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DEVELOPMENT STRATEGY OF SEAWEED (*Kappaphycus alvarezii*) CULTIVATION BUSINESS IN THE WATERS OF PANTAI AMAL OF TARAKAN CITY

STRATEGI PENGEMBANGAN USAHA BUDIDAYA RUMPUT LAUT (*Kappaphycus alvarezii*) DI PERAIRAN PANTAI AMAL KOTA TARAKAN

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ABSTRACT

Kappaphycus alvarezii seaweed is one of the fishery commodities developed in Tarakan City, especially in the water of Pantai Amal, Tarakan City, since 2009, with fluctuating production. This research aims to analyze the financial feasibility of the seaweed cultivation based on internal and external factors and to develop appropriate strategies to increase seaweed production in the Tarakan City. Sampling technique was conducted purposively with a qualitative approach using a questionnaire. The SWOT (strengths, weaknesses, opportunities, and threats) and QSP (quantitative strategic planning) analysis results show five internal strengths and five weaknesses with an IFE (internal factor evaluation) value of 2.57, as well as four threats and five external opportunities with an EFE (external factor evaluation) value of 2.86. Based on the IE (internal-external) matrix, the business is in the growth phase (cell V), so the right strategy is to develop the *K. alvarezii* seaweed cultivation business using the longline method in Tarakan City through empowering members and groups to increase business (with a score of 5.83), expanding cultivation land (score 5.65), and improving technical cultivation skills to increase product quality and quantity (score 5.52).

Keywords: business development strategy, *Kappaphycus alvarezii* seaweed

ABSTRAK

Rumput laut *Kappaphycus alvarezii* merupakan salah satu komoditas perikanan yang dikembangkan di Kota Tarakan khususnya di Perairan Pantai Amal Kota Tarakan sejak tahun 2009 dengan produksi yang fluktuatif. Tujuan penelitian ini adalah untuk menganalisis kelayakan finansial budidaya rumput laut berdasarkan faktor internal dan eksternal serta menyusun strategi yang tepat untuk peningkatan produksi rumput laut di Kota Tarakan. Teknik pengambilan sampel secara *purposive sampling* dengan pendekatan kualitatif menggunakan alat bantu kuesioner. Hasil analisis SWOT (*strengths, weaknesses, opportunities, and threats*) dan QSP (*quantitative strategic planning*) menunjukkan bahwa terdapat lima kekuatan dan lima kelemahan internal dengan nilai IFE (*internal factor evaluation*) 2,57, serta empat ancaman dan lima peluang eksternal dengan nilai EFE (*external factor evaluation*) 2,86. Berdasarkan matriks IE (internal-eksternal) usaha berada dalam fase pertumbuhan (sel V), sehingga strategi yang tepat untuk mengembangkan usaha budidaya rumput laut *K. alvarezii* menggunakan metode *longline* di Kota Tarakan melalui pemberdayaan anggota dan kelompok guna peningkatkan usaha (dengan skor 5,83), memperluas lahan budidaya (skor 5,65), dan peningkatan keterampilan teknis budidaya untuk peningkatan kualitas dan kuantitas produk (skor 5,52).

Kata kunci: rumput laut *Kappaphycus alvarezii*, strategi pengembangan usaha

INTRODUCTION

Indonesia is one of the largest maritime countries in the world, where seaweed commodities are one of the government's mainstay sectors in generating foreign exchange. The seaweed commodity type *Eucheuma cottonii*, a synonym for *Kappaphycus alvarezii* in the world of trade, is one of the commodities with economic value. Even during the COVID-19 pandemic, the demand for seaweed continues, especially from China (Arthatiani *et al.* 2021). In 2022, national seaweed production reached 9.12 million tons, while the production in North Kalimantan Province reached 627,875 tons. Hence, the contribution of seaweed production from North Kalimantan nationally was 6.88% and made it the fifth largest province producing seaweed after South Sulawesi, East Nusa Tenggara, Central Sulawesi, and West Nusa Tenggara (KKP 2023).

One of the locations contributing to seaweed production in North Kalimantan Province is Tarakan City. Pantai Amal Village is the central area for seaweed cultivation development in Tarakan City. Cultivation activities carried out by farmers from 2019 until now using the longline method have experienced fluctuating production. Based on data from the Marine and Fisheries Service of Tarakan City (2023), in 2021, the value of seaweed production in Tarakan City was recorded at 211,654,599 kg, but in 2022 it fell to 201,481,600 kg, and in 2023 it increased to 220,998,124 kg. The production produced by seaweed farmers in Pantai Amal Village is marketed or sold through collectors and then marketed to wholesalers outside Tarakan City, namely in Surabaya, Jakarta, and Makassar (BKIPM 2021).

