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ANALYSIS FOR INCREASING THE COMPETITIVENESS OF INDONESIAN SEAWEED EXPORTS TO SOUTH KOREA

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ABSTRACT

Background: Indonesia's fisheries and marine sector contributes a small percentage to the national gross domestic product (GDP), with seaweed being a key commodity. However, Indonesian seaweed exports are highly dependent on China, which poses an economic risk. South Korea has emerged as a potential alternative market with increasing demand for seaweed products.
Purpose: This study aimed to analyze the trade performance, comparative advantage, and competitive advantage of Indonesian seaweed exports to South Korea and provide strategic recommendations to enhance competitiveness in the market.
Design/methodology/approach: This study employs secondary data from 2018 to 2022, analyzing trade performance using the Trade Specialization Index (TSI), comparative advantage using the Revealed Comparative Advantage (RCA) index, and competitive advantage using the Export Product Dynamic (EPD) and Porter's Diamond model.
Findings/Results: The analysis shows that Indonesia has strong trade performance in South Korea, holding a significant share of the market and being in the maturity stage of export development. The RCA results indicate that Indonesia has a high comparative advantage over other exporters. The EPD places Indonesia in the "Rising Star" category, confirming its growing competitiveness. However, competition with China remains a challenge. Recommendations include improving production efficiency, increasing investment in seaweed processing, enhancing infrastructure, and strengthening market positioning strategies.
Conclusion: Indonesian seaweed has strong comparative and competitive advantages in South Korea. However, to sustain and further increase competitiveness, strategic improvements in production factors, demand conditions, related industries, and competition structures are necessary.
Originality/Value: This study provides a comprehensive analysis of Indonesia's seaweed export competitiveness in South Korea by integrating multiple analytical frameworks to offer strategic recommendations for sustainable market expansion.

Keywords: competitiveness, export, EPD, RCA, seaweed

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INTRODUCTION

The fisheries and marine sector has a relatively low contribution to Indonesia's Gross Domestic Product (GDP), contributing only 2.81% (BPS, 2023). The subsector that significantly boosts the GDP contribution of the fisheries sector is aquaculture, with seaweed as its leading commodity. Data from the Directorate General of Marine and Fisheries Resources Supervision (DJPSDKP) show that seaweed is the primary commodity in aquaculture, with an export volume growth of 11.74% and export value growth of 32.67% from 2021 to 2022. The increase in seaweed export value also contributed to the GDP growth of the fisheries sector by 2.62% in the fourth quarter of 2022 compared to the fourth quarter of 2021, with seaweed contributing 8.86%. This indicates that seaweed plays a crucial role in the Indonesian economy.

High export value is also influenced by China, the main destination country. However, Indonesia's heavy reliance on China as the primary export destination poses risks, such as potential decreases in demand or the implementation of policies restricting the entry of export commodities. In addition to China, Indonesia's seaweed exports to South Korea are continuously growing. In 2022, the total export value of seaweed reached $15,809,800, a significant increase from $5,403,100 in 2021 (BPS, 2022). This high potential in South Korea has prompted other countries to increase their seaweed export activities.

Therefore, an analysis of Indonesia's seaweed trade performance in the South Korean market is necessary to determine its comparative advantage, competitive advantage, and trade specialization. Furthermore, the analysis results can be used to design strategies for improving export competitiveness, ensuring that Indonesian seaweed maintains a strong position and continues to grow in the South Korean market.

Based on the issues described above, this research aims to (1) analyze the trade performance of Indonesian seaweed exports to South Korea, (2) assess the comparative advantage of Indonesian seaweed in the South Korean market, (3) evaluate the competitive advantage of Indonesian seaweed in South Korea, and (4) formulate strategies for enhancing the competitiveness of Indonesian seaweed exports to South Korea. These objectives aim to provide a comprehensive understanding of Indonesia's position in the South Korean seaweed market and develop effective approaches to strengthen its market presence and growth potential.

The focus of this research is on seaweed commodities with HS code 121221, which include seaweed and other algae types, fresh, chilled, or dried, primarily for human consumption. The study utilizes secondary data in the form of annual (yearly time series) data for the last five years, from 2018 to 2022. The formulation of recommendations employs descriptive analysis without going through in-depth strategy formulation stages, such as weighting and determining strategy priorities.

METHODS

The research consisted of activities including problem formulation, research objective design, secondary data collection, data processing, analysis, and obtaining results from the research problem formulation. Data collection and research were conducted from September 2023 to March 2024. This study utilized secondary data sourced from the literature. The data sources for this research focused on export and import data for seaweed commodities with HS code 122212 in the South Korean market over a 5-year period (from to 2018-2022) from ITC Trademap and BPS (Statistics Indonesia), as well as other supporting data up to 2024 to complement the analysis. These additional data were sourced from the Ministry of Maritime and Fisheries Affairs, Ministry of Trade, relevant institutions, and various other related literature. The framework of this study is shown in Figure 1.

Several techniques were used to analyze the data being gathered. This study employed multiple analytical methods to assess the trade performance and competitiveness of Indonesian seaweed in the South Korean market. Trade performance was analyzed using export and import data along with the Trade Specialization Index (TSI) to measure the commodity's potential and developmental stage. The TSI was calculated using the following formula:

$$TSI = (Xij - Mij)/ (Xij + Mij)$$

Notes: Xij (Export value of seaweed commodity from country); Mij (Import value of seaweed commodity to country j); i (Seaweed commodity); j (Exporting country).

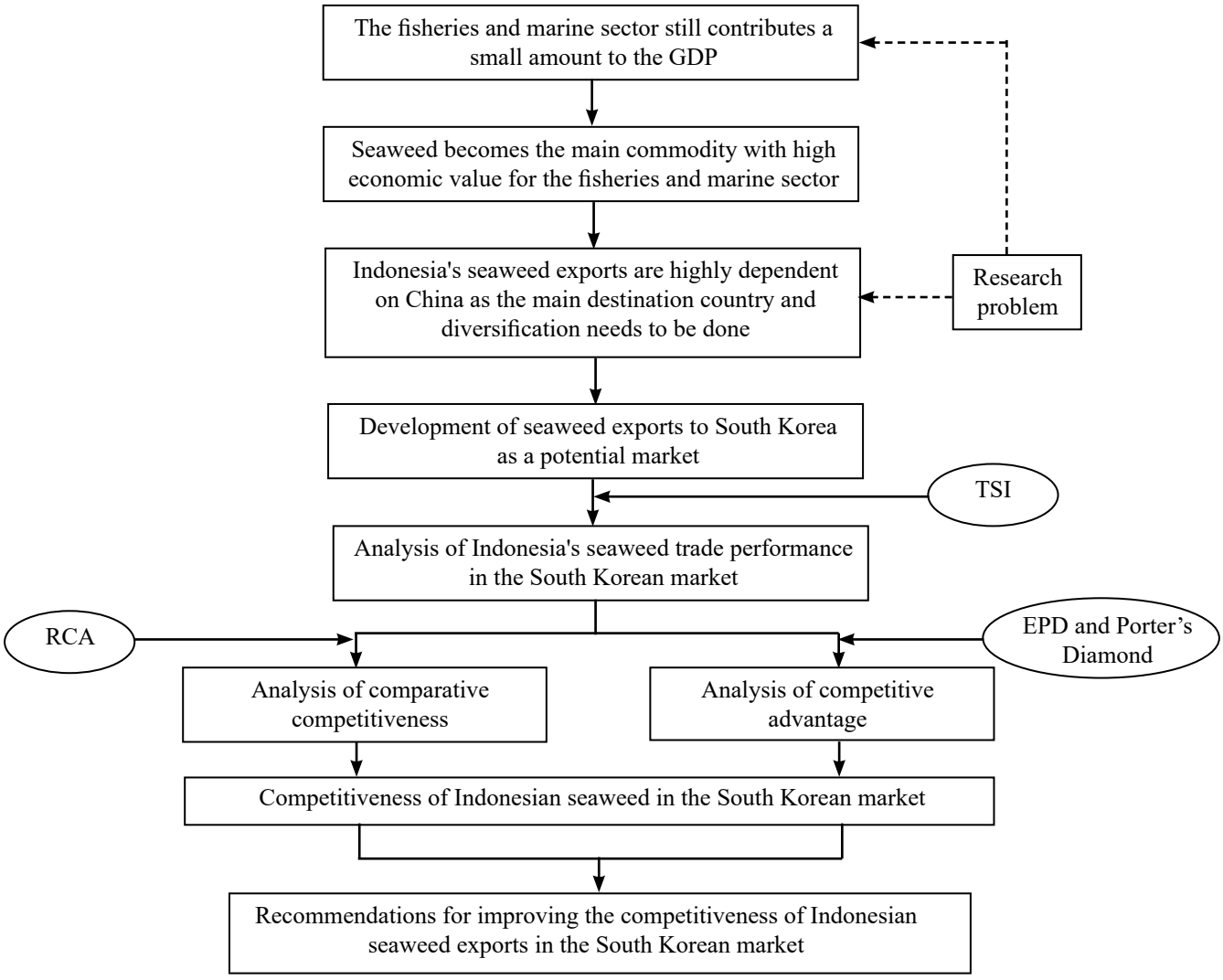

Figure 1. Research Framework

TSI could be represented in a curve (Ministry of Trade 2020) showing that the growth level of a commodity in trade can be identified in five stages: (1) introduction stage (ISP value between -1 to -0.50), (2) import substitution stage (ISP value between -0.50 to 0.00), (3) growth stage (ISP value between 0.01 to 0.80), which is the export expansion stage, (4) maturity stage (ISP value between 0.81 to 1.00), and (5) re-importing stage, if the ISP value decreases again from 1.00 to 0. At this stage, the industry in the country loses market competition and domestic production is less than its demand (Simangunsong, