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Research Article

ANALYSIS OF THE TREND IN EXPORTS OF DRIED SEAWEED BY CV MESTA ALAM TO THE GLOBAL MARKET

Siti Markhamah[1,*], Sudarmiatin[1], Heri Pratikto[1]

[1] Faculty of Economics and Business, Universitas Negeri Malang, Jawa Timur, Indonesia
Corresponding author email: siti.markhamah.2404139@students.um.ac.id

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Abstract
This study aims to analyze the influence of seaweed production, exchange rates, and international prices on the export trend of CV Mesta Alam's dried seaweed to the global market. Indonesia as a maritime country has great potential in seaweed development, but national export trends show fluctuations. The study uses a quantitative approach with panel data regression analysis that combines time series data (2020-2024) and cross-section (three central provinces: East Java, NTT, and Southeast Sulawesi). The selection of the best model through the Chow and Lagrange Multiplier tests shows the Common Effect Model (CEM) as the most appropriate model. The results of the analysis prove that partially, seaweed production (X1) has a positive and significant effect on exports (t-count 2.747 > t-table, sig. 0.019). The exchange rate (X2) also has a positive and significant effect (t-count 3.026 > t-table, sig. 0.010). Meanwhile, international prices (X3) have no significant effect (t-count 0.246 < t-table, sig. 0.808). Simultaneously, the three variables significantly influence exports (F-count 6.303 > F-table, sig. 0.009). The Adjusted R Square value of 53.19% indicates that the production, exchange rate, and price variables are able to explain the variation in CV Mesta Alam's exports, while the remaining 46.81% is explained by other factors. This finding implies the need to increase production with guaranteed quality, utilize the momentum of Rupiah depreciation, and strengthen non-price competitiveness through certification and market diversification.

Keywords: Exchange Rates, International Prices, Panel Data, Production, Seaweed Exports.

INTRODUCTION

Indonesia is one of the largest maritime nations in the world. As a maritime nation, Indonesia naturally possesses abundant and diverse natural resources. These natural resources serve as a fundamental asset that must be optimally managed and can improve the welfare and prosperity of the Indonesian people (Ministry of Maritime Affairs and Fisheries, 2023). International trade has become a platform for building bilateral and multilateral relationships with foreign countries. Imports and exports not only build relationships with other countries, but trade also facilitates the flow of goods and services from one country to another, and vice versa. Exports occur when domestic production exceeds domestic demand (Wijayanti, 2021).

As a maritime nation, Indonesia certainly has considerable potential for developing its marine natural resources. International trade activities have a significant impact on various economic sectors and trade products, including the marine export sector. Indonesia is one of the exporting countries due to its comparative advantage in terms of biodiversity. One of the fishery products in question is seaweed which has the potential to be exported because market demand is increasing (Ramadhani, 2023).

Seaweed and other algae are the commodities with the largest contribution to Indonesia's aquaculture sector. From 2020 to 2024, this commodity accounted for an average of 67.14 percent. In 2024, the export value of this commodity accounted for 55.10 percent of total aquaculture exports, a decrease from the 61.89 percent contribution in 2023. The development of seaweed and other algae exports over the past five years has shown a downward trend. The export value of this commodity decreased by 15.74 percent in 2020, 28.98 percent in 2023, and 32.32 percent in 2024. However, despite the decrease in value, the export value of this commodity increased by 5.82 percent in 2023, indicating a decline in the export price of seaweed and other algae commodities during that year. However, in 2024, the export value of this commodity decreased again by 3.98 percent.

When viewed by export destination, China holds the largest share of Indonesia's seaweed and other algae exports, accounting for 86.73 percent of Indonesia's seaweed and other algae exports in 2024, or US$167.2 million. The four other countries that are the largest export destinations for this commodity in 2024 are Vietnam, with US$5.3 million; South Korea, US$5.1 million; the Philippines, US$3.7 million; and Japan, US$2.8 million. Seaweed has transformed into one of Indonesia's leading fishery exports, often dubbed the archipelago's "green gold," with potential for broad product diversification, ranging from raw materials for the food, pharmaceutical, and cosmetics industries. Amidst the increasingly competitive global market, South Korea, for example, recorded a record seaweed export of US$1.04 billion in 2025, driven by the popularity of pop culture and changes in healthy lifestyles among global consumers. This phenomenon confirms that demand for seaweed, especially in dried form, is showing a significant growth trend, with Korea even recording a 37.1% increase in dried seaweed exports in the first quarter of 2025. This wide-open market opportunity should be optimally utilized by Indonesian businesses, given Indonesia's position as one of the world's largest seaweed producers.

The Indonesian government, through the Ministry of Maritime Affairs and Fisheries (KKP), continues its efforts to encourage global market penetration, as reflected in its active participation in the Food Ingredients Europe (FIE) 2025 exhibition in Paris, targeting transactions of up to US$8 million. National export data shows positive performance, with Indonesian seaweed exports reaching US$264.6 million from January to October 2025, with the largest contribution coming from dried seaweed, valued at US$144.7 million. China is the primary market, absorbing US$138.2 million of dried seaweed products, followed by the European Union, ASEAN, the United States, and Japan. However, despite these national achievements, Indonesia's export structure remains dominated by raw or semi-finished materials, and challenges such as supply stability, quality consistency, and company-level competitiveness remain crucial.