Seaweed cultivation efforts in Tarakan City experience various problems, as well as those that occur in other areas, both technical and non-technical, due to internal and external factors. This condition causes seaweed production in Tarakan City to fluctuate, so a more in-depth study is needed so that seaweed production in Tarakan City can continue to increase. The study was carried out with research related to business feasibility analysis, factors that influence seaweed production, and strategies that can be used so that seaweed cultivation efforts can be ecologically and financially sustainable for cultivators, especially in Tarakan City.

METHODS

Time and location

This research was conducted for three months, from August to October 2023, Pantai Amal Village, East Tarakan District, Tarakan City, North Kalimantan Province.

Information sources

This study uses primary and secondary data. Some of the primary data used are farmer profile data (age, education level, experience), land area, type of seaweed, cultivation methods, production volume, and quality, weather, pests and diseases, product distribution, selling prices, market access, government programs and support, and capital data. Some of the secondary data used include data on area, boundaries, population and livelihoods, annual seaweed production data, regional zoning, results of strengths, weaknesses, opportunities, and threats (SWOT) analysis studies, research results from other relevant areas, transportation, and port access, reports from the Central Statistics Agency (BPS), and Regional Medium Term Development Plan (RPJMD) document data. According to Amalia *et al.* (2022), to obtain a distribution of measurement values close to normal, the number of respondents for the questionnaire test with validity and reliability tests is at least 30. The primary and secondary data above were obtained from the Pantai Amal Urban Village Office, Tarakan City Fisheries Service, Regional Development Planning Agency (Bappeda) of Tarakan City, Non-Governmental Organizations (NGOs), and experts from academic literature, legislation, library materials, documents, research reports, and scientific papers that support this research during the period 2019-2023.

Research instruments and data collection procedures

The data collection instruments and procedures can be seen in the flowchart (Figure 1). The flowchart illustrates four main methods that complement each other to obtain comprehensive data. Direct observation is conducted to objectively record conditions or phenomena in the field, while interviews gather in-depth information from respondents about their experiences or views. The PRA (participatory rapid appraisal) method involves community

participation to understand local problems through participatory mapping, seasonal calendars, and decision flow diagrams. Literature studies complement data by reviewing literature such as books, journals, and articles to obtain theoretical foundations and understand previous findings.

Data analysis

Data analysis in this study is related to the business's financial feasibility analysis. A financial feasibility analysis of the business is carried out to examine the potential profit (profitability) or loss obtained from a business. According to Permatasari and Afriadi (2021), financial analysis of the business is based on profit analysis, analysis of the balance of income and costs (revenue cost ratio), payback period (PP) analysis, and return of investment (ROI) analysis.

Qualitative analysis was carried out by analyzing the internal factor evaluation (IFE) matrix and external factor evaluation (EFE) matrix, then mapped according to the IE (internal-external) matrix to see the position of the business in a diagram. The SWOT matrix and QSP matrix are used to facilitate the formulation of alternative strategies and the most attractive strategies for business development. The IFE matrix can describe the company's internal conditions through calculated strengths and weaknesses. In contrast, the EFE matrix can provide information about the magnitude of the influence of external factors on the company (Astuti and Ratnawati 2020). The form of assessment of the weighting can be seen in Tables 1 and 2. The results of the weighting and rating are then entered in Tables 3 and 4.

SWOT matrix

The SWOT matrix is one of the most basic analysis methods that can be used to evaluate a problem from four different sides: strengths, weaknesses, opportunities, and threats of a company or organization, or specific projects (Handayani 2021). According to Astuti and Ratnawati (2020), if the SWOT analysis is carried out accurately, it will maximize the existing strengths and opportunities and minimize the weaknesses and threats so that information related to the strategy for a business can be obtained.

The SWOT matrix is generally applied by selecting one of two matrix models, namely the SWOT or TOWS matrix, which will produce four alternative strategies: the S-T strategy, W-O strategy, W-T strategy, and S-O strategy. The SWOT matrix can be seen in Table 5.

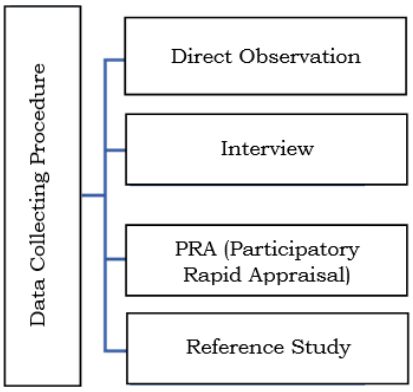

Figure 1. Flow diagram of data collection procedures.

Table 1. Weight assessment of internal factor evaluation (IFE) business.

Internal Strategic Factors	A	B	C	D	...	Total
A						
B						
C						
D						
.....						
Total						

Table 2. Weight assessment of external factor evaluation (EFE) business.

External Strategic Factors	A	B	C	D	...	Total
A						
B						
C						
D						
.....						
Total						

Table 3. Internal factor evaluation (IFE) matrix.

Internal Strategic Factors	Weights (a)	Ratings (b)	Scores (a x b)
Strengths :			
1.			
2.			
.....			
Sub Total			
Weaknesses :			
1.			
2.			
.....			
Sub Total			
Total (A+B)			

Table 4. External factor evaluation (EFE) matrix.

External Strategic Factors	Weights (a)	Ratings (b)	Scores (a x b)
Opportunities :			
1.			
2.			
.....			
Sub Total			
Threats :			
1.			
2.			
.....			
Sub Total			
Total (A+B)			

IE matrix

The IE matrix aims to see the strategic position of a business. According to Astuti and Ratnawati (2020), a business's strategic position must be based on an analysis of internal and external business factors combined into a suggestive model. There are 9 cells in the IE matrix based on the total score of the EFA and the total score of the IFA (David 2006). The IE matrix is divided into three main areas with different strategic implications. An example of the application of the IE matrix can be seen in Figure 2.

Table 5. SWOT matrix analysis.

IFAS / EFAS	Strengths (S) 1. 2. 3. etc...	Weaknesses (W) 1. 2. 3. etc...
Opportunities(O) 1. 2. 3. etc...	SO Strategy. Using strengths to take advantage of opportunities.	WO Strategy. Overcoming weaknesses by taking advantage of opportunities.
Threats (T) 1. 2. 3. etc...	ST Strategy. Using strengths to avoid threats.	WT Strategy. Minimize weaknesses and avoid threats.

Sources: Adopted from Rangkuti (2008)

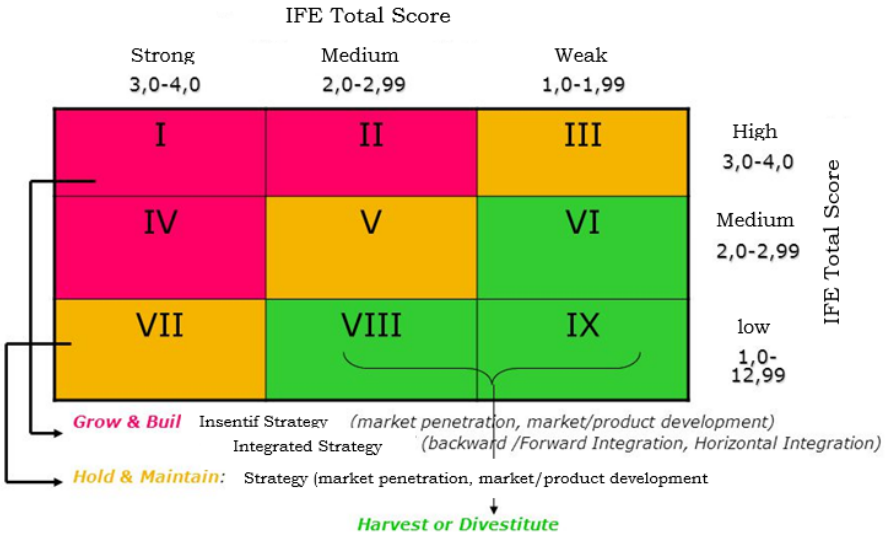

Figure 2. Example of the application of the internal external (IE) matrix.

If the business position is in Cells I, II, and IV, the company can implement a growth and build strategy; if it is in Cells III, V, and VII, the company can implement a hold and maintain strategy; and if the business is in Cells VI, VIII, and IX, the company can implement a harvest or divest strategy.

Quantitative strategic planning matrix (QSPM) analysis

QSPM analysis is generally used to objectively evaluate strategies based on the internal-external (IE) key success factors identified in the previous stage. According to Mahfud (2020), QSPM analysis is the final stage of strategy formulation analysis because it will determine the best strategy a company should implement. Furthermore, Indriarti and Chaidir (2021) stated that the quantitative strategic planning matrix (QSPM) is the key needed to develop an effective strategic plan based on external and internal information of a business or organization. The application of QSPM can be seen in Table 6.

Formulation based on calculations with AS (attractive score) and TAS (total score attractiveness) values. According to Siregar (2020), the AS value is obtained through a questionnaire addressed to respondents who are directly related to the business activities being carried out; the TAS value is obtained by multiplying the AS value by the average weight of the key factors, while the STAS (sum total attractiveness scores) value is obtained by adding the TAS values vertically. Then, the highest STAS value will be the priority of an attractive strategy.

Table 6. Quantitative strategic planning matrix.

Key Factors	Weight	Strategy Alternatives			
		Strategy 1		Strategy 2	
		AS 1	TAS 1	AS 2	TAS 2
Opportunities					
1.....					
Etc					
Threats					
1.....					
Etc					
Strengths					
1.....					
Etc					
Weaknesses					
1.....					
Etc					

Description : AS = Score Attractiveness
TAS = Total Score Attractiveness
Sources : Adopted from Mahfud and Mulyani (2017)

RESULTS AND DISCUSSION

Overview of the research location

Tarakan City is an archipelago in North Kalimantan Province with an area of 254.18 km², which is geographically located at 3°14'23" – 3°26'37" North Latitude and 117°30'50" – 117°40'12" East Longitude. The boundaries of Tarakan City in the north are the coast of Pulau Bunyu District, Bulungan Regency; in the east, it borders the coastal area of Sesayap District, Tana Tidung Regency; in the south, it borders the Sulawesi Sea; and in the west, it borders the coast of Tanjung Palas District and Bulungan Regency. Tarakan City administratively consists of four districts and 20 sub-districts. Based on data from BPS Tarakan City (2023), the number and area of neighborhoods and districts in Tarakan City can be seen in Table 7.

Location and business history

Pantai Amal Village, with an area of 20.23 km², is one of seven villages in the East Tarakan District. Several tribes, such as Bugis, Makassar, Tidung, Toraja, Mandar, and Javanese, inhabit the population in Pantai Amal Village. The population in Pantai Amal Village is divided into 2 areas, namely Old Amal and New Amal, with a total of 15 neighborhood associations (RT). The number of residents in Pantai Amal Village can be seen in Table 8.

The work of Pantai Amal Village residents is very diverse, both at sea and on land. Based on the study's results, out of 30 seaweed farmer respondents, 12 respondents (40%) made seaweed cultivation their primary job, while 18 respondents (60%) made seaweed cultivation their side job. Some of the respondents' main jobs were laborers, plantation farmers, traders, and self-employed, so seaweed cultivation has not become the main job of the community.

Seaweed cultivation potential

Pantai Amal Village, a coastal area with a coastline of 17 km², has the potential for developing marine cultivation. According to Sakti and Amalia (2020), several fishery commodities that have the potential to be developed in the waters of Pantai Amal include tiger prawns, snapper, pomfret, crabs, shellfish, and seaweed.

Seaweed is one of the commodities cultivated in Pantai Amal Village, Tarakan City, where the value of seaweed cultivation production has fluctuated since 2019. The amount of wet seaweed production in Tarakan City can be seen in Table 9.

Table 7. Number of districts and urban villages in Tarakan City and their area.

No	Districts	Areas (km^2)	Percentages	Village Numbers
1	East Tarakan	357.70	54.42	7
2	Central Tarakan	84.00	12.78	5
3	West Tarakan	46.35	7.05	5
4	North Tarakan	169.28	25.75	3
Total		**657.33**	**100**	**20**

Table 8. Population data for Pantai Amal Village, Tarakan City.

Neighborhood Community Group (RT)	Population			Head of Family Number
	Man	Woman	Total	
1	180	171	351	112
2	203	195	398	128
3	138	146	264	88
4	410	346	756	250
5	229	204	433	144
6	250	213	463	147
7	351	314	665	215
8	106	93	199	65
9	416	365	781	245
10	480	427	907	288
11	430	401	831	268
12	415	374	789	251
13	290	286	576	187
14	682	659	1,341	428
15	301	267	568	182
Total	**4,481**	**4,461**	**9,342**	**2,998**

Table 9. Seaweed production in Tarakan City.

