Universal Journal of Agricultural Research 11(5): 906-915, 2023 http://www.hrpub.org
DOI: 10.13189/ujar.2023.110515

Farmers' Decision on Seaweed Harvests Marketing: Direct or Delayed Selling

Nur Inda Sari[1], Muhammad Arsyad[2,*], Hamzah[3]

[1]Agribusiness Study Programme, Graduate School, Universitas Hasanuddin, Indonesia
[2]Department of Agricultural Socio-economics, Faculty of Agriculture, Universitas Hasanuddin, Indonesia
[3]Department of Fisheries Agribusiness, Faculty of Marine Science and Fisheries, Universitas Hasanuddin, Indonesia

Received August 4, 2023; Revised September 29, 2023; Accepted October 24, 2023

Cite This Paper in the Following Citation Styles

(a): *[1] Nur Inda Sari, Muhammad Arsyad, Hamzah , "Farmers' Decision on Seaweed Harvests Marketing: Direct or Delayed Selling," Universal Journal of Agricultural Research, Vol. 11, No. 5, pp. 906 - 915, 2023. DOI: 10.13189/ujar.2023.110515.*

(b): *Nur Inda Sari, Muhammad Arsyad, Hamzah (2023). Farmers' Decision on Seaweed Harvests Marketing: Direct or Delayed Selling. Universal Journal of Agricultural Research, 11(5), 906 - 915. DOI: 10.13189/ujar.2023.110515.*

Abstract Seaweed of the leading products in government policy will uplift Indonesia becoming the largest producer of marine fisheries products worldwide by 2020, but this achievement has not been accompanied by the increase in income of seaweed cultivation farmers in Jeneponto Regency, Indonesia which is still relatively low or small when compared to other business fields. The varying and fluctuating selling prices of dried and wet seaweed are thought to be one of the factors contributing to seaweed farmers' low income. Therefore, farmers in marketing seaweed have considerations in deciding to make direct or delay selling. The purpose of this study was to analyse the decision process of farmers to make direct or delay selling of the dried seaweed harvest, analyse the factors that influence farmers' decisions to make direct or delay selling of the dried seaweed harvest and analyse the ideal strategy to support farmers' decisions to make direct or delay selling of the dried seaweed harvest. The analysis used was descriptive analysis, binary logistic regression, and SWOT. According to findings of this study, farmers generally make decisions on harvest yields with the help of other people. Factors that significantly influence farmers' decisions on seaweed harvests are land area, number of family dependents, total production, price predictions, other sources of income, access to market information, and warehouse receipt systems. Ideal strategy that supports farmers' decisions on seaweed yields is the development of seaweed cultivation businesses through the application of warehouse receipt systems, improving Marketing Networks, and creating Micro, Small and Medium Enterprises (MSMEs) for seaweed products processing with a TAS score (5.59).

Keywords Farmers Decision, Delay Selling, Seaweed

1. Introduction

Indonesia is known as a maritime country since its marine area is larger than its land area. Indonesia contains 5.87 million km^2 of water, a land area of around 2.01 milion km^2, and a coastline of about 81,000 km [1]. The extensive seas have the potential to be utilised for seaweed cultivation. Seaweed is one of the leading products in government policy that will promote Indonesia as the largest producer of marine fisheries products worldwide by 2020 [2].

In the current condition, seaweed cultivation is no longer just a side job to get additional income, but has become one of the main livelihoods [3]. Seaweed is the foundation of hope for a small number of coastal communities in the present and the future for a number of reasons. Firstly, different types of potential seaweed can be and are relatively easy to cultivate because the technology is simple and requires only the fertility of the waters in its cultivation. Secondly, the opportunity for some types of seaweed to be used as food and as industrial materials makes it very strategic to be used as a value-added commodity. Thirdly, seaweed cultivation is a source of

income and at the same time a business opportunity. Supported by several studies that in coastal areas seaweed cultivation activities have even become the foundation of new hopes to improve economic conditions and improve the welfare of those who have been in a poverty line [4].

The development of seaweed cultivation in South Sulawesi is quite potential where the production and use of seaweed tend to increase every year making seaweed prospective to be developed with potential land for marine cultivation in South Sulawesi province reaching 250,000 Ha so that seaweed development opportunities are still widely open. Seaweed contributes to fisheries exports in South Sulawesi Province by 35%-46% of the export value [5].

Jeneponto Regency is one of the seaweed producing areas in South Sulawesi well-known as a potential area for seaweed development because it has a coastal length of ± 95 km with an area of 749.79 km ²[6]. Based on data from the statistical agency, the production of E.cottonii seaweed in Jeneponto Regency in several districts from 2016 to 2020 continues to increase every year aligned with seaweed farmers' income [6]. In Jeneponto Regency, seaweed cultivation is one of the largest sources of local revenue so when managed properly, it will have a positive impact, especially for coastal communities. In line with the opinion of Anh [7] evaluating the welfare of cultivators, the level of marketing and profits generated by cultivation are two important factors.

