

ANALYSIS OF FARMERS RESOURCES AND STRATEGIES IN FACING SEAWEED FARMING RISKS IN LOMBOK ISLAND

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Abstract: This study aims to analyze seaweed farming income, identify sources of production and price risks, and determine strategies that farmers can implement to face seaweed farming risks on Lombok Island. The research areas were East Lombok and Central Lombok, selected by *purposive sampling*. Respondents consisted of 42 people and six key informants consisting of experts in related fields. Data were analyzed using FMEA, SWOT, and QSPM analyses. The results showed that seaweed farming income on Lombok Island during 2024 was an average of Rp. 186,805,693.22. /LLG or an average of Rp . 319,261,001.63 /Ha. The main sources of production and price risks come from production risks, namely climate change/extreme weather and pest and disease attacks. Meanwhile, from the price risk type, the most important risk is low production quality, followed by limited marketing channels and fluctuations in selling prices. Other risks such as seawater pollution and fishing disruptions have a relatively lower impact. The strategy that farmers can implement is a growth-oriented strategy (aggressive strategy). Strategies that utilize strengths and opportunities consist of four alternative strategies. The main priority strategy for dealing with seaweed farming risks on Lombok Island is the use of digital media. Other strategies include collaboration through farmer groups, regular harvest cycles, and expansion of cultivation areas.

Keywords: Seaweed, Risk Source, FMEA, SWOT, QSPM.

I. INTRODUCTION

Indonesia is a fertile and resource-rich country with a sea area of 5.8 million km² and a coastline of 95,181 km. It is strategically located between the Asian and Australian continents and the Indian and Pacific Oceans, making Indonesia possess enormous marine potential (Prasetya, 2018). With abundant coastal and marine resources, the potential of the blue economy should be optimized to support the national economy and development (Tomo, 2018).

One of the promising commodities in the fisheries and marine sector with high economic value and great potential for development is seaweed (Agustang *et al.* , 2021). A stable tropical climate, sufficient sunlight, and extensive coastal waters provide a comparative advantage for Indonesia in seaweed cultivation activities (Darmawati *et al.*, 2023). Indonesia plays a significant role in the global seaweed trade. This is because Indonesia contributes more than 40% to total global production and accounts for around 30% of global seaweed exports (Saragih *et al.*, 2022). The potential added value of seaweed is enormous because it is not only used as food ingredients such as agar and carrageenan, but also used in various industries such as cosmetics, pharmaceuticals, organic fertilizers, bioplastics, and nutraceutical products. According to Krishnan *et al.* . (2024), seaweed polysaccharides such as alginate, agar, and carrageenan have important functions as basic ingredients for bioplastics , health products , and active components in cosmetics and pharmaceuticals . Global market demand for seaweed continues to show a positive trend in terms of volume and value (Yanamisra *et al.*, 2023)

Lombok Island in West Nusa Tenggara Province is one of the regions supporting national seaweed production. Its coastal areas boast numerous calm bays, making it suitable for cultivation. Seaweed farming has become an economic mainstay for coastal communities in this region. However, seaweed production on Lombok Island has fluctuated over the past five years. Data from the Maritime Affairs and Fisheries Service (DKP NTB, 2024) shows that seaweed production in 2019 was

112,928.77 tons, increasing to 118,238.12 tons in 2020, but dropping drastically to 59,716.69 tons in 2021. Production in 2022 and 2023 saw gradual increases, reaching 68,500.24 tons, respectively, and 74,680.46 tons.

This pattern indicates that seaweed production on Lombok Island is unstable from year to year, reflecting significant production risks (Sejati et al., 2020). The drastic decline in production mid-period and slow recovery indicate that farming activities are heavily influenced by external factors such as weather, water quality, and ocean wave conditions (Puspitasari & Hasan, 2021). These risks not only impact harvest quantity but also influence farmers' incomes and management decisions (Jufri et al., 2018). Furthermore, poor harvest quality, low prices, and the possibility of crop failure exacerbate the uncertainty of seaweed farming outcomes at the on-farm level (Fadli et al., 2017).

In addition to production risks, seaweed farmers also face price risks, characterized by fluctuations in selling prices. Seaweed prices are influenced by harvest quality, export market demand, and the dominance of collectors who control the distribution chain. According to Mappigau et al. (2022), quality and price are interrelated. The purchasing power of importing countries also determines seaweed trade volume and selling value (Saragih et al., 2022).

Based on the description above, this study aims to: (1) Analyze the income of seaweed farming on Lombok Island; (2) Identify the sources of production risk and price risk of seaweed farming on Lombok Island; and (3) Determine strategies that can be implemented by farmers in facing production risk and price risk of seaweed farming on Lombok Island. This study serves as an initial reference in understanding the characteristics and challenges of risks faced in seaweed farming, providing input for farmers and policy makers in formulating management strategies that are appropriate to field conditions.

II. METHODS

This study employed a descriptive approach with a survey method, chosen because it was appropriate for obtaining a realistic picture of the risks faced by seaweed farmers on Lombok Island. Furthermore, a literature review was conducted to identify theories and concepts addressing risks in farming, which served as the basis for developing instruments and data analysis. Prior to primary data collection, a pre-survey was conducted as an initial stage of data collection through observation and brief interviews with farmers. The aim was to determine the cultivation methods used, the frequency of planting seasons, and to adjust the questionnaire for the main survey.

The unit of analysis in this study is seaweed farming on Lombok Island. The research area was determined by purposive sampling based on the characteristics of the regions that are the main centers of seaweed cultivation in the coastal waters of Lombok Island, namely East Lombok Regency and Central Lombok Regency, specifically Jerowaru and Pujut Districts. The number of respondents in this study was determined at 42 people using the Slovin formula, which aims to obtain proportional representation of the population. The determination of the number of respondents in each district was carried out using a proportional sampling method, so that the sample distribution corresponds to the population size in each location. The selection of respondents was carried out by simple random sampling so that each member of the population has an equal chance of being selected. In addition to the main respondents, this study also involved six key informants consisting of local government officials, fisheries extension workers, collectors, and seaweed farmers on Lombok Island.

Data analysis in this study was conducted using three main approaches tailored to the research objectives. First, to calculate seaweed farming income, the following formula was used (Trisnantoro, 2018):

$$TR = P \times Q$$

Information:

TR	= Total Revenue (Rp)
Q	= Production (Kg)
P	= Price (Rp/Kg)

Second, to analyze the sources of production and price risks, the *Failure Mode and Effect Analysis* (FMEA) method was used. This FMEA approach was adapted from Siddik et al. (2025), who successfully identified and prioritized risks in horticultural farming using a similar method. Through FMEA, each risk is evaluated based on three indicators: severity, probability of occurrence, and detectability. The criteria for assessing risk refer to *The Basics of FMEA* by McDermott with a scale of 1-10. The assessment criteria are presented in the following tables:

a. *Severity*

Table 1: Severity Assessment Criteria

Ranking	Information
9 – 10	Causes of failure impact production failure > 20%
7–8	The causes of failure impact production failure by 10%–20%
5–6	The causes of failure impact production failure by 5% - 10%
3–4	The cause of failure has an influence on production failure < 5%
1–2	The cause of failure has no significant influence on production failure.

Source: Carbon and Tippet in Puspitasari and Hasan, 2021

b. *Occurrence*

Table 2. Criteria for Assessing the Occurrence

Possible failure	Information	Ranking
Very high	> 1 of 10	10
	1 of 20	9
Tall	1 of 50	8
	1 in 100	7
Currently	1 in 200	6
	1 in 500	5
	1 in 1,000	4
Low	1 in 2,000	3
	1 in 10,000	2
Very low	< 1 in 100,000	1

Source: Carlson in Puspitasari and Hasan, 2021

c. *Detection*

Table 3: Detection Assessment Criteria

Ranking	Information
10	Cause of failure not detected
9	The probability of the cause of the failure being detected is quite small.
6-8	The possible cause of the failure is detected quite easily.
2-5	The probability of the cause of the failure being detected is high
1	The probable cause of failure is almost certainly detected.

Source: Carbone and Tippet in Puspitasari and Hasan, 2021

The Risk Priority Number (RPN) is calculated based on three main indicators: severity (S), probability of occurrence (O), and detectability (D). These three indicators reflect the magnitude of a risk's impact, its frequency of occurrence, and its difficulty of detection. The more severe the impact, the more frequent the occurrence, and the more difficult it is to detect, the higher the RPN value, indicating that the risk requires more immediate priority management. The calculation formula is as follows: (Puspitasari and Hasan, 2021)

$$RPN = S \times O \times D$$

S = Severity

O = Occurrence

D = Detection

Third, to analyze strategies that farmers can implement against farming risks and determine priority strategies, the *Strengths, Weaknesses, Opportunities, and Threats* (SWOT) and *Quantitative Strategic Planning Matrix* (QSPM) approaches were used. Data analysis was carried out through several stages including; identification of each SWOT variable, formulation of alternative strategies using the SWOT matrix and the results of the SWOT analysis were then combined with the

Quantitative Strategic Planning Matrix (QSPM) method to determine priority strategies. The QSPM is used to evaluate and determine the most appropriate strategy by assessing the attractiveness of various existing alternatives through assigning weights and scores to previously determined key factors (Sagala et al., 2025). At this stage, indicators are measured using a scale of 1 to 5 to represent the magnitude of the influence of each alternative strategy obtained through the SWOT analysis. The final result is a strategy priority ranking based on the relative attractiveness of each available alternative.

III. RESULTS AND DISCUSSION

Seaweed farming on Lombok Island is a crucial economic activity for coastal communities. In practice, farmers face various risks that can impact production and income. This study reveals the various sources of production and price risks faced, as well as strategies farmers can implement to mitigate or address these risks.

1. Seaweed Farming Income Analysis

Income is the result obtained by someone through buying and selling activities, which occurs when there is a price agreement between the seller and buyer in a transaction (Madji et al., 2019). Table 4 shows that the average income from seaweed farming on Lombok Island during 2024 was Rp. 186.805.693,22/LLG or an average of Rp.319.261.001,63 /ha. This value reflects the difference between total revenue and production costs during one year of cultivation.

Table 4. Seaweed Farming Income on Lombok Island in 2024

No	Description	Per LLG (0.59 Ha)	Per Ha (1 Ha)
1	Production (Kg)	19.246,43	32.893,18
2	Production Cost (Rp)	104.927.640,12	179.326.994,30
3	Production Value (Rp)	291.733.333,33	498.587.995,93
4	Income (Rp)	186.805.693,22	319.261.001,63

Source: Primary data processed (2025)

2. Analysis of Risk Sources in Seaweed Farming

Risk analysis is an activity designed to determine the likelihood, frequency, and impact of a risk on achieving a goal or objective, taking into account existing management activities (Utomo et al., 2024). As a first step in understanding the risks faced by seaweed farmers on Lombok Island, a process of identifying various potential risks that could impact the operation of the farming business was conducted. These potential risks were obtained from a literature review and interviews with respondents and informants in the field. Next, to assess the urgency of addressing each risk, an approach was used that considered the risk's severity, likelihood of occurrence, and ability to detect the risk. The results of the analysis are presented in the following table as a basis for determining the main risks that require further attention.

Table 5. Ranking of Sources of Production Risk and Price Risk of Seaweed Farming on Lombok Island

No.	Causes of Risk	Types of Risk	Severity(S)	Occurrence (O)	Detection (D)	RPN	Risk Rating
1	Climate change/extreme weather	Production	381	415	231	492.99	1
2	Pest and disease attacks	Production	271	414	268	405.84	2
3	Sea water pollution due to waste and other hazardous materials	Production	130	255	184	82.33	6
4	Location disturbed by other activities (fishing)	Production	112	288	82	35.70	7
5	The selling price of seaweed fluctuates	Price	209	420	253	299.76	5
6	Marketing channels are limited to local buyers/collectors only	Price	209	420	264	312.79	4
7	Low production quality (non-uniform or damaged)	Price	335	389	179	314.85	3

Source: Processed primary data (2025)

Based on the results of the FMEA (*Failure Mode and Effect Analysis*) analysis above, it was found that the highest primary risk source in seaweed farming on Lombok Island is climate change/extreme weather with a *Risk Priority Number* (RPN) of 492.99. This risk is classified as a production risk and ranks first, this is because the cultivation process is highly

dependent on weather conditions, including wind speed. Wind speed affects the strength of ocean currents; currents that are too strong risk damaging seaweed, while currents that are too weak can inhibit its growth. The second-ranked risk also comes from the production aspect, namely pest and disease attacks with an RPN value of 405.84. These attacks occur quite frequently and are difficult to detect early, so appropriate mitigation strategies are needed. Sources of agricultural production risk generally come from unpredictable weather changes and pest and disease attacks (Aryal *et al.*, 2021). Meanwhile, the most significant risk from the price aspect is low production quality (uneven or damaged), with an RPN value of 314.85, ranking third overall. This risk is related to selling prices because the quality of the harvest significantly determines farmers' bargaining power with buyers or collectors. Furthermore, risks related to limited marketing channels to local buyers ranked fourth (RPN 312.79), followed by fluctuations in seaweed selling prices ranked fifth (RPN 299.76). These two risks indicate that, in terms of pricing, farmers still rely on limited local markets and do not yet have access to broader markets. Meanwhile, seawater pollution due to waste, with an RPN of 82.33, and disruptive fishing activities with an RPN of 35.70, are risks with lower RPN values, ranking sixth and seventh, respectively. This indicates that while still requiring attention, the impact and frequency of these risks are relatively smaller compared to other major risks.

3. Internal Factor Analysis (Strengths and Weaknesses) and External Factor Analysis (Opportunities and Threats)

a. Internal Factors of Seaweed Farming

Internal factors influencing the success of seaweed farming on Lombok Island encompass various aspects of the business system itself, which determine farmers' ability to maintain sustainability and productivity. These factors reflect the conditions and capacities of farmers, including resources, experience, and overall business management. Understanding these internal conditions is crucial for assessing the potential that can be maximized and the challenges that need to be overcome to ensure optimal farming operations. In this context, there are supporting strengths, such as technical skills, a workforce, and a favorable business location. Meanwhile, weaknesses remain, such as limited capital, a lack of supporting equipment, and unequal access to information and markets. Identifying these conditions provides a crucial foundation for developing farmer strategies to address production and price risks that can impact business continuity.

Table 6. Internal Factors

No	Strength	No	Weakness
1	Farmers have experience and technical skills that can support business development.	1	Capital limitations
2	Availability of labor within and outside the family	2	Do not have tools and machines for processing the results
3	The seaweed planting location is large and in accordance with its natural habitat.	3	Lack of knowledge about diversification of processed seaweed products
4	Fast planting cycle and periodic harvests	4	Marketing channels are limited to local buyers/collectors only
5	Involvement in farmer groups		

b. External Factors of Seaweed Farming

External factors are factors beyond the control of farmers that can impact the operation of seaweed farming on Lombok Island, both in the form of opportunities and threats. Opportunities such as support from various parties, market potential, and technological developments can be utilized to strengthen the business. Conversely, threats such as price fluctuations, pest attacks, extreme weather, and marine pollution pose challenges that can disrupt farmer production and income. Understanding these external factors is crucial in determining appropriate strategies to address production and price risks, which cannot be fully controlled internally.