No	Year	Wet Seaweed Production (kg)
1	2019	152,577,359
2	2020	185,491,704
3	2021	211,645,599
4	2022	201,481,600
5	2023	220,998,124

Based on Table 9, seaweed commodities cultivated in Tarakan City have good prospects to continue to be developed sustainably; even during the COVID-19 pandemic, seaweed production is still running. However, in reality, the amount of production is not optimal when compared to the area of the cultivation location. Based on the Regional Regulation of North Kalimantan Province No. 4 of 2018 concerning Coastal and Small Islands Zoning Space (RZWP3K) for 2018-2038, it states that the coastal cultivation regulations for Tarakan Island cover an area of 7,780.30 ha in the designated zone, namely the coast of Pantai Amal Village, East Tarakan District on the map sheet: 6502-05 Scale 1: 50,000 with the code KPU-BD-BL. Based on the potential for seaweed cultivation land of 7,780.30, only 2,467 ha has been utilized to develop seaweed cultivation (Tarakan City Fisheries Service 2023).

Ecological factors

Based on Table 9, seaweed commodities cultivated in Tarakan City have the ecological factors of *Kappaphycus alvarezii* seaweed cultivation in the waters of Pantai Amal, Tarakan City, were studied by measuring several water quality parameters using in situ and ex-situ water quality examination methods carried out in August, September, and October 2023 to evaluate the feasibility and suitability of land for developing seaweed cultivation. In this study, measurements were carried out at three stations: where station I is located in the RT 04 area at coordinate point 3° 21'N, station II is located in the RT 07 area at coordinate point 3° 19'N, and Station III is located at RT 14 at coordinate point 117° 40'E. The results of water quality parameter measurements at the three stations can be seen in Table 10.

The results of water quality measurements in Table 10 show that all measured parameters are still within the criteria of being very suitable for seaweed cultivation activities, except for the brightness parameter, which shows the categories of being quite suitable and not suitable (Table 11).

Feasibility of seaweed cultivation business

Income/profit

Farmers in Pantai Amal, Tarakan City, cultivate *K. alvarezii* seaweed using the longline method throughout the year. Farmers can plant as many as 8-10 times in one year. The number of rope spans used by farmers in each unit ranges from 150 to 200, with a rope length of 30 to 40 meters. The price of dried seaweed ranges from IDR 14,500-16,000/kg depending on the quality of the seaweed. The income obtained by seaweed farmers in the waters of Pantai Amal, Tarakan City, from the results of the *K. alvarezii* seaweed cultivation business using the longline method, is IDR 92,800,000/unit/year.

Production/operational costs

Based on the calculation results, the production cost of *K. alvarezii* seaweed cultivation using the longline method per year for 1 unit is 32,000,000 IDR, the total fixed and variable costs. Production/operational costs can be seen in Table 12.

Revenue and cost (R/C) balance analysis

The calculation of the revenue and cost (R/C) balance analysis obtained a result of 2.9. This result shows that the business is profitable and worth managing.

Analysis payback period (PP)

The average payback period (PP) after the data was processed obtained from respondents obtained a payback period (PP) analysis value of 0.59. This shows that the time required to return the amount of funds invested in seaweed cultivation in the waters of Pantai Amal, Tarakan City, the faster return on investment in seaweed cultivation activities, the better the business will be. Conversely, if the return on investment is longer, the value of the business is not profitable.

Table 10. Results of water quality measurements in the waters of Pantai Amal, Tarakan City during the research.

No	Parameters	Units	Stations		
			I	II	III
1	Transparancy	cm	43-60	125-140	90-150
2	Current	meter/second	0.33-0.40	0.22-0.50	0.40-0.45
3	Temperature	°C	29-30	28-30	28-30
4	pH	-	6.5-7.9	6.8-8.1	6.5-7.2
5	Salinity	ppt	28-30	29-30	29-30
6	Dissolved Oxygen	mg/liter	3.8-4.5	4.1-4.5	4.5-4.9
7	Phosphate	mg/liter	0.19-0.39	0.31-0.42	0.42-0.47
8	Nitrate	mg/liter	0.6-0.8	0.7-1.2	0.5-0.7
9	Depth	meter	2.9-4.8	3.3-5.3	3.6-5.7

Table 12. Production/operating costs per year for 1 unit (50 m × 200 m).