The production of seaweed is sold to the market by collectors who come to farmers, and then the income obtained by farmers. When compared to other business sectors, the income of seaweed cultivation farmers in Jeneponto Regency is still low or modest. The fluctuating selling price of dry and wet seaweed is thought to be one of the causes of the low revenue of seaweed farmers in Jeneponto Regency. Farmers in seaweed marketing might weigh several factors before deciding whether to sell directly or delay. Zamroni [8] states that uncertain market conditions and fluctuating seaweed prices, lack of value-added products and activities, low farmer income and long seaweed market chains are obstacles and constraints that also need to be addressed. Similarly, Muthalib [9] states that price fluctuations are a marketing problem that often occurs in seaweed cultivation and is detrimental to farmers because they cannot manage the time of their sales to get a more favourable selling price.

Based on the above circumstances and phenomena that often occur among seaweed cultivators, it is necessary to take an action of decision making by seaweed farmers in Jeneponto Regency where farmers' decisions are usually influenced by age, education level and land area. There have been many studies conducted on this problem to find out the factors that influence farmers' decisions. The emerging problem this study analysed was about the decision-making process of seaweed farmers to sell product directly or delay which was influenced by a number of factors, namely daily needs, education costs, land area, commodity prices, storage and so on. It is inevitable that the choice is different between one farmer and another.

Decision-making attitude by farmers will be one of the efforts in the development of seaweed cultivation in Jeneponto Regency. Farmers need to make a scheme of decision-making in order to be able to manage their business properly to increase the income. For this reason, this study aims to analyse the decision process of farmers deciding to make direct or delay selling of the dried seaweed harvest, analyse the factors that influence farmers' decisions to make direct or delay selling of the dried seaweed harvest and analyse the ideal strategy to support farmers' decisions to make direct or delay selling the dried seaweed harvest.

2. Materials and Methods

This research was conducted during May-July 2023 in Jeneponto Regency, South Sulawesi Province. Location was determined deliberately based on the consideration that Jeneponto Regency is one of the centres of seaweed production in the province of South Sulawesi and is known for its good quality seaweed products. The population in this study were all seaweed farmers in Tarowang, Binamu, and Tamalatea districts in Jeneponto Regency. The selection of the three districts was based on the highest production level of seaweed in Jeneponto Regency. The population in this study was unknown in number. Sampling techniques used probability sampling with cluster random sampling using the chocran formula [10] with a critical value of 10% so as to obtain a sample size of 97 seaweed farmers in 3 districts as respondents.

Descriptive analysis was used to describe the characteristics of respondents on the decision-making process of seaweed farmers on the harvest of seaweed in Jeneponto Regency. Binary logistic regression analysis was conducted to analyse what factors influence farmers to sell and delay selling seaweed harvest. The research logit model equation is:

$$Y = \ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \varepsilon.$$

Where:

Y = Farmer's decision on harvest yield

P = Directly sell the harvest (1 = Direct Selling)

1-p = Delay in selling the harvest (0 = Delay in selling)

β_0 = Constant

β_1 - β_7 = Regression coefficient

X_1= Land Area (Ha)

X_2= Number of family dependents (people)

X_3= Cultivating experience (years)

X_4= Total Production (Kg)

X_5= Price Prediction (1= high, 0= low)

X_6= Other sources of income (1= Yes, 0= No)

X_7= Access to market information (1= easy, 0= not Easy)

X_8= Access to social facilities (1= yes, No =0)

X_9= Warehouse receipt system (1= Participate, 0= do not participate)

ε = Random variable

Parameter estimation in binary logistic regression was done by the Maximum Likelihood Estimation (MLE) method. The Maximum Likelihood Estimation (MLE) was used to maximise the LF to get the parameter value ai , so that there's a probability of getting the maximum Y value [10]. After estimating the model parameters, test the suitability of the model formed. The accuracy of the model was tested using chi-square statistics with the hypothesis:

H0: There is no difference between the model and the observed data

H1: There is a difference between the model and the observed data.

Meanwhile, to test whether the role of parameters affecting simultaneously the logistic binary regression coefficient is significant or not, the G test statistic was used.

The hypotheses used are:

H0: $\beta i = 0$, meaning the model is meaningless

H1: at least one $\beta i \neq 0$; i = 1, 2, 3, ..., i, meaning the model is meaningful

Furthermore, the Wald test was carried out to determine whether the role of the parameters in the model has an individual effect (Partial) on the binary logistic regression coefficients with the following hypothesis formulation:

H0: $\beta i = 0$, meaning that the independent variable has no partial effect on the dependent variable.

H1: $\beta i \neq 0$, meaning that the independent variable partially affects the dependent variable.

Then the interpretation of the logistic regression results was done by looking at the odds value. If an explanatory variable has a positive coefficient sign, then the odd ratio value will be greater than one and vice versa. Odds ratio is a measure to see how much the tendency and opportunity of the independent variable are on the dependent variable. Y = 1 in the condition x = 1 by exp(ai) times compared to x = 0 [10].

To answer the third objective of research on ideal strategies that can support farmers' decisions on seaweed yields, SWOT analysis is used. The analysis includes two main components, namely the internal component (strengths and weaknesses) and the external component (opportunities and threats) [25]. Furthermore, the determination of the weight of internal factors (IFAS) and external factors (EFAS) is obtained from the results of binary logistic regression analysis which is then used as internal and external factors in the SWOT analysis. The total amount of maximum value weighting is (1) for both IFAS (Total number of strength and weakness factors) and EFAS (Total number of opportunity and threat factors). The next stage is carried out the calculation of position coordinates. These coordinates are then interpreted to determine the ideal strategy that can support farmers' decisions on seaweed yields. At the last stage, the researcher formulates an ideal strategy. From the results of the SWOT analysis, strengths, weaknesses, opportunities, and threats are mapped in digaram and SWOT matrix. Furthermore, an alternative strategy was formulated using matrix analysis (QSPM).

Analysis is carried out to produce priority strategies that can be carried out by farmers.

3. Results and Discussion

3.1. Farmers' Decision Process to Make Direct or Delay Selling

Seaweed cultivation business conducted by coastal communities, especially fishermen's families, has involved all family members, both fishermen's wives and their children. According to Wahyu [11], women or fishermen's wives participate in the seaweed cultivation process in the form of decision-making in the aspects of finance, marketing, tying seeds and post-harvest. This condition is related to the cultural construction in seaweed business activities which regulates that land preparation, maintenance and harvesting are usually done by men, and women play more roles in land work such as making ropes, tying seeds and drying seaweed.

The pattern of decision-making about seaweed cultivation of husband and wife respondents in fishermen households is carried out in deliberation, which is the result of a discussion between husband and wife. The amount of respondents choosing to make decisions by involving other people (Table 1).

Table 1. Distribution of Respondents Based on Decision-Making Process

No.	Decision-making	Number of Farmers			
		Direct Selling		Delay Selling	
		(Person)	(%)	(Person)	(%)
1.	Involvement of others	46	82.14	33	80.48
2.	Self-determined	10	17.86	8	19.52
	Score	56	100	41	100

Table 1 clearly shows that most farmers, both direct sellers and delayed sellers, involve other parties in the decision-making process of their seaweed harvest, with 46 respondents from direct sellers (82.14%) and 33 respondents from delayed sellers (80.48%). While farmers who make decisions on their own (self-determined) as many as 10 people from farmers who choose to sell directly and 8 people from farmers who choose to delay

selling. So it can be concluded that respondents in the 3 districts in Jeneponto Regency mostly in the decision-making process involve the help of others.

Decision-making patterns for reproductive and social activities are more jointly decided. The involvement of other family members in productive activities contributes to household income [12]. However, in some matters related to cultivation activities, the role of husbands, who on average are members of seaweed fishermen groups, is very influential in making decisions for their cultivation business, although husband and wife still discuss first to decide on a matter, the quality of the harvest is still prioritised by the husband because the husband knows better the right and good way to produce quality seaweed based on knowledge gained from extension workers, while wives sometimes only get counselling in the field of post-harvest processing [13]. So it still has possibility that in the decision-making process a farmer does it without the involvement of others (self-determined), although in general it is done with the involvement of others.

3.2. Factors Influencing Farmers' Decisions on Dry Seaweed Yields

Respondents engaged in cultivation need to choose between selling the harvest directly or delaying the sale. The respondent's own background influences his or her decision. In this study, the factors that influence respondents in decision-making on seaweed harvests were analysed with binary logistic regression where the response variable was categorised as Y = 0 (respondents chose to delay selling) and Y = 1 (respondents chose to sell directly). The results of the binary logistic regression analysis are shown in (Table 2).

Table 2 presents the results of the binary logistic regression test showing that the significance value in the G test is 0.000 <0.05 so it is concluded that the variables in the binary logistic regression model have a simultaneous effect and can explain the influence of the variables of land area, number of family dependents, cultivating experience, total production, price prediction, other sources of income, access to market information, access to social facilities, warehouse receipt system on the decision of seaweed farmers in Jeneponto Regency on harvest yields. Variables can be included in the model.

The Log Likelihood value at block number 0 is 132.142> the Log Likelihood value at Block Number 1 which is 84.667, so it can be concluded that the regression model used is good. This means that the independent variables consisting of land area, number of family dependents, cultivating experience, production amount, price prediction, other sources of income, access to market information, access to social facilities, and warehouse receipt system can explain the dependent variable, that is the farmer's decision on seaweed harvest in Jeneponto Regency.

Goodness of fit test (R^2) obtained a Nagelkerke R Square value of 0.520 which means that 52.0% of farmers' decisions on harvest yields can be explained by variables of land area, number of family dependents, cultivating experience, total production, price predictions, other sources of income, access to market information, access to social facilities, and warehouse receipt system. While the remaining 48.0% is explained by other variables outside the model in this study.

Wald test variable cultivation experience and access to social facilities do not significantly affect the farmer's decision on seaweed harvest because it has a sig value> 0.05 which is greater than alpha.

Table 2. Binary logistic regression test of factors influencing farmers' decisions on dry seaweed yields

Variables	Coefficient	S.E	Wald	df	Sig.	Exp(Y)
Land Area	-.010	.003	7.847	1	.005	.990
Number of Family Dependents	-.397	.222	3.195	1	.074	.672
Cultivating experience	-.061	.088	.477	1	.490	.941
Production Quantity	.001	.001	3.847	1	.050	1.001
Price Prediction	1.427	.624	5.232	1	.022	4.167
Other sources of income Access to Market	1.710	.720	5.639	1	.018	5.528
informationAccess to social facilities Warehouse	1.400	.778	3.242	1	.072	4.055
receipt system Constant	-.115	.712	.026	1	.871	.891
	-3.134	.937	11.191	1	.001	0.44
	2.291	1450	2.497	1	.114	9.886
Chin Square $(X)^2$						47.475
-2 log Likelihood Block Number = 0						132.142
-2 log Likelihood Block Number =1						84.667
Nagelkerke R Square						.520

In the variable of cultivating experience with a significance of 0.490> 0.05 means greater than alpha. The decision taken is that H0 is accepted and H1 is rejected, which means that the variable of cultivating experience does not have a significant effect on farmers' decisions on seaweed harvests in Jeneponto Regency, with a logistic regression coefficient value (B) of -0.061 with an odds ratio Exp (Y) value of 0.941 meaning that every additional of cultivating experience will not provide an opportunity for farmers to delay selling. As the opinion of, Wati [14] experienced farmers can calculate how much money is needed for their business activities so that in making decisions they do not follow others.

Access to social facilities with a significance of 0.871 > 0.05 means no effect sig. with a logistic regression coefficient value (B) of -115 with an odds ratio Exp (Y) value of 0.891 indicates that every increase of 1 unit of access to social facilities will reduce the chances of farmers choosing to sell seaweed directly by 0.891 times smaller than farmers who choose to delay selling. It means that if access to social facilities increases, then the possibility of farmers' decisions to sell seaweed directly will be lower. This is in line with access to social facilities such as education and health where accessing these facilities will certainly add costs to the seaweed farmers themselves. According to Permadi [15], the modern social environment of farmers supports in increasing access to social facilities to generate innovations that will have an impact on improving the standard of living of farmers and bring up a new culture in relation to agriculture, which is positive.

The variables of land area, number of family dependents, amount of production, price prediction, other sources of income, access to market information, and warehouse receipt system significantly affect the farmer's decision on seaweed harvest because they have sig value of <0.05 which is smaller than alpha.

Variable land area with a significance of 0.005 <0.05 means less than alpha. The decision taken is that H0 is rejected and H1 is accepted so it means that the variable land area has a significant effect on farmers' decisions on seaweed harvests in Jeneponto Regency. With the value of the logistic regression coefficient value (B) of 0.010, the value of the odds ratio Exp (Y) of 0.990 indicates that every increase of 1 stretch of land area will reduce the opportunity to sell seaweed directly by 0.990 times less than farmers who choose to delay selling. The size of the land area has a relationship with farmers' decisions in terms of marketing seaweed harvests. Farmers who have a large land area are more likely to choose to delay selling their harvests than farmers who have a small land size [16].

The variable number of family dependents with a significance of 0.074 <0.05 means less than alpha. The decision taken is H0 rejected and H1 accepted so it means that the variable number of family dependents has a significant effect on the farmer's decision on seaweed harvest in Jeneponto Regency. With the value of the logistic regression coefficient value (B)-0.397, the value of the odds ratio Exp (Y) of 0.672 indicates that every increase of one family member will reduce the chance of farmers choosing to sell seaweed directly by 0.672 times less than farmers who choose to delay selling. In line with the opinion of Ardelia [17] that if the number of family members increases, the dependence of farmers on agricultural products also increases and it requires money for daily needs so that the opportunity to delay selling the harvest is also greater in order to provide household needs and other family investments.

The production quantity variable with a significance of 0.050 <0.05 means less than alpha. The decision taken is H0 rejected and H1 accepted so it means that the variable amount of production has a significant effect on the farmer's decision on seaweed harvest in Jeneponto Regency. With a logistic regression coefficient value (B) of 0.001, an odds ratio Exp (Y) value of 1.001 indicates that every 100 kg increase in the amount of production will increase the chance of farmers choosing to sell seaweed directly by 1.001 times greater than farmers who choose to delay selling. The production quantity has a positive relationship and a significant effect on the farmer's decision on the harvest. Farmers who have a high amount of production are more likely to choose the decision to sell directly than farmers who have a small amount of production. As stated by a research of Antowijoyo [18], increasing the amount of seaweed production with the development of good cultivation is the first operational step that needs to be done to increase farmers' income in the future.

Price prediction variable with a significance of 0.022 <0.05 means less than alpha. The decision taken is that H0 is rejected and H1 is accepted so it means that the price prediction variable has a significant effect on farmers' decisions on seaweed harvests in Jeneponto Regency. With a logistic regression coefficient value (B) of 1.427, an odds ratio Exp (Y) value of 4.167 indicates that every increase of 1 unit of farmer price prediction will increase the chance of farmers choosing to sell seaweed directly by 4.167 times greater than farmers who choose to delay selling. Farmers who make price predictions tend to prefer to sell directly because the price of seaweed is in the range of Rp.18.000 to 25.000/kg and according to research in the field the farmers do not want to store their harvests for a long time, but after harvesting the farmers immediately sell the seaweed on the grounds that they are afraid that the price of seaweed will go down, the uncertainty of the price of seaweed commodities makes farmers take an action to make price prediction decisions in order to minimise losses if the price of seaweed falls.

Maximizing profit of seaweed selling requires farmers to forecast the selling price of seaweed some time in the future. Accurate forecasts of future selling prices, allow farmers to make qualified decisions about investments in their production processes. Sometimes, such forecasting is

challenging, for instance during rainy periods, farmers have difficulty forecasting future selling prices for seaweed [19].

Other income source variables with a significance of 0.018 <0.05 means less than alpha. The decision taken is that H0 is rejected and H1 is accepted so it means that other income source variables have a significant effect on farmers' decisions on seaweed harvests in Jeneponto Regency. With a logistic regression coefficient value (B) of 1.710, an odds ratio Exp (Y) value of 5.528 indicates that every increase of 1 unit of farmer income sources will increase the chance of farmers choosing to sell seaweed directly by 5.528 times greater than farmers who choose to delay selling.

Other sources of income have a positive effect on farmers' decisions on harvest yields. Farmers who have other sources of income tend to prefer to sell their seaweed directly compared to farmers who do not have other sources of income, which is in line with referring the conditions in the field, and farmers who have other sources of income tend not to find it difficult to decide to sell or delay selling even though the price of seaweed has dropped because farmers still have other sources of income that can support the economic needs of their households. Meanwhile, farmers who do not have other sources of income tend to choose to delay selling because of considerations of profit and loss if the income cannot cover the cultivation capital.

Access to Market information variable with a significance of 0.072 <0.05 means less than alpha. The decision taken is that H0 is rejected and H1 is accepted so it means that the acces to market information variable has a significant effect on farmers' decisions on seaweed harvests in Jeneponto Regency . With a logistic regression coefficient value (B) of 1.400, an odds ratio Exp (Y) value of 4.055 indicates that every increase of 1 unit of market information access will increase the chances of farmers choosing to sell seaweed directly by 4.055 times greater than farmers who choose to delay selling.

Farmers who have easy market access tend to be able to make decisions to sell seaweed directly compared to farmers who do not easily get access to market information. Ramadhani [20] stated that farmerslack bargaining power in determining the selling price of seaweed when they sell their harvests to middlemen or dealers, which happens because of the lack of information obtained by farmers regarding market information. This is because farmers only rely on information from their friends who are seaweed farmers and middlemen/collecting traders, so they are unable to reach access to broader market information because these farmers only sell based on their daily habits or routines [21].

The warehouse receipt system with a significance of 0.001 <0.05 means less than alpha. The decision taken is that H0 is rejected and H1 is accepted so it means that the warehouse receipt variable has a significant effect on farmers' decisions on seaweed harvests in Jeneponto Regency . With a logistic regression coefficient value (B) of -3.134, an odds ratio Exp (B) value of 0.044 indicates that every 1 unit increase in the warehouse receipt system will reduce the chance of farmers choosing to sell seaweed directly by 0.044 times less than farmers who choose to delay selling.

If the warehouse receipt system increases, the likelihood of farmers' decision to sell seaweed directly will be lower. This is because the warehouse can be a place for farmers to store their harvests until the time comes when the farmers want to sell them. In line with this, research Regina [22] shows that the warehouse receipt system has increased the income of seaweed farmers in South Sulawesi. The warehouse receipt system has also succeeded in changing the mindset of farmers towards a more business-oriented approach to agriculture, which allows farmers to live more securely and contribute to a stronger community. In addition, with the warehouse receipt system, there is an impact on economic improvement due to the development of commodity cultivation and processing activities has happened in Ghana [23].

3.3. Ideal Strategy to Support Farmers' Decision to Sell or Delay

The identification of internal and external factors in the form of strengths and weaknesses as well as opportunities and threats affects the determination of ideal strategies that can support farmers' decisions on seaweed yields in Jeneponto Regency. The results of the identification of strengths and weaknesses as internal strategy factors give the weight and rating for each factor so that the total score is shown in (Table 3). As for external factors that have been given weight and score, the assessment results are shown in (Table 4). The total value obtained from the IFAS and EFAS matrices is 2.372 for IFAS and 2.405 for EFAS. The position of this value is assessed as a weighted average of 2. This condition shows that internally and externallyposition of this farmer's seaweed cultivation activities is quite good in utilizing internal and external factors [24].