At the company level, the dynamics are often not reflected in national macroeconomic data. CV Mesta Alam, a dried seaweed exporter, faces a fluctuating market reality. These export trend fluctuations are influenced by various factors, ranging from prices in the international market, demand from destination countries, to the company's ability to meet strict quality standards and regulations, such as those required by European buyers regarding product traceability and documentation. A study by Awaluddin et al. (2025) found that partially, the exchange rate and economic distance variables had a negative and significant influence on Indonesian seaweed exports, while the Gross Domestic Product (GDP) of the destination country had no significant effect. Furthermore, Sadhina's (2025) study confirmed that perceptions of corruption had a negative influence, while the quality of trade and transportation infrastructure had a positive influence on Indonesian seaweed exports.

Previous studies, such as those by Awaluddin et al. (2025) and Sadhina (2025), generally focused on analyzing the macroeconomic factors influencing Indonesian seaweed exports in aggregate to destination countries. Meanwhile, the analysis by CBI (2019) highlighted structural challenges within the value chain, such as poor coordination between actors and SMEs' lack of knowledge of European market trends. A significant research gap remains: the lack of a specific study analyzing dried seaweed export trends at the company level, such as that conducted by CV Mesta Alam. This micro-level analysis is crucial for concretely understanding how global market dynamics, internal company capacity, and export policies interact and shape export patterns over time.

GAP Analysis, Previous studies (e.g., Awaluddin et al., 2025; Sadhina, 2025) predominantly examined macroeconomic factors (exchange rate, GDP, corruption perception, infrastructure) affecting Indonesian seaweed exports at the aggregate national level or across multiple destination countries. They largely ignored the micro-dynamics at the individual exporter level, especially for SMEs like CV Mesta Alam. Moreover, research on the role of international prices on seaweed export volume has produced contradictory results. Thus, there is a clear empirical gap regarding the determinants of dried seaweed export trends at the firm level. Uniqueness of this study, this research is the first to analyze the combined effect of production, exchange rate, and international price on dried seaweed exports specifically for a single SME exporter (CV Mesta Alam) using panel data from three seaweed-producing provinces as a proxy for the company's operational context. It also provides a novel comparison between firm-level and macro-level findings, highlighting the divergence in the significance of production.

Research objectives, (1) To examine the partial effect of seaweed production, exchange rate, and international price on CV Mesta Alam's dried seaweed exports; (2) to test their simultaneous effect; (3) to interpret the results in light of previous studies; and (4) to derive strategic implications for the company. Therefore, this study, "Analysis of Dried Seaweed Export Trends by CV Mesta Alam to the Global Market," is crucial and urgent. This study aims to fill the gap in empirical research at the company level by in-depth analyzing the development of CV Mesta Alam's export volume, value, and destinations over a specific period. The results of this study are expected to not only provide a comprehensive picture of the company's export performance, but also serve as strategic input for CV Mesta Alam management in formulating future export policies, as well as contributing to the literature on the competitiveness of Indonesian seaweed SMEs in the global market.

RESEARCH METHOD

According to Ghozali (2021), quantitative methods are research methods that use numerical data and analyze the collected data using statistical formulas. The approach used is a correlation study. According to Sugiyono (2019), a correlation study is a type of research characterized by a correlational relationship between two or more variables. This study used secondary data. The instruments were data collection sheets (see Table 1) that recorded export volume (Y, in tons), seaweed production (X1, in tons), exchange rate (X2, IDR/USD, annual average), and international price (X3, USD/kg, derived from unit value) for three provinces (East Java, East Nusa Tenggara, Southeast Sulawesi) from 2020 to 2024. All data were obtained from official sources: BPS (export and production), Bank Indonesia (exchange rate), and ITC Trade Map (international price). The data panel consisted of 15 observations (3 provinces × 5 years). There are three models in panel data analysis the Common Effect Model (CEM), the Fixed Effect Model (FEM), and the Random Effect Model (REM). The analysis software used is Microsoft Excel and Eviews.

This study uses a quantitative approach. This research design uses panel data that combines time series data (for the period 2020-2024) and cross-sectional data (from three provinces that are seaweed production centers in Indonesia: East Java, East Nusa Tenggara, and Southeast Sulawesi). The choice of a panel data design allows the study to capture dynamics between time and between regions simultaneously, thereby providing more comprehensive analysis results. The target or subject of this study is data on dried seaweed exports from three major production centers in Indonesia, namely East Java, East Nusa Tenggara, and Southeast Sulawesi, during the period from 2020 to 2024. These three provinces were selected based on the consideration that they are the main seaweed production and export centers in Indonesia, contributing significantly to national exports. East Java was selected in particular because it is the location of CV Mesta Alam's operations, so data from this province can be used as a relevant proxy to describe the conditions and trends faced by the company. The data collected includes the volume of dried seaweed exports (Y), seaweed production (X1), the rupiah exchange rate against the US dollar (X2), and the international price of seaweed (X3) for each province and year of observation, resulting in a total of 15 observations (3 provinces × 5 years) in this study.