No	Production Cost/Operational	Number (person)	Cost/Year (IDR)
	Fixed cost		
1	Planning		3,600,000
Total fixed cost			**3,600,000**
	Non fixed cost		
1	Wages for washing the ropes	1	4,800,000
2	Wages for planting seedlings	2	2,400,000
3	Wages for caring for seedlings	1	800,000
4	Wages for harvesting seedlings	3	3,600,000
5	Wages for drying seedlings	2	2,400,000
6	Wages for tying seedlings	3	14,400,000
	Non fixed cost		**28,400,000**
	Total operational cost		**32,000,000**

Return on Investment (ROI) Analysis

Based on the calculation results obtained from respondents, the value (ROI) is 68.98%, meaning the profit obtained is 68.98% per year from the invested results. If production and production value increase, the percentage of profit will be greater, and vice versa; if production and production value decrease, the rate of profit obtained will decrease within 1 year.

Seaweed cultivation business development strategy

The development of a business will run smoothly if supported by a good strategy. According to Sulaiman and Asmawi (2022), a business development strategy is carried out by increasing scale, innovating products, expanding markets, and carrying out market innovation. The seaweed cultivation development strategy in Tarakan City must involve a comprehensive and sustainable approach, utilizing local strengths such as supportive water conditions and community experience in marine cultivation. The primary efforts should be focused on applying more modern cultivation technology to increase productivity and quality of results, as well as diversifying seaweed derivative products to open new domestic and export markets. In addition, it is important to strengthen the capacity of farmers through training and mentoring, as well as building partnerships with the private sector and government to increase market access and financing. To face challenges such as climate change and market competition, collaboration between farmers, researchers, and local governments is essential in maintaining business sustainability and increasing the competitiveness of seaweed products from Tarakan.

Placement of business based on IE matrix

Internal factor evaluation (IFE) matrix

Identify internal business factors in the form of strengths and weaknesses that influence the development of seaweed cultivation businesses. Internal strategy factors of seaweed cultivation businesses can be seen in Table 13.

The results of the internal strategy factors in Table 13 show that simple cultivation techniques are the most crucial factor in grass cultivation, with a score of 0.48, which is the main strength of the activity. Other significant factors are that the cultivation location is still available, with a score of 0.40, and the short cultivation time, with a score of 0.32. Facilities and infrastructure that are easy to obtain are more of a concern for business strengths than labor, with a score of 0.21 for the production facilities and infrastructure factor and 0.20 for the labor factor from the surrounding environment.

Internal strategic factors also describe the value ranking of business weakness factors where entrepreneurship is not yet optimal and is a decisive weakness factor for the business (score 0.28), so it needs to be minimized. The second and third weakness factors are in-continuous access to quality seeds and limited capital, which weigh 0.12

with a score of 0.24. Business groups that are less empowered, with a score of 0.12 and sub-optimal cultivation production of 0.08, also contribute to seaweed production in Tarakan City.

Based on the results of the analysis of the calculation of internal factors, a total score of 2.57 was obtained. This value is above the average of 2.5, which indicates a relatively strong internal position of the business and above-average capabilities in utilizing strengths and anticipating internal weaknesses (Rusli *et al*. 2020).

External factor evaluation (EFE) matrix

Identification of external business factors in the form of opportunities and threats that influence the development of seaweed cultivation businesses. The following external strategy factors for seaweed cultivation businesses can be seen in Table 14.

The calculation results of external strategic factors show that the foremost opportunity in developing seaweed cultivation businesses is that product quality requirements are easy to meet (score 0.60). This opportunity is supported by the available seaweed market (score 0.52). Partnerships with suppliers and the positive image of seaweed from North Kalimantan are considered quite good (score 0.36). Another opportunity is support from government policies (score 0.30). Threats that arise from the calculation of external strategic factors that need to be considered are fluctuating seaweed prices (score 0.26), then pest and disease attacks (score 0.20), competition from other regions (score 0.18), and changes in seasons during cultivation activities (score 0.09). The total score of external strategic factors is 2.87, according to Rusli *et al*. (2020), indicating that the business position is quite strong in taking advantage of opportunities and anticipating external threats.

IE matrix

The IE matrix has three strategies with nine quadrants. The IFE and EFE values obtained will determine the business position and help seaweed farmers determine strategies for developing their businesses. The IFE value was obtained with a score of 2.57, and the EFE value with a score of 2.87. The location of the business position and the strategy to be implemented can be seen in Figure 3.

Based on the IE matrix mapping in Figure 1, it can be seen that the business position is in cell V (growth strategy), which has substantial internal factors and favorable external conditions. According to Nurdin *et al*. (2013), several strategies can be carried out, including production expansion through expansion of cultivation areas and marketing, product diversification, market expansion, collaboration with the government and related parties, and innovation in cultivation methods.

Table 13. Internal strategic factors of the business.