Table 7. External Factors

No	Opportunity	No	Threat
1	High market demand, including for processed products (product diversification)	1	Seaweed prices fluctuate
2	There is support from related parties	2	Pest/disease attacks
3	There is still potential land available that is suitable for seaweed cultivation.	3	Climate change and extreme weather
4	Advances in information technology and ease of promotion through digital media	4	Sea water pollution due to waste and other hazardous materials

c. Internal Evaluation Matrix (IFE) Analysis

The Internal Factor Evaluation (IFE) Matrix is used to provide a quantitative assessment of the internal position of seaweed farming by measuring the strengths and weaknesses of farmers. Each factor is assessed through weighting and rating to determine its impact on business success. The results of this matrix serve as the basis for formulating strategies tailored to the farmers' internal conditions. The IFE Matrix used in this study is presented in Table 8.

Table 8. IFE Matrix of Seaweed Farming on Lombok Island

Strategic Internal Factors	Weight	Ranking	Score
Strengths			
Farmers have experience and technical skills that can support business development.	0.13	4	0.50
Availability of labor within and outside the family	0.12	4	0.49
The seaweed planting location is large and in accordance with its natural habitat.	0.13	4	0.50
Fast planting cycle and periodic harvests	0.12	3	0.37
Involvement in farmer groups	0.12	2	0.24
Total	0.62	17	2.10
Weakness			
Capital limitations	0.07	1	0.07
Do not have tools and machines for processing the results	0.11	3	0.34
Lack of knowledge about diversification of processed seaweed products	0.08	3	0.25
Marketing channels are limited to local buyers/collectors only	0.11	2	0.23
Total	0.38	9	0.89
Total Internal Factors	1	26	2.99

Source: Processed primary data (2025)

The analysis of internal factors influencing seaweed farming on Lombok Island indicates that the primary strengths stem from farmers' experience in cultivation, labor availability, and cultivation locations that support seaweed growth. Furthermore, relatively quick planting times and the presence of farmer groups contribute to business continuity. The total strengths score reached 2.10, indicating that internal strengths play a significant role in supporting the success of seaweed cultivation amidst various challenges. On the other hand, identified weaknesses include limited business capital, the unavailability of processing equipment, and farmers' limited understanding of processed product development. Dependence on middlemen as a marketing channel also hinders market reach and product sales. The total weaknesses score was 0.89, indicating that the existing weaknesses are still relatively low and not yet significantly inhibiting overall, but still require attention to prevent them from developing into larger obstacles in the future.

d. External Factor Evaluation Matrix (EFE) Analysis

The External Factor Evaluation (EFE) Matrix is used to assess the influence of external factors on the sustainability of seaweed cultivation. This matrix lists various opportunities and threats, weighted and rated, to determine their level of urgency and impact on farmers' businesses. The results of this analysis serve as the basis for formulating strategies that can help farmers respond appropriately to external conditions. The EFE Matrix used in this study is presented in Table 9.

Table 9. EFE Matrix of Seaweed Farming on Lombok Island

Strategic External Factors	Weight	Ranking	Score
Opportunities			
High market demand, including for processed products (product diversification)	0.13	4	0.52
There is support from related parties	0.13	2	0.26
There is still potential land available that is suitable for seaweed cultivation.	0.15	4	0.58
Advances in information technology and ease of promotion through digital media	0.14	3	0.42
Total	0.55	13	1.78
Threats			
Seaweed prices fluctuate	0.13	1	0.13
Pest/disease attacks	0.12	2	0.25
Climate change and extreme weather	0.14	1	0.14
Sea water pollution due to waste and other hazardous materials	0.06	3	0.18
Total	0.45	7	0.70
Total External Factors	1	20	2.48

Source: Processed primary data (2025)

The analysis of external factors indicates that the greatest opportunities stem from the availability of suitable land for cultivation, high market demand, and advances in information technology that support product promotion. Support from relevant parties also provides space for farmers to develop their businesses with a more integrated approach. The total opportunity score of 1.78 indicates that the external environment still offers significant potential for farmers to leverage to develop their businesses.

Meanwhile, threats faced include fluctuating seaweed prices, pest and disease attacks, unpredictable climate change, and marine pollution from waste. While these factors can hinder cultivation activities, the total threat score of only 0.70 indicates that the overall threat level is manageable. Therefore, strategies need to be directed at strengthening farmers' readiness to respond more quickly and efficiently to external disruptions.

4. Internal-External Matrix Analysis (IE)

The Internal-External (IE) Matrix is used to determine the strategic position of a business based on its internal strengths and weaknesses, as well as opportunities and threats from the external environment that have been analyzed quantitatively. The total score of internal factors (IFE) is placed on the X-axis, while the total score of external factors (EFE) is placed on the Y-axis. The results of these calculations are then mapped into nine cells in the IE matrix, each of which represents a main strategic direction, such as growth, maintenance, or re-evaluation of business activities.

a. SWOT diagram

A SWOT diagram aims to visually depict the relationship between internal and external factors, based on the difference between strengths and weaknesses (X-axis) and opportunities and threats (Y-axis). The results indicate a business's position within one of four strategic quadrants. Each quadrant provides a different strategic approach, for example, an aggressive strategy when strengths and opportunities are strong, or a defensive strategy when weaknesses and threats are more dominant. This approach helps business actors choose strategies that are more appropriate to the actual conditions on the ground (Wahyudin *et al.*, 2023).

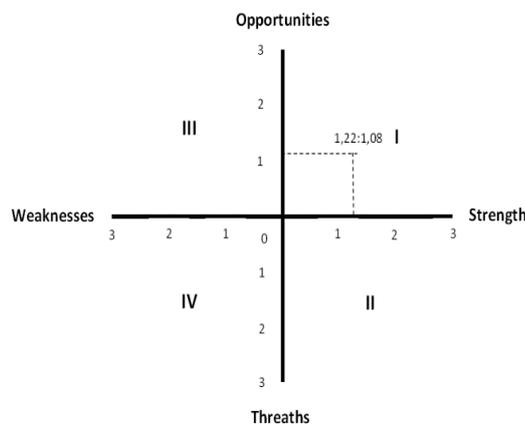


Figure 1. SWOT diagram

Based on the calculation results, the X-axis value was 1.22 and the Y-axis value was 1.08, which places seaweed farming on Lombok Island in Quadrant I in the SWOT Diagram. This position indicates that the farming business is in a strong condition and has great opportunities for development. The appropriate strategy for this position is an aggressive strategy (*Growth-Oriented Strategy*), namely a strategy that encourages business actors to utilize internal strengths to seize existing market opportunities. This approach is supported by Chanifatun *et al.* (2023), who stated that an aggressive strategy is appropriate for use when a company has internal advantages and faces promising opportunities, so it needs to focus on active and optimal business development. Similar findings were also explained by Rakhmansyah *et al.* (2022), who stated that business actors in Quadrant I can increase the intensity of promotions, maintain product quality, and strengthen communication with the market.

b. SWOT Matrix Analysis

This study used a SWOT analysis to evaluate strategies that farmers can implement to address risks in seaweed farming on Lombok Island by identifying strengths, weaknesses, opportunities, and threats. This method was chosen because it provides a comprehensive overview of internal conditions (such as farmer experience, cultivation skills, and farmer institutions) and

external conditions (such as price dynamics, weather conditions, and market demand). Through this analysis, the formulated strategies are expected to help farmers mitigate the impact of production and price risks in an adaptive and sustainable manner.

The SWOT approach is considered highly flexible and applicable in the context of seaweed farming because it reflects real-world conditions through direct involvement of farmers and stakeholders. As noted by Wardono et al. (2024), a SWOT analysis can provide valuable strategic insights for strengthening local seaweed business models, particularly through stakeholder engagement and optimization of available resources.

Table 10. SWOT Matrix of Seaweed Farming

IFE EFE	Strengths=S	Weaknesses=W
	<ol style="list-style-type: none"> 1. Farmers have experience and technical skills that can support business development. 2. Availability of labor within and outside the family 3. The seaweed planting location is large and in accordance with its natural habitat. 4. fast planting cycle and periodic harvests 5. Involvement in farmer groups 	<ol style="list-style-type: none"> 1. Capital limitations 2. Do not have tools and machines for processing the results 3. Lack of knowledge about diversification of processed seaweed products 4. Marketing channels are limited to local buyers/collectors only
Opportunities=O	SO Strategy	WO Strategy
<ol style="list-style-type: none"> 1. High market demand, including for processed products (product diversification) 2. There is support from related parties 3. There is still potential land available that is suitable for seaweed cultivation. 4. Advances in information technology and ease of promotion through digital media 	<ol style="list-style-type: none"> 1. Expanding Cultivation Area Using Available Labor (S 2,S3,O3) 2. Utilizing periodic harvest cycles to meet high market demand (S 4,O 1) 3. Enhancing Cooperation with Related Parties Through Farmer Groups (S 5,O 2) 4. Using digital media to promote cultivation results directly (S 1,O 4) 	<ol style="list-style-type: none"> 1. Submitting capital support, equipment assistance and training to relevant agencies to address the lack of equipment and processing skills (W1, W2, W3, O1, O2) 2. Utilizing farmer groups to share equipment, materials, and information to keep businesses running despite limited capital (W 1, W 2, O2) 3. Seeking market information through the help of agencies or online media to reach new buyers (W 4, O 2, O4)
Threats=T	ST Strategy	WT Strategy
<ol style="list-style-type: none"> 1. Seaweed prices fluctuate 2. Pest/disease attacks 3. Climate change and extreme weather 4. Sea water pollution due to waste and other hazardous materials 	<ol style="list-style-type: none"> 1. Arrange planting and harvesting schedules more flexibly so that production can continue even when the weather is unpredictable (S 1, S 4, S3) 2. Utilize the experience and skills of farmers to manage cultivation carefully and reduce the risk of pest or disease attacks (S 1,T 2) 3. Using scattered cultivation areas to reduce losses if some locations are affected by pollution or disease attacks (S 2,T 2,T4) 4. Conduct regular production recording and evaluation to anticipate the impact of price and weather fluctuations (S 1, T 1, T3) 5. Utilize available manpower to carry out routine monitoring and maintenance of seaweed (S 2,T 2,T3,T4) 	<ol style="list-style-type: none"> 1. Avoid expanding your business if you don't have enough capital and equipment, so you don't suffer losses when prices fall (W 1,W 2,T1) 2. Storing the harvest when prices are low, if you cannot sell it to other markets (W 5,T 1) 3. Learn to make simple products from dried seaweed so you don't always have to depend on selling raw materials (W 3,T 1) 4. Establish partnerships with local cooperatives or institutions to expand marketing channels and reduce dependence on collectors when market conditions are unstable (W5+T1)

Source: Processed primary data (2025)

5. QSPM Matrix Analysis

The QSPM (Quantitative Strategic Planning Matrix) analysis was used in this study to evaluate and determine priority strategies that farmers can implement to address seaweed farming risks on Lombok Island, referring to the results of a previously compiled SWOT analysis. This matrix helps in objectively determining the best strategy through the calculation of the *Total Attractiveness Score* (TAS), which is obtained from assessing the relative attractiveness of each strategic factor against each alternative strategy. This is in line with the findings of Purnamasari et al. (2024), who showed that the QSPM is effective in determining strategies for developing a household-scale seaweed agro-industry through a quantitative SWOT-based assessment. Furthermore, Widiyanti et al. (2021) also confirmed that the QSPM can clarify the direction of strategic decision-making by considering the weights and attractiveness scores of previously identified internal and external factors.

Table 11. Ranking of Alternative Strategies

No	Alternative Strategy	TAS Value	Ranking
Strategy 1	Expanding Cultivation Areas Using Available Labor	8.10	4
Strategy 2	Utilizing periodic harvest cycles to meet high market demand	8.19	3
Strategy 3	Enhancing Cooperation with Related Parties Through Farmer Groups	8.25	2
Strategy 4	Using digital media to promote cultivation results directly	9.20	1

Source: Processed primary data (2025)

The QSPM analysis results indicate that the priority strategy that seaweed farmers on Lombok Island can implement is using digital media to directly promote their cultivation products, with the highest *Total Attractiveness Score* (TAS) of 9.20. This strategy is considered highly effective in addressing price and market risks because it can expand consumer reach and reduce dependence on middlemen. Furthermore, this strategy also contributes to addressing production risks, as digital platforms can be utilized to access technical cultivation information, online training, and even early warning systems for extreme weather or pests. This aligns with the findings of Nurcomariah et al. (2022), who stated that strengthening downstream aspects and utilizing information technology can strengthen the resilience of seaweed businesses, both in terms of marketing and increasing production capacity.

The strategy of collaborating with stakeholders through farmer groups ranks second in the QSPM matrix. Involvement in farmer groups can improve farmers' access to training, technical assistance, and institutional support, which are crucial for mitigating the impact of production risks such as crop failure due to technical errors or seasonal changes. This finding aligns with research by Rusli et al. (2020), which emphasized the importance of technical assistance through farmer groups in increasing seaweed cultivation productivity. Meanwhile, the strategy of utilizing regular harvest cycles ranks third and is considered beneficial for adjusting production to demand fluctuations, although its impact is more medium-term. The strategy of expanding cultivation areas ranks lowest because it requires additional resources that not all farmers have. This view is reinforced by Nurcomariah et al. (2022), who stated that cultivation land expansion faces serious obstacles such as limited access to capital and conflicts over land use in coastal areas

IV. CONCLUSION AND RECOMMENDATION

Conclusion

Based on the research results and discussion, it can be concluded that:

1. The average income from seaweed farming on Lombok Island in 2024 was Rp 186,805,693.22/LLG, or Rp 319,261,001.63 / ha .
2. There are two main types of risks faced by seaweed farming on Lombok Island: production risk and price risk. Sources of production risk and price risk in seaweed farming on Lombok Island indicate that the main risks originate from production risks, namely climate change/extreme weather and pest and disease attacks . Of the price risks, the main source of price risk is low production quality , followed by limited marketing channels and fluctuations in selling prices . Other sources of risk, such as seawater pollution and fishing disturbances, have a relatively lower impact.
3. Strategies that farmers can implement to address the risks of seaweed farming on Lombok Island focus on aggressive strategies that capitalize on strengths and opportunities. The primary priority is the use of digital media to mitigate price risk and assist with production risk management. Other strategies include farmer group collaboration, regular harvest cycles, and expansion of cultivation areas . Additionally, farmers can manage planting schedules flexibly, apply for capital support from relevant agencies, and partner with cooperatives to expand marketing and reduce market dependence.

Recommendation

Based on the research results, the following recommendations can be given:

1. For seaweed farmers on Lombok Island, it is recommended to start utilizing digital technology, especially for marketing and income-increasing purposes, as well as in risk management.
2. It is recommended that local governments and related agencies be more active in providing technical assistance and opening wider market access for seaweed farmers.
3. For academics, it is recommended that research focus be directed at developing seaweed cultivation technology that is resilient to climate change and market dynamics.

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