The research procedure began with problem identification and literature study to formulate the background, objectives, and hypotheses. Next, secondary data collection was conducted from BPS, KKP, Bank Indonesia, and ITC Trade Map, covering export, production, exchange rate, and international price data for the 2020-2024 period from three provinces (East Java, NTT, Southeast Sulawesi). The data was tabulated in a panel data format using Microsoft Excel. The next stage was data analysis using Eviews 12 software, which began with a model selection test (Chow Test and Lagrange Multiplier) to determine the best model. After the model was selected, a classical assumption test (multicollinearity and

heteroscedasticity) was conducted to ensure that the model met the BLUE criteria. Next, panel data regression analysis was performed to test the hypotheses partially and simultaneously, as well as to calculate the coefficient of determination. The results of the analysis were then interpreted and conclusions were drawn to answer the research questions.

Table 1. Seaweed Export Data Panel

Cross Section	Year	Export (Y)	Production (X1)	Value (X2)	Price (X3)
East Java	2020	359.376,5800	683425,38	2575607	3.769,00
East Java	2021	348.202,8000	669258	3317354	5.000,00
East Java	2022	352.237,1400	644293,63	2502291	3.884,00
East Java	2023	328.182,3600	708903,69	3544518	5.000,00
East Java	2024	365.120,6800	723292,5	2822147	3.902,00
East Nusa Tenggara	2020	1.780,7300	1879265,96	4954188	2.636,00
East Nusa Tenggara	2021	3.554,0400	1166896,78	2917242	2.500,00
East Nusa Tenggara	2022	3.909,2200	1175123,88	4112934	3.500,00
East Nusa Tenggara	2023	2.549,6200	767775,26	2303326	3.000,00
East Nusa Tenggara	2024	1.716,0300	1140370,29	3126788	2.742,00
Southeast Sulawesi	2020	4.815,5200	89331,72	484958	5.429,00
Southeast Sulawesi	2021	5.129,9700	89323,03	207222	2.320,00
Southeast Sulawesi	2022	4.310,0000	111170,99	389100	3.500,00
Southeast Sulawesi	2023	6.643,3000	98301,04	350747	3.568,00
Southeast Sulawesi	2024	5.879,4900	91068,31	194279	2.113,00

Table 1 shows panel data consisting of cross-sectional data and time series data for the period 2020-2024. The research variables consist of exports, production volume, value, and price. The data was obtained from the official website of the Central Statistics Agency and the data portal of the Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia.

Data analysis techniques using panel data regression analysis with the help of Eviews 12. The analysis steps include: (1) Model selection test (Chow Test and Lagrange Multiplier) which produced the Common Effect Model (CEM) as the best model; (2) Classical assumption tests: the multicollinearity test shows that all variables have VIF ≤ 10 and correlation coefficients <0.85 (free of multicollinearity), while the Glejser heteroscedasticity test shows that all variables have probabilities >0.05 (free of heteroscedasticity); (3) CEM panel data regression analysis to obtain the regression equation; (4) Partial hypothesis testing (t-test) with the criterion of rejecting H0 if t-count > t-table or sig. <0.05; (5) Simultaneous hypothesis testing (F test) with the criterion of rejecting H0 if F-count > F-table or sig. <0.05; (6) Coefficient of determination (Adjusted R Square) to measure the proportion of variation in the dependent variable explained by the independent variables.

Statistical power and sample size consideration: With 15 observations and 3 independent variables, the study has limited statistical power for detecting small effects. However, for medium-to-large effects (Cohen's $f^2 \geq 0.35$) at $\alpha=0.05$, the achieved power is approximately 0.60–0.70. This limitation is acknowledged, and the results should be interpreted conservatively. Analytical steps: Model selection: Chow test (to choose between CEM and FEM) and Lagrange Multiplier (LM) test (to choose between CEM and REM). Classical assumption tests: Multicollinearity (VIF and correlation matrix) and heteroscedasticity (Glejser test). Panel data regression using the selected Common Effect Model (CEM). Hypothesis testing: t-test for partial effects, F-test for simultaneous effects. Coefficient of determination (Adjusted R^2). All analyses were performed using Eviews 12.

RESULTS AND DISCUSSION

The analysis uses the help of Eviews 12 software with several tests carried out, namely the model selection test, from the tests that have been carried out (Chow Test, Hausman Test, and LM Test) this study uses the CEM model, classical assumption test, panel data regression model selection test and panel data regression test. There are two variables used in this study, namely the independent variable and the dependent variable. The dependent variable used is Seaweed Export (Y), and the independent variables are Seaweed Production (X1), Exchange Rate (X2), Price (X3), for the period 2020–2024.

Model Selection Test

Chow Test

Table 2. Chow Test Result

Effect Test	Statistic	d.f.	Prob
Cross-section F	1158.517250	(2,9)	0.0000
Cross-section Chi-square	83.320434	2	0.0000

Based on the results of the Chow test in Table 1 using Eviews12, a probability value of 0.0000 was obtained. This indicates that the probability value is smaller than the significance level (0.05), so a better estimate is used using the Fixed Effect Model (FEM) method, then continued with the Hausman test.

Lagrange Multiplier Test

Table 3. Lagrange Multiplier Test Result

	Test Hyphothesis		
	Cross-section	Time	Both
Breusch-Pagan	1.077749 (0.29992)	1.040450 (0.3077	2.118199 (0.1456)
Honda	1.038147 (0.1496)	-1.020025 (0.8461)	0.012814 (0.4949)
King-Wu	1.038147 (0.1469)	1.020025 (0.8461)	0.258732 (0.3979)
Standardized Honda	7.227251 (0.0000)	-0.940692 (0.8266)	-2.181350 (0.9584)
Standardized King-Wu	7.227251 (0.0000)	-0.940692 (0.8266)	-1.833122 (0.9666)
Gourieroux, et al.	-	-	1.077749 (0.2955)

Based on the results of the Lagrange Multiplier test in Table 3 using Eviews12, a probability value of 1.0777 was obtained. This indicates that the probability value is greater than the significance level (0.05) so that a better estimate is used using the Common Effect Model (CEM) method, therefore this study in the data analysis process uses the CEM model.

Classical Assumption Test

Multicollinearity Test

Table 4. Multicollinearity Test Result

	X1	X2	X3
X1	1.000000	0.924968	-0.206944
X2	0.924968	1.000000	0.089758
X3	-0.206944	0.089758	1.000000

From the results of Table 4, it can be seen that the independent variables used in the equation are free from multicollinearity problems because all variables used in this study have VIF values ≤ 10, which means that the data used for the study do not experience multicollinearity. The correlation coefficient of Production (X1), Value (X2) is 0.924968 <0.85, X1 and X3 are 0.206944 <0.85 and X2 and X3 are 0.089758. So it can be said that it is free from multicollinearity problems (Napitupulu et al, 2021:141).

Heterokedasticity Test

Table 5. Glejser Heteroscedasticity Test Results

Variable	Coeficient	Std. Error	t-Statisctic	Prob.
C	74090.66	98125.13	0.755063	0.4661
X1	-0.154734	0.144362	-1.071850	0.3067
X2	0.064616	0.046686	1.352183	0.2035
X3	-12.31996	28.39564	-0.433868	0.6728

From the results of Table 5, it can be seen that the independent variables used in the equation in the Glejser Heteroscedasticity test where the probability value must be greater than 0.05. From the results of the analysis, the Production value (X1) is 0.3067, Value (X2) is 0.2035, and the Price value (X3) is 0.672, so it is said that there is no heteroscedasticity.

Panel Data Regression Equation

Export (Y) = (59518.3569509) - 0.663941659772* Production (X1) + 0.242132381931* Value (X2) - 11.7205320399* Price (X3)

The explanation is as follows: 1) The constant value of 59,518,356 means that without the variables of Seaweed Production (X1), Exchange Rate (X2), and Price (X3), the Export variable (Y) would increase by 5.95%; 2) The beta coefficient value of the Production variable (X1) is 0.6639. If the values of the other variables remain constant and X1 increases by 66.39%, then the Export variable (Y) will increase by 66.39%. Likewise, if the values of the other variables remain constant and Production (X1) decreases by 66.39%, then the Export variable (Y) will decrease by 66.39%; 3) The beta coefficient value of the Value variable (X2) is 0.2421. If the values of the other variables remain constant and X2 increases by 24.21%, then the Export variable (Y) will increase by 24.21%. Likewise, if the values of other variables remain constant and the Value variable (X2) decreases by 24.21%, then the export variable (Y) will decrease by 24.21%; 4) The beta coefficient value of the Price variable (X3) is 11.7205. If the values of other variables remain constant and the X3 variable increases by 1172.05%, then the Export variable (Y) will increase by 1172.05%. Likewise, if the values of other variables remain constant and the Price variable (X3) decreases by 1172.05%, then the Export variable (Y) will decrease by 1172.05%.

Hypothesis Testing

Table 6. Hypothesis Test Results

Variable	Coeficient	Std. Error	t-Statisctic	Prob.
C	59518.36	164276.8	0.362305	0.7240
X1	-0.663942	0.241685	-2.747142	0.0190
X2	0.242132	0.080002	3.026581	0.0115
X3	-11.72053	47.53875	-0.246547	0.8098

The partial effect of the independent variables on the dependent variable. The t-test results for the Production variable (X1) yield a calculated t-value of 2.7471 > the t-table value of 2.1603 and a sig. value of 0.0190 < 0.05. Therefore, the hypothesis is accepted that seaweed production influences exports. The t-test results for the Value variable (X2) yield a calculated t-value of 3.0265 > the t-table value of 2.1603 and a sig. value of 0.0105 < 0.05. Therefore, the hypothesis is accepted that seaweed price influences exports. The t-test results for the Price variable (X3) yield a calculated t-value of 0.2465 < the t-table value of 2.1603 and a sig. value of 0.8089 > 0.05. Therefore, the hypothesis is rejected that seaweed price does not influence exports.

F-Test (Simultaneous)

Table 7. Simultaneous Test Results

Test	Results
R-Squared	0.632229
Adjusted R-squared	0.531927
S. E. of regression	115824.6
Sum squared resid	1.48E+11
Log likelihood	-193.8554
F-statistic	6.303295
Prob (F-statistic)	0.009551

The F-statistics value of 6.303295 is greater than the F table, which is 3.587 with a sig. value of 0.0095 < 0.05, so the hypothesis is accepted, meaning that the variables Production (X1), Value (X2), and Price (X3) of seaweed have an effect on export activities.

Coefficient of Determination Test

Table 8. Results of the Coefficient of Determination Test

Test	Results
R-Squared	0.632229
Adjusted R-squared	0.531927
S. E. of regression	115824.6
Sum squared resid	1.48E+11
Log likelihood	-193.8554
F-statistic	6.303295
Prob (F-statistic)	0.009551

The Adjusted R Square value is 0.531927 or 53.19%. The coefficient of determination value indicates that the independent variables consisting of Production, Value, and Price are able to explain the export variable of CV. Mesta Alam by 53.19%, while the remaining 46.81% (100 – Adjusted R Square value) is explained by other variables not included in this research model.

The positive and significant effect of production (X1) confirms that for an SME like CV Mesta Alam, supply availability is a binding constraint. Every 1% increase in production raises exports by 0.66%. This finding aligns with micro-level studies (Fahmi & Rafiana, 2014; Tajerin & Yusuf, 2008) but contradicts macro-level studies (Awaluddin et al., 2025; Simanjuntak, 2017) where production was insignificant. The divergence arises because at the firm level, production directly translates into exportable surplus, whereas national production may be absorbed by domestic demand or informal markets.

The positive effect of the exchange rate (depreciation of Rupiah) supports the standard trade theory: a weaker IDR makes Indonesian dried seaweed cheaper abroad, boosting export volume. This result is consistent with Tajerin & Yusuf (2008) and Garuda Kemdikbud (2022) but opposite to Awaluddin et al. (2025) and Ni'mah (2025) who found a negative effect. The difference can be attributed to: (1) different time periods (pre- vs. post-pandemic), (2) use of nominal vs. real exchange rate, and (3) firm-level versus aggregate data. For CV Mesta Alam, the depreciation acts as a windfall.

The non-significant effect of international price (X3) indicates that price fluctuations do not drive CV Mesta Alam's export volume. This might be due to the company's long-term relational contracts (where quality and trust dominate), or the relatively inelastic demand for dried seaweed in key markets. This result contrasts with Faradiah et al. (2022) and Lestari (2025) who found negative price effects, but supports the notion that non-price factors (certification, continuity) are decisive for SMEs.

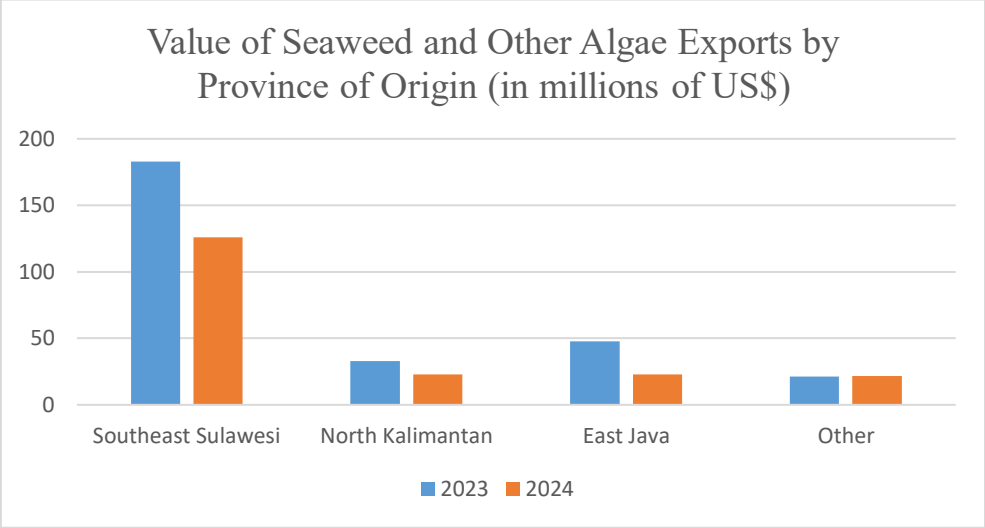

Figure 1. Export Value of Seaweed and Other Algae by Province of Origin, 2023 and 2024

By province of origin, seaweed and other algae exports primarily originate from South Sulawesi, North Kalimantan, and East Java. In 2024, the value of seaweed and other algae exports from these three provinces accounted for 88.82 percent of total national exports of this commodity. Exports of this commodity from South Sulawesi were recorded at US$125.8 million in 2024, while those from North Kalimantan reached US$22.9 million and those from East Java reached US$22.5 million. Seaweed and other algae exports from these three provinces decreased compared to 2023, with the largest decline occurring in East Java, which saw a 53.10 percent decrease.

The findings are generalizable to similar SMEs in the Indonesian seaweed export sector, especially those operating in East Java, NTT, and Southeast Sulawesi. However, caution is needed when extrapolating to large-scale exporters or other commodities. Implication for managerial , CV Mesta Alam should prioritize production capacity expansion while maintaining quality (e.g., through better farming partnerships). It should actively monitor exchange rate movements and use forward contracts to lock in favorable rates. Since price is not significant, the company should avoid competing solely on price; instead, invest in international certification (HACCP, organic) and diversify export destinations beyond China. Policy, Government support should focus on improving production infrastructure and providing exchange rate risk management tools for SMEs.