No	Internal Factors	Weights (a)	Ratings (b)	Values (a×b)
	Strengths			
1	Cultivation locations are still available	0.10	4	0.40
2	Production infrastructure is easy to obtain	0.07	3	0.21
3	Short cultivation periods	0.08	4	0.32
4	Simple cultivation techniques	0.12	4	0.48
5	Labor is easy to obtain	0.05	4	0.20
	Weaknesses			
1	Limited business capital	0.12	2	0.24
2	Cultivation production is not optimal	0.08	1	0.08
3	Business groups are not empowered enough	0.12	1	0.12
4	Access to quality seeds is not continuous	0.12	2	0.24
5	Entrepreneurship is not optimal	0.14	2	0.28
	Total	**1.00**		**2.57**

Table 14. External strategic factors of the business.

No	External Factors	Weights (a)	Ratings (b)	Values (a×b)
	Opportunities			
1	The seaweed market is available	0.13	4	0.52
2	Product quality requirements are easy to meet	0.15	4	0.60
3	Policy support from the government	0.10	3	0.30
4	Seaweed quality from North Kalimantan is positive	0.09	4	0.36
5	Partnerships with good suppliers	0.12	3	0.36
	Threats			
1	Seaweed prices fluctuate	0.13	2	0.26
2	Competition from other regions	0.09	2	0.18
3	Seasonal changes	0.09	1	0.09
4	Pest and disease attacks	0.10	2	0.20
	Total	**1.00**		**2.87**

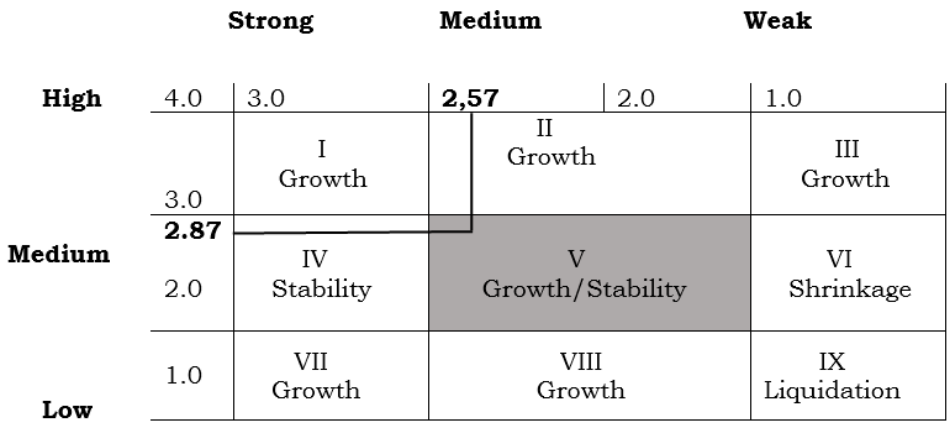

Figure 3. Business position in IE matrix analysis.

Alternative strategy formulation

The strategic steps that emerge from the IE matrix are then analyzed using the SWOT matrix to obtain appropriate strategic alternatives that can be implemented, as shown in Table 15.

The alternative strategies obtained are then processed using the quantitative strategic planning matrix (QSPM) to determine the most appropriate alternative strategy to implement, as listed in Table 16.

The QSP matrix provides a clear picture of the factors that need to be improved and emphasized in the seaweed cultivation business development strategy in Tarakan City. The QSP matrix in Table 16 shows that the right strategy to enhance the development of seaweed cultivation businesses is to increase group empowerment through training, guidance, and mentoring (score 5.83); expansion of new cultivation locations (score 5.65); and optimizing cultivation production by improving the efficiency and effectiveness of the production process (score 5.52).

Empowering seaweed farming groups is a key strategy in the QSP matrix because it can holistically improve the competitiveness of seaweed farming businesses in Tarakan City. Empowering farming groups will give them better access to training, more efficient farming technology, and financing that can reduce capital constraints.

Table 15. SWOT matrix of Kappaphycus alvarezii seaweed cultivation business using the longline method in the coastal waters of Pantai Amal, Tarakan City.

