunities-threats) were assessed based on the level of importance. These level were determined based on the results of interview (questionnaire) using a weighted value.

Criteria for assigning a level of importance are as follows: if a weighted value of 4 means very important, a weighted value of 3 means important, a weighted value of 2 means somewhat important and a weighted value of 1 means that it is not important. Assessment of internal factors and external factors of vannamei shrimp culture are presented in Table 6 and Table 7.

Identification results on the strength factor in Table 6 show that the range of farmers' choices is between important to very important. It revealed that for farmers, information on how to implemented busmetik is easier to manage and the yield of vannamei shrimp has good quality due to the availability of quality seeds. Weakness factor according to farmers has an important to very important value. On the other hand, quality of human resources is also a very important factor for farmers in continuity of busmetik business.

Table 6. Internal factors importance of the busmetik strategy

Symbol	Strengths	Level of importance
S1	Availability of quality seeds	very important
S2	Shrimp produced is high quality	very important
S3	Information about maintenance of busmetik is perfectly	important
S4	Easy in busmetik management	very important
Symbol	Weakness	Level of importance
W1	Limited capital owned	important
W2	Evaluation is carried out when harvest failure occurs	important
W3	Human resources quality that is not optimal	very important
W4	Limited land occupied	important

Table 7 shows that opportunity factor had an important and very important value for farmers. Market availability was a very important factor in continuity of the business. Likewise with threat factor, which had an important to very important value. Difficult terms for borrowing capital are a very important threat factor because it takes a relatively long time to disburse loans.

Table 7. External factors importance of the busmetik strategy

Symbol	Opportunity	Level of importance
O1	Market availability	very important
O2	Shrimp prices are relatively stable	important
O3	Market information is easy to get	important
Symbol	Threat	Level of importance
T1	Disease attacks that can cause harvest failure	important
T2	Increasingly difficult capital loan requirements	very important
T3	Competition of shrimp quality produced by other farmers	important
T4	Environmental pollution	important

Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE)

IFE and EFE matrices were arranged by giving a score of 1-4 on each factor according to the level of importance. Internal and external evaluations carried out through rating, weighting and scoring were presented in Table 8 and Table 9. Table 8 shows the results of IFE getting a score of 3.51, where strength factor received a score of 1.78 and weakness with a score of 1.72. The biggest strength of busmetik business lies in the availability of quality seeds, while the biggest weakness is limited capital. Table 9 shows that EFE get a score of 3.38, where the opportunity factor gets a score of 1.40 and the threat factor with a score of 1.97. The biggest opportunity for the busmetic business is availability, while the biggest threat factor lies in environmental pollution caused by the business in the form of waste. However, this last aspect has a solution, namely every farmer must have a waste control facility (WWTP).

Table 8. Matrices of Internal Factor Evaluation (IFE)

Symbol	Strength	Rating	Weight	Score
S1	Availability of quality seeds	3.8	0.17	0.64
S2	Shrimp produced is high quality	3.5	0.12	0.41
S3	Information about maintenance of busmetik is perfectly	3.1	0.10	0.32
S4	Easy in busmetik management	3.6	0.12	0.42
Total strength			0.50	1.78
Symbol	Weakness			
W1	Limited capital owned	3.4	0.15	0.50
W2	Evaluation is carried out when harvest failure occurs	3.2	0.12	0.37
W3	Human resources quality that is not optimal	3.7	0.13	0.49
W4	Limited land occupied	3.4	0.10	0.35
Total weakness			0.50	1.72
Total Internal			1.00	3.51

Table 9. Matrices of External Factor Evaluation (EFE)

Symbol	Opportunity	Rating	Weight	Score
O1	Market availability	3.7	0.16	0.58
O2	Shrimp prices are relatively stable	3.5	0.09	0.32
O3	Market information is easy to get	3.2	0.16	0.50
Total Opportunity			0.41	1.40
Symbol	Threat			
T1	Disease attacks that can cause harvest failure	3.1	0.18	0.56
T2	Increasingly difficult capital loan requirements	3.5	0.18	0.61
T3	Competition of shrimp quality produced by other farmers	3.1	0.05	0.16
T4	Environmental pollution	3.5	0.18	0.64
Total Threat			0.59	1.97
Total External			1.00	3.38

Based on the evaluation results, it is possible to predict the strategic position of busmetik vannamei. Strategic position of the business in the SWOT quadrant is

determined as follows: 1) X axis is determined by reducing strength factor score by the weakness factor score, which is 1.78-1.72 = 0.06, 2) Y axis is determined by reducing opportunity factor score by the threat factor score, which is 1.40-1.97 = -0.57. Mapping of values on the X-axis and Y-axis (coordinates) into the SWOT quadrant can be seen in Figure 1.