This study provides the first firm-level panel data evidence on seaweed export determinants in Indonesia. It demonstrates that production and exchange rate effects differ between macro and micro levels, resolving a previous inconsistency in the literature. Limitation of the research is Small sample size (15 observations) limits statistical power and prevents the inclusion of additional control variables, the use of provincial data as a proxy for CV Mesta Alam's actual production may introduce aggregation bias, and the study does not capture internal firm factors such as technology, labor skills, or management quality. Recommendation, Replicate the study with a larger panel (more provinces and longer time series), Include firm-level primary data (e.g., actual production and export records of CV Mesta Alam), and Apply non-linear models to capture threshold effects of exchange rate volatility.

The Impact of CV Mesta Alam's Seaweed Production on Export Trends

The results of the panel data regression analysis in this study indicate that seaweed production (X1) has a positive and significant influence on CV Mesta Alam's dried seaweed exports. This is evidenced by the calculated t-value of 2.7471, which is greater than the t-table (2.1603), and a significance value of 0.0190 <0.05. The regression coefficient for the production variable, 0.6639, indicates that every 1% increase in seaweed production will drive a 0.66% increase in export volume, assuming other variables remain constant. This finding empirically demonstrates that the availability of raw material supplies is a key foundation for export activities, where increased production enables the company to meet global market demand more consistently. For CV Mesta Alam, as an MSME, adequate production capacity is an absolute prerequisite for building trust with international buyers who demand continuous supply.

This finding aligns with previous research conducted by Fahmi and Rafiana (2014) in their study of factors influencing the competitiveness of processed Indonesian seaweed products. The study, which used static panel data analysis, found that seaweed production positively impacted the competitiveness of processed seaweed products in the international market. This indicates that increased production not only impacts export volume but also strengthens the product's competitive position in the global market. Research by Tajerin and Yusuf (2008) using the Error Correction Model (ECM) approach also supports this finding, where the analysis showed that Indonesia's seaweed export supply to the international market is positively influenced by national seaweed production. The consistency of these findings confirms that production is a fundamental determinant in the seaweed export supply function.

However, the results of this study are interesting to contrast with the findings of Awaluddin et al. (2025) in their study, which analyzed the effect of seaweed production on exports to five destination countries (China, Chile, South Korea, the Philippines, and Spain) for the period 2012-2021. Using panel data regression, the study found that, partially, the production variable had no significant effect on Indonesian seaweed exports. This difference in results can be explained by the different levels of analysis used. The study by Awaluddin et al. While using national aggregate data, this study focuses on the company level (CV Mesta Alam). At the micro level, the relationship between production and exports tends to be more direct and measurable because companies have greater control over their supply chains. Conversely, at the macro level, the influence of production can be overshadowed by other factors such as trade policies, fluctuations in global demand, or market distortions.

Simanjuntak's (2017) study, which examined the influence of production, international prices, and exchange rates on Indonesian seaweed export volume from 2009 to 2014, also found similar results to Awaluddin et al., namely, no partial effect between production and export volume. This finding indicates that, in a national aggregate context, increased production does not automatically lead to increased exports, possibly due to high domestic consumption, limited market access, or low price competitiveness. For CV Mesta Alam, the positive findings in this study provide important capital to continue increasing production capacity while maintaining quality. As highlighted in the study on China's influence in the global carrageenan industry, Indonesia exports almost all of its seaweed to China, but the export structure dominated by raw materials needs to be balanced with increased added value through processing. Thus, CV Mesta Alam's production increase strategy must be accompanied by efforts to improve quality, obtain international certification, and diversify products in order to compete in the increasingly competitive global market.

The Impact of CV Mesta Alam's Seaweed Value on Export Trends

The results of the panel data regression analysis in this study indicate that the exchange rate (X2) has a positive and significant effect on CV Mesta Alam's dried seaweed exports. This is evidenced by the calculated t-value of 3.0265, which is greater than the t-table (2.1603), and a significance value of 0.0105 <0.05. The regression coefficient of the exchange rate variable, 0.2421, indicates that every 1% increase in the exchange rate (Rupiah depreciation) will drive a 0.24% increase in export volume, assuming other variables remain constant. This finding empirically confirms the international trade theory that domestic currency depreciation lowers the price of exported goods in the global market, thereby increasing price competitiveness and ultimately driving increased export volume. For CV Mesta Alam, as an MSME, exchange rate fluctuations are a crucial external variable because they directly affect profitability and pricing strategies in the international market.

This positive finding aligns with research conducted by Tajerin and Yusuf (2008) using an Error Correction Model (ECM) approach, which found that the rupiah exchange rate positively influences the supply of Indonesian seaweed exports to the international market. Similar results were also found in a study published in Garuda Kemdikbud (2022), which analyzed the influence of price, exchange rate, and production on Indonesian seaweed exports to Europe. The study showed that, partially, the exchange rate had a positive and significant effect on Indonesian seaweed exports. This consistent finding confirms that the exchange rate transmission mechanism in the seaweed trade operates in accordance with theory, where a weakening rupiah is a boon for exporters because it increases domestic currency revenues and expands market share.

However, the results of this study are interesting to contrast with the findings of several other studies that indicate a different direction of influence. Awaluddin et al. (2025), in their study analyzing exports to five destination countries (China, Chile, South Korea, the Philippines, and Spain) for the period 2012-2021, found that, partially, the exchange rate variable had a negative and significant effect on

Indonesian seaweed commodity exports. Ni'mah's (2025) research at UIN Sunan Kalijaga, using panel data from 2012 to 2024, also found that the exchange rate had a negative and significant effect on exports. Similarly, Novianti and Amalina (2015), in their analysis of Indonesian seaweed competitiveness, found that the real exchange rate negatively affected seaweed export volume. This difference in direction can be explained through several perspectives. First, different analysis time periods and different macroeconomic conditions can produce different coefficient estimates. Second, the model specification and definition of the exchange rate variable (nominal versus real, and the unit of measurement IDR/USD versus USD/IDR) can influence the interpretation of the results. Third, different characteristics of destination markets (demand elasticity, market structure, and consumer preferences) can moderate the effect of the exchange rate on export volume.

Research by Herawati et al. (2022), which analyzed the determinants of Indonesian seaweed trade with seven destination countries (China, South Korea, France, Chile, the Philippines, the United States, and Japan) using a gravity model approach, found that the exchange rate significantly influenced trade volume. A study by Nuryartono et al. (2022) presented at the International Seaweed Symposium also confirmed that the Real Exchange Rate has a significant influence on dried seaweed exports. For CV Mesta Alam, the positive findings in this study provide strategic implications: the company needs to actively monitor exchange rate movements and take advantage of Rupiah depreciation to increase market penetration. However, high exchange rate fluctuations also bring uncertainty that needs to be anticipated through risk management strategies such as the use of forward contracts or currency diversification in export transactions. Thus, a deep understanding of exchange rate dynamics is a crucial competency for CV Mesta Alam to maintain and improve its export performance in the global market.

The Impact of CV Mesta Alam's Seaweed Price on Export Trends

The results of the panel data regression analysis in this study indicate that international prices (X3) do not significantly influence CV Mesta Alam's dried seaweed exports. This is evidenced by the calculated t-value of 0.2465, which is smaller than the t-table (2.1603), and a significance value of 0.8089 > 0.05. The regression coefficient for the price variable of -11.7205 indicates a negative relationship, but because it is not statistically significant, this effect cannot be interpreted as definitive. This finding empirically indicates that international price fluctuations were not a primary determinant of CV Mesta Alam's export decisions during the observation period. This insignificance can be explained through several perspectives, including the characteristics of dried seaweed as a commodity with relatively price-inelastic demand, or the presence of non-price factors such as quality, continuity of supply, and long-term relationships with buyers that are more dominant in determining the company's export volume.

The finding that price does not significantly influence exports aligns with several previous studies that have also found similar results in different contexts. Research conducted by Awaluddin et al. (2025) in their analysis of Indonesian seaweed exports to five destination countries (China, Chile, South Korea, the Philippines, and Spain) for the 2012-2021 period did not explicitly include price in the main model. However, the study highlighted that variables such as exchange rates and economic distance were more dominant in influencing exports than price factors. Ramadani's (2022) research at the University of Jambi, which analyzed the competitiveness of Indonesian seaweed product exports from 2000-2020 using multiple linear regression, found that export prices significantly influenced export competitiveness. However, it should be noted that the study used the competitiveness index as the dependent variable, not direct export volume. This difference in the definition of the dependent variable may explain the discrepancies in the study results.

However, these results contradict several other studies that found a significant effect of price on seaweed exports. Faradiah et al. (2022) in a study published in the E-Journal of Economics and Business at Udayana University, using a gravity model and panel data analysis, found that export prices had a negative and significant effect on the volume of Indonesian seaweed exports to ten main destination countries. Lestari's (2025) research at the Bogor Agricultural Institute, which examined the influence of non-tariff measures on demand for Indonesian seaweed, also found that import prices had a negative and significant impact on export volume. Similarly, Apristiana (2023), in her research at the Islamic University of Indonesia, which analyzed the factors influencing seaweed export volume to 10 major destination countries from 2012 to 2020, found that price had a positive and significant impact on Indonesian seaweed export volume. These differences in results indicate that the influence of price on exports is contextual and highly dependent on the analysis period, destination country, and the specific characteristics of the exporter.

The insignificant influence of price in this study has important strategic implications for CV Mesta Alam. First, as an MSME, CV Mesta Alam may have established long-term trading relationships (relational contracts) with buyers in destination countries, where price is not the sole primary consideration. Factors such as trust, consistent quality, and timely delivery may be prioritized by trading partners. Second, this finding can also be explained by a common practice in the seaweed industry, where foreign buyers often "manipulate prices," resulting in unstable supply from farmers. In such situations, exporters like CV Mesta Alam may be more focused on maintaining supply continuity rather than responding to short-term price fluctuations. Third, research by Tajerin and Yusuf (2008) using the Error Correction Model (ECM) approach found that export prices have a positive effect on Indonesia's seaweed export supply, but this effect may take time to manifest (time lag). For CV Mesta Alam, future export growth strategies cannot rely solely on price fluctuations, but must be accompanied by increased non-price competitiveness such as improving product quality, obtaining international certification, and diversifying destination markets to reduce dependence on one or two purchasing countries.

The Impact of CV Mesta Alam's Seaweed Production, Value, and Price on Export Trends

The results of the panel data regression analysis in this study indicate that simultaneously, the variables of seaweed production (X1), exchange rate (X2), and international prices (X3) have a significant effect on CV Mesta Alam's dried seaweed exports. This is evidenced by the F-statistic value of 6.303295 which is greater than the F-table (3.587) and a significance value of 0.0095 <0.05. This finding indicates that the three independent variables together are able to explain variations in the company's export volume during the 2020-2024 observation period. The Adjusted R Square value of 0.531927 or 53.19% indicates that the variables of production, exchange rate, and price simultaneously contribute 53.19% to changes in CV Mesta Alam's exports, while the remaining 46.81% is explained by other variables outside the research model such as trade policies of destination countries, product quality, international certification, or other macroeconomic factors. Statistically, this simultaneous significance confirms that the constructed regression model is suitable for analyzing the determinants of seaweed exports at the company level.

This finding of a significant simultaneous effect aligns with various previous studies that have found similar findings in different contexts. Research conducted by Awaluddin et al. (2025), in their study analyzing Indonesian seaweed exports to five destination countries (China, Chile, South Korea, the Philippines, and Spain) from 2012 to 2021, found that simultaneously, seaweed production, exchange rates, Gross Domestic Product (GDP), and economic distance significantly influenced Indonesian seaweed exports. Similarly, Marhaeni (2021), in her research published in the E-Journal of Development Economics at Udayana University, analyzed from 1989 to 2018 and found that the volume of Indonesian dried seaweed production, the export price of Indonesian dried seaweed, the US dollar exchange rate against the rupiah, and China's real GDP significantly influenced the volume of Indonesian dried seaweed exports to China. The consistency of these findings across various levels of analysis (national and company) and across different time periods strengthens the validity of the model used in this study.

Simanjuntak's (2017) study, which examined the influence of production, international prices, and exchange rates on Indonesian seaweed export volume from 2009 to 2014, also found a joint influence between these three variables on export volume. Similar results were found in a study published in Garuda Kemdikbud (2022), which analyzed the influence of prices, exchange rates, and production on Indonesian seaweed exports to Europe. The study concluded that simultaneously, exchange rates and seaweed production had a positive and significant effect on Indonesian seaweed exports. Rhesyawan's (2013) study at UPN Veteran, East Java, using a case study of PT Terminal Petikemas Surabaya also confirmed that foreign exchange rates, domestic production prices, domestic production, and inflation simultaneously significantly influenced the value of Indonesian seaweed exports to China. These various studies demonstrate that, although partial results differ, macroeconomic and production variables are consistently found to be important determinants of seaweed exports.

The significant simultaneous findings in this study provide important strategic implications for the management of CV Mesta Alam. First, the large contribution of 53.19% from the three variables indicates that the company needs to pay balanced attention to production (internal) and exchange rate and pricing (external) aspects in formulating its export strategy. Increasing production capacity must be accompanied by careful monitoring of exchange rate fluctuations and international price movements. Second, the remaining 46.81% of the variation explained by other factors indicates that CV Mesta Alam needs to identify and manage non-price variables such as product quality, international certification, distribution networks, and relationships with buyers in destination countries. Ni'mah's (2025) research at

UIN Sunan Kalijaga, using a Random Effects Model (REM), found that inflation in destination countries had a negative and significant effect on exports, while international prices had no significant effect. This indicates that Indonesia's seaweed export performance is more influenced by domestic production capacity than by price fluctuations in the global market. For CV Mesta Alam, this underscores the importance of building sustainable competitive advantage through increasing product added value, diversifying target markets, and strengthening long-term partnerships with international buyers to ensure stable export growth amidst global market dynamics.

CONCLUSION

This study concludes that: (1) seaweed production has a positive and significant effect on CV Mesta Alam's dried seaweed exports; (2) the exchange rate (IDR/USD) also has a positive and significant effect; (3) international price has no significant effect; and (4) simultaneously, all three variables significantly influence exports, explaining 53.19% of the variation. These findings answer the research objectives by identifying production and exchange rate as key drivers while rejecting price as a determinant. The study confirms that at the micro (SME) level, production plays a more direct role than at the macro level, suggesting a need to refine international trade models for firm-level analysis. CV Mesta Alam should increase production capacity with guaranteed quality, capitalize on Rupiah depreciation moments, and strengthen non-price competitiveness (certification, market diversification) to sustain export growth. Policymakers should facilitate SME access to exchange rate hedging instruments and production technology. The "micro-macro divergence" in seaweed export determinants where production matters at firm level but not at national level is a new empirical insight contributed by this study.

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AUTHOR CONTRIBUTIONS

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CONFLICTS OF INTEREST

The author(s) declare no conflict of interest.

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

The authors declare that no artificial intelligence (AI) tools were used in the generation, analysis, or writing of this manuscript. All aspects of the research, including data collection, interpretation, and manuscript preparation, were carried out entirely by the authors without the assistance of AI-based technologies.

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