Internal Factors / **External Factors**	**Strengths (S)**	**Weaknesses (W)**
	1. Cultivation locations are still available 2. Production facilities and infrastructure are easy to obtain 3. Short cultivation time 4. Simple cultivation techniques 5. Labor is easy to obtain	1. Limited business capital 2. Cultivation production is not optimal 3. Business groups are not empowered enough 4. Access to quality seeds is not continuous 5. Entrepreneurship is not optimal
Opportunity (O) 1. The seaweed market is available 2. Product quality requirements are easy to meet 3. Policy support from the government 4. The quality of seaweed from North Kalimantan is positive 5. Partnerships with good suppliers	**Strategy S-O** 1. Expansion of new cultivation locations (S1, S2, S4, S5, O1, O2, O5) 2. Diversification of seaweed products (S2, S4, O2, O4, O5)	**Strategy W-O** 1. Optimizing cultivation production by increasing the efficiency and effectiveness of the production process (W2, W3, W4, W5, O1, O4, O5) 2. Increasing group empowerment through training, guidance, and mentoring (W3, W5, O1, O3, O5)
Threats (T) 1. Seaweed prices fluctuate 2. Competition from other regions 3. Seasonal changes 4. Pest and disease attacks	**Strategy S-T** 1. Optimizing the quality and quantity of existing products (S1, S2, S4, S5, T3, T4)	**Strategy W-T** 1. Expanding access to capital sources (W1, W2, W3, T1, T2) 2. Maintaining relationships in marketing networks (W1, W3, T1, T2)

Table 16. Determining the best business strategy alternative (QSPM matrix).

Alternative	**Linkage**	**Weight**	**Level**
Strategy S – O			
Expansion of new cultivation locations.	S3,S2,S4,S1,S5,O5,O2,O1	5.65	II
Diversification of seaweed products.	S4, S2, S5, O5, O4, O2	5.17	IV
Strategy W – O			
Optimizing cultivation production by increasing the efficiency and effectiveness of the production process.	W5, W4, W3, W2, O5, O4, O1	5.52	III
Increasing group empowerment through training, guidance, and mentoring.	W5, W3, O5, O3, O1	5.83	I
Strategy W – T			
Expanding access to capital sources.	W3, W2, W1, T2, T1	4.33	VI
Maintaining relationships in marketing networks.	W3, W1, T2, T1	4.12	VII
Strategy S – T			
Optimizing the quality and quantity of existing products.	S4, S2, S1, T5, T4	4.59	V

Expanding new cultivation sites can open up opportunities to increase production and diversify natural resources used in seaweed farming. In Tarakan City, although there is excellent potential in coastal areas, expansion to new cultivation sites with favorable water conditions will expand production areas and reduce dependence on a single location vulnerable to climate change or contamination. In addition, by expanding cultivation sites, farmers can optimize the use of existing natural resources, reduce pressure on certain ecosystems, and develop new markets by increasing production volumes. Optimizing cultivation production by increasing the efficiency and effectiveness of the production process can significantly reduce production costs and increase yields. Applying more efficient cultivation technology and methods is essential for seaweed farming in Tarakan City to increase productivity without sacrificing quality. Using more modern cultivation techniques, such as hanging rope systems or cultivation with better technological supervision, can reduce the time and costs required for maintenance and increase yields.

CONCLUSION

Based on the research results that have been presented, the conclusions that can be drawn from this study are:

1. Based on the analysis of production data, the calculation of income is 92,800,000 IDR/year (8 plantings); analysis of the balance of income and costs (R/C) is 2.9; analysis of the payback period (PP) is 0.59 years; and analysis of Return of Investment (ROI) is 68.98%.
2. Based on the identification of internal factors, there are five indicators of strength (the cultivation location is still available, facilities and infrastructure are easy to obtain, the cultivation time is short, the cultivation technique is simple, and the labor is easy to get) and five weaknesses (limited business capital, the farmer group is not empowered enough, access to quality seeds is not continuous, entrepreneurship and farmer production are not optimal), with a total value of 2.57. Identification of external factors includes five opportunities (the seaweed market is available, the market easily meets product quality requirements, partnerships with suitable suppliers, seaweed from North Kalimantan is positive, and government policies that support the business) and four threats (fluctuating seaweed prices, pests and diseases, competition from other regions, and the influence of seasonal changes), with a total value of 2.86. The IE Matrix mapping based on EFE and IFE analysis shows that the business is in a growth position (cell V).
3. Based on the SWOT analysis, which is continued with the QSPM matrix, the most appropriate strategy for developing the *Kappaphycus alvarezii* seaweed cultivation business using the longline method in the waters of Pantai Amal, Tarakan City, is to increase group empowerment through training, guidance, and mentoring (score 5.83); expansion of new cultivation land (score 5.65); and optimizing cultivation production by increasing the efficiency and effectiveness of the production process (score 5.52). These three strategies can be implemented together because they support each other.

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