Table 3. Internal Factor Analysis (IFAS)

	Internal factor evaluation	Score (S)	Weight (W)	S x W
	Strenght			
1.	High production	3	0.31	0.93
2.	Relatively short cultivation period	2	0.126	0.252
3.	Market demand	2	0.188	0.376
				1.558
	Weakness			
1.	Land area	3	0.042	0.126
2.	Cultivating experience			
3.	Limited capital	2	0.084	0.168
		2	0.25	0.52
			1.00	0.814
	S-W			2.372

Table 4. External Factor Analysis (EFAS)

	External factor evaluation	Score (S)	Weight (W)	S x W
	Opportunity			
1.	Warehouse receiptsystem	3	0.192	0.576
2.	Access to marketinformation	2	0.128	0.256
3.	Other sources of income	2	0.149	0.298
				1.13
	Threat			
a.	Volatile prices	3	0.213	0.639
b.	Global marketrequirements	2	0.127	0.254
c.	Erratic climate and weatheraffect the amount of harvest	2	0.191	0.382
			1.00	1.275
	O-T			2.405

SWOT diagram shows the coordinates (SW for the X axis and OT for the Y axis). After combining the total IFAS and EFAS scores into the X and Y axes, the results of the IE matrix, farmers' decisions on seaweed harvest occupy quadrant V with a weighted score of internal and external factors (2.372 and 2.405), thus placing farmers' decisions on holding and maintaining position. Common strategies used in this cell are market penetration, product development and market development [25].

The SWOT matrix is an analytical tool that describes alternative strategies that farmers can develop to support and consider internal strengths and weaknesses, as well as external opportunities and threats (Table 5). From the SWOT results, we identify strengths, weaknesses, opportunities and threats. The score places that farmers' decisions on crop yields have several weaknesses and threats, especially the condition of the area of cultivated land, limited capital, uncertain seaweed prices as well as global market requirements and uncertain weather conditions. In addition, seaweed cultivation activities also have strengths and opportunities to be developed so that they can support ideal strategies for farmers' decisions [26].

Resources or farmers who are skilled in seaweed cultivation business are large capital because skilled cultivators can take advantage of opportunities in cultivation activities such as utilizing the warehouse receipt system and looking for other income to support household needs [28].

After the formulation of strategies in the SWOT matrix, the final stage of strategy analysis is the selection of strategies that are suitable and can be carried out by seaweed farmers in Jeneponto Regency. The selection of suitable strategies is carried out using the QSPM analysis tool. (Table 6) indicates that, the highest value on the TAS was the alternative strategy on SO with a total score of TAS (5.59), namely the development of seaweed cultivation businesses through the application of warehouse receipt systems, improving Marketing Networks and creating MSMEs Processing of processed seaweed products is an ideal strategy that can support farmers' decisions on seaweed harvests.

Table 5. SWOT Analysis

INTERNAL / EXTERNAL	Strengths	Weaknesses
	a. High production b. Relatively short cultivation period c. Market demand	a. Land area b. Cultivating experience c. Limited capital
Opportunities a. Warehouse receiptsystem b. Access to marketinformation c. Other sources of income	**Strategy S><0** a. Seaweed aquaculture business development through the implementation of warehouse receipt system (S1,S2,S3,01) b. Improving Marketing Networks (S3,03) c. Creating MSMEs Processing of processed seaweed products (S1,S3,03)	**W><O strategy** a. Improve seaweed quality by optimising human resources and optimising training in cultivation and post-harvest processing (W2,O2,O3). b. Provide capital assistance/loans to cultivators evenly (W1,W3,O1)
Threats a. Volatile prices b. Global marketrequirements c. Erratic climate and weather affect the amount of harvest	**S>< T strategy** a. There is a need for legality in pricing and quality of seaweed seedlings to be cultivated for global market requirements from the local government authorities (S1,S2,S3,T1,T2). b. Implement good cultivation so that seaweed cultivating can be sustainable through counselling and post-harvesttraining (S1,S2,T3)	**W><T strategy** a. Procurement of market partnership cooperation patterns (W1,W2,T1,T2) b. Improve cultivation facilities and infrastructure to obtain seaweed quality that meets SNI standards (W1,W2,T2,T3) c. Establish a loan scheme for farmers to overcomecapital constraints (W1,W3,T1)

Table 6. QSPM Analysis

Alternative Strategies	Score TAS	Rank
Strategy S-O		
a. Seaweed aquaculture business development through the implementation of warehouse receipt system (S1,S2,S3,01) b. Improving Marketing Networks(S3,03) c. Creating MSMEs Processing of processed seaweed products (S1,S3,03)	5.59	I
Strategy S-T		
a. There is a need for legality in pricing and quality of seaweed seedlings to be cultivated for global market requirements from the localgovernment authorities(S1,S2,S3,T1,T2). b. Implement good cultivation so that seaweed cultivating can be sustainable through counselling and post-harvest training (S1,S2,T3)	4.407	II
Strategy W-O		
a. Improve seaweed quality by optimising human resources and optimizing training in cultivation and post-harvest processing (W2,O2,O3). b. Provide capital assistance/loans to cultivators evenly (W1,W3,O1)	3.511	III
StrategyW-T		
a. Procurement of market partnership cooperation patterns (W1,W2,T1,T2) b. Improve cultivation facilities and infrastructure to obtain seaweed quality that meets SNI standards (W1,W2,T2,T3) c. Establish a loan scheme for farmers to overcome capital constraints (W1,W3,T1)	3.475	IV