Figure 1 shows that busmetik business strategy is in the position of diversification strategy. It position has an implication that implementation of busmetik technology had a greater opportunity than the threat. Opportunities available include market share available at relatively stable prices because market information for vannamei shrimp is easy to obtain. In addition to great opportunities, busmetik business had threats, such as disease, competition for quality of shrimp circulating in the market, to environmental pollution due to waste water and shrimp that have died during the rearing process. Therefore, to minimize threats, it is necessary to improve quality of human resources so that proper maintenance management based on vannamei shrimp rearing standards can be well controlled by farmers. Based on the SWOT analysis, there are 6 (six) alternative strategies in shrimp farming with busmetik technology: (1) classifying product size based on quality; (2) increase production volume with optimal land use; (3) integrated production management; (4) product differentiation; (5) training program planning; and (6) cooperate with third parties for assistance.

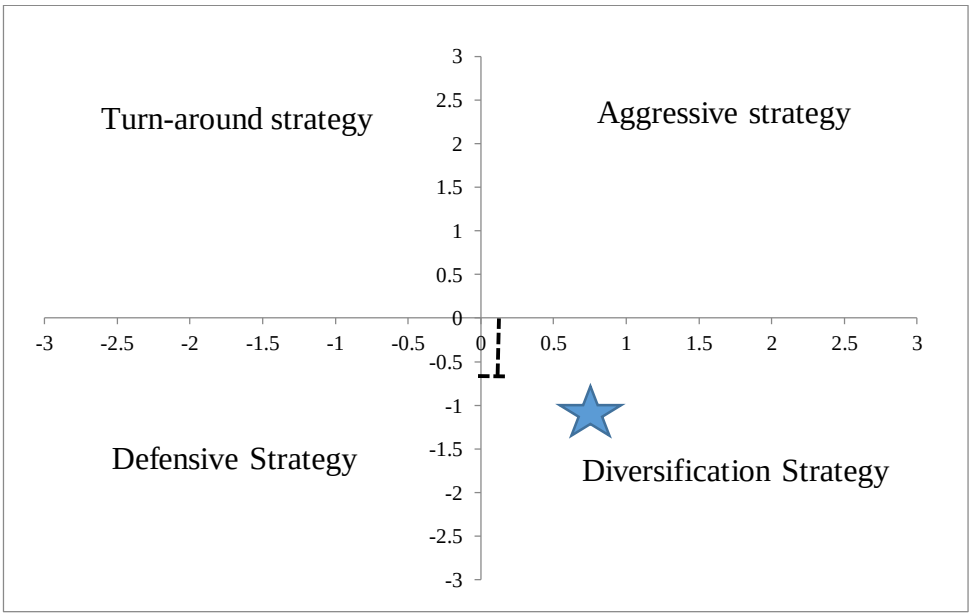

Figure 1. Matrix of SWOT quadrant of the busmetik strategy

Classification based on quality (size) is one step in maintaining and increasing price of vannamei shrimp. Shrimp marketed with similar size and quality, will have a high economic value compared to shrimp marketed with various qualities. Limited land owned is not an obstacle to increase income. One way is to optimize land use so that production volume increases by continuously rearing shrimp. It will create an integrated production management so that it can meet market demand both in terms of quantity and quality of vannamei shrimp.

Busmetik business continues to grow so as to bring in competitors with similar products and equal quality. One of the steps to overcome it is to differentiate shrimp products by increasing the types of shrimp that are cultivated. New type of shrimp must be able to meet market segment. To make it happen, it is necessary to present programs that are able to improve quality of human resources, such as training in shrimp rearing management to handling waste.

Conclusions

Busmetik vannamei shrimp farming in Pasuruan Regency is feasible to be developed based on investment criteria: R/C and B/C greater than one, short payback period, BEP price and production lower than real price and production, positive NPV, and higher IRR higher than the bank interest rate. Sensitivity analysis on the decline in production and prices by 20% resulted in the similar conclusion that the business is just feasible.

Strategy analysis using a SWOT approach shows that the relevant development position is diversification strategy. There are six strategies recommended for the development of busmetik vannamei shrimp farming business, namely 1) classifying product size based on quality; 2) increase production volume with optimal land use; 3) integrated production management; 4) product differentiation; 5) training program planning; and 6) cooperate with third parties for assistance.

Government can facilitate farmers through provision of loan funds considering receipt of indirect payments in cash, so that business will be sustainable. In the future, further research with focus on the business sustainability will be conduct because to be able to carry out this cultivation, farmers must pay attention to environmental conditions. WWTP must be made first.

Author Contributions

The first author is in charge of collecting and analyzing data, as well as compiling a draft manuscript. The second author is in charge of compiling tabulation results and data analysis, revising draft articles, adjusting templates, submitting and correspondence. The third author collects articles for reference.

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