The development of aquaculture through the implementation of a warehouse receipt system is none other than the first step in improving the economy of farmers because they can hold their seaweed if the price of seaweed commodities is low, in addition to the warehouse receipt system that farmers can maintain the quality of their seaweed compared to just storing seaweeds at the farmer's house [27].. Expanding the market can be considered as expanding the business, because if the market share increases, the demand will increase. And creating MSMEs processing seaweed products is an effort to avoid dependence on production results. The existence of seaweed processing MSMEs will certainly increase the income of farmers where farmers can process seaweed into various products such as seaweed ready to eat typical MSMEs, crackers, noodles, candy, nata and ice cream. Ilyas [27] argues that the low application of post-harvest products is a major problem on the fisheries market side. Public interest in a product can be a potential market for cultivators by processing raw materials into a product that adds value.

4. Conclusions

The decision-making process of farmers choosing to sell directly or delay selling the dried seaweed harvest is influenced by the involvement of others, with a percentage of 82.14% of farmers choosing to sell directly and 80.14% of farmers choosing to delay selling. Factors influencing farmers' decisions on seaweed harvests are simutaneously influenced by all variables. But partially only influenced by the factor of land area, number of family dependents, total production, price prediction, other sources of income, access to market information, and warehouse receipt system. While the factor of cultivation experience and access to social facilities have no significant effect on farmers decision. The ideal strategy to support farmers' decisions on seaweed harvests obtained based on QSPM analysis is an alternative strategy on SO Development of seaweed cultivation businesses through the application of warehouse receipt systems, improving Marketing Networks and creating MSMEs for seaweed products processing with a total score of TAS (5.59).

REFERENCES

[1] Ramadhan, M. Taslim, A, ”Application of Geographic Information System in Assessing the Proportion of Indonesian Sea Area ,” *Journal Scientific Geomatics*, vol. 19, no. 2, pp. 141-146, 2013.

[2] Akil, N, “Analysis of prospects and development strategies for seaweed superior commodities Wajo,” pp. 439-451, 2021, http://repository.ipb.ac.id.

[3] Handayani, R, "Factors affecting the income of seaweed farmers in Bonto Ujung Village, Tarowong District, Jeneponto Regency, Muhamadiyah University Makassar, 2021, https://digilibadmin.unismuh.ac.id.

[4] Azizah A. N, ”Factors Affecting Production and Income of Seaweed Farmers in Tarowang, 2021, http://repository.unhas.ac.id/id/eprint/7518/.

[5] Fatonny, N. Nurmalina, Fariyanti, A, ”Analysis of Seaweed Agribusiness System in Takalar Regency, South Sulawesi Province,” *Forum Agribisnis: Agribusiness Forum*, vol. 13, no.1, pp. 35-49, 2023, doi.org/10.29244/fagb.13.1.35- 49.

[6] BPS “(Central Bureau of Statistics) South Sulawesi, Jeneponto Regency in Figures. BPS Sulawesi Province, 2021.” https://sulsel.bps.go.id/.

[7] Anh, M. Hanh, H. P, ”Marketing and Income Analysis of Seaweed Farming Business,” *Journal La Bisecoman*, vol. 2, no. 3, pp. 17-21, 2021, doi.org/10.37899/journallabisecoman.v2i3.405.

[8] Zamroni A, Yamao M, ”Livelihood Strategy in Indonesian Coastal Villages: Case Study on Seaweed Farming in Laikang Bay, South Sulawesi Province,” *Vulnerability of Agriculture, Water and Fisheries to Climate Change*, pp. 289-300, 2014, doi.org/10.1007/978-94-017-8962-2_18.

[9] Muthalib, Abd A, Asrip P, Ahmad M, Muhammad N, ”Seaweed Business Conditions And Marketing Channels In Coastal District Of Southeast Sulawesi,” *The Intenational Journal Of Engineering And Sciences*, vol. 6, no. 10, pp. 35-41, 2017.

[10] Sapta Pranoto, ” Factors Affecting Farmers' Decisions on White Pepper Yield in Simpang Teritip District, West Bangka Regency,” *Journal of Agribusiness and Rural Development Research*, vol. 2, no. 1, pp. 69-74, 2016, doi.org/10.18196/agr.2127.

[11] Wahyu, N. S, ” The Role and Potential of Women in Meeting the Economic Needs of Fishermen's Families,” *Journal of Education Social Studies*, vol.1, no. 2, pp. 105-111, 2012, doi.org/10.15294/jess.v1i2.739.

[12] Ariwidodo, ”Contribution of Women Seaweed Sector Workers in Bluto District, Sumenep Regency,” *Journal of Social and Religious Sciences Research*, vol. 13, no. 2, pp. 329, 2016, doi.org/10.19105/nuansa.v13i2.1389.

[13] Junaidi, Suaidi, ”Fisherwomen Between Domestic, and ProductiveRoles,”2015,http://pesisir.blogspot.com/2006.

[14] Wati, Dewi. R, ”Access to Microcredit for Organic Rice Farmers in Bogor Regency,” *Journal of Agribusiness*, vol. 9, no. 2, pp. 97-110, 2015, doi.org/10.15408/aj.v9i2.5286.

[15] Permadi, A, Rudi, W. Triana, D. H, ”Factors Affecting the Decision of Farmer Credit Partners of Pg Djombang Baru to Choose Sugarcane Varieties and Their Effect on Sugarcane Production,” *Journal of Agricultural Social Economics*, vol. 8, no. 2, pp. 59-67, 2015.

[16] Saqib, S. E, John, K . M, Kowurnu, Sanaullah Panezia and Ubaid A, ”Factors Determining Subsistence Farmers' Access to Agricultural Credit in Flood-Prone Areas of Pakistan. Kasetsart,” *Journal of Social Sciences*, vol. 39, no. 2, pp.1-7, 2018, doi.org/10.1016/j.kjss.2017.06.001.

[17] Ardelia, R, Anwarudin, O. Nazaruddin, ”Access to

Information Technology through Electronic Media for KRPL Farmers," *Triton Journal*, vol. 11, no. 1, pp. 24-36, 2020, doi.org/10.47687/jt.v11i1.101.

[18] Antowijoyo, Tarmaji, Yuliyanto, Yulianti, P. Fifi S, "Business feasibility of eucheuma cottonii seaweed cultivation with the longline method," *Journal of Management Insights*, vol. 5, no. 1, pp. 73-88, 2017, doi.org/10.20527/jw m. v5i1.10.

[19] Latuny, "Predicting the Selling Price of Dried Seaweed at the Farmer Level," *ALE Proceeding*, vo. 186-199, no. 2, 2021, doi.org/10.30598/ale.2.2019.18 6-199.

[20] Ramadhani, W. Rasmikayati, E, "Market Selection of Mango Farmers and Agribusiness Dynamics in Panyingkiran District, Majalengka Regency, West Java Province," *Journal Mimbar Agribusiness*, vol. 3, no. 2, pp. 185-202, 2017, doi.org/10.25157/ma.v3i2.35.

[21] Maina, C. M, "Effect of transaction costs on choice of mango marketing channel and income of small-scale farmers in Makueni County," Kenya, A *Thesis* Submitted to the Graduate School in Partial Fulfiment of the Requirements for the master of Science Degree in Agricultural and Applied Economics of Egerton University,2015,http://41.89.96.81:8080/xmlui/handle/123 456789/1994.

[22] Regina, G, "The Role Of Warehouse Receipt System On Seaweed Farmers In Makassar, South Sulawesi" Gadjah Mada University, *Thesis*, 2020, https://etd.repository.ugm. ac.id/.

[23] Mario, J. M, Mulangu, F. M, Kemeze, S, and Kolavalli, "Warehouse Receipt Financing Benefit Ghanaian Smallholders Strategy Support Programme," Journal Agricultural Economics, vol. 50, no. 5, pp. 1-3, 2019, doi.org/10.1111/agec.12514.

[24] Angraeni, E. Sutinah, M. Hamzah, T, "Development strategy of seaweed (*Gracillaria sp*) cultivation through spore culture in Takalar Regency," *International Journal of Environment, Agriculture and Biotechnology*, vol. 6, no. 1, pp. 120-126, 2021, doi.org/10.22161/ijeab.61.16.

[25] Hanafi, I. Hubeis, A. V. S, Raharja, S, "Strategy for Increasing the Competitiveness of Rubber-based Automotive and Electronic Parts Products at PT BesQ Sarana Abadi," *Journal of Small and Medium Industry Development Management, vol.* 13, no. 2, pp. 167-174, 2019, doi.org/10.29244/mikm.13.2.1 67-174 .

[26] David, F. R, "Strategic Management: a competitive advantage approach." *Salemba Empat*, Jakarta, 2015.

[27] Ilyas, I. Ridwan, M. Kasmi, M. Seniorita, S. Natsir, A. B,"Development of Seaweed Business Competitiveness Through Integrative as an Increase in Coastal Community Income in Pangkep Regency," *Journal of Science and Technology on Fisheries Resources Utilization*, vol. 7, no. 13, pp. 53-61, 2020, doi.org/10.20956/jipsp.v7i13.9683.

[28] Santoso, R. Wahyudi, D. Hafid, A, "Seaweed development strategy in Talango District, Sumenep Regency,"*Journal of Fir Agriculture*, vol. 12, no. 1, pp. 14-19, 2015, doi.org/10.24929/ fp.v12i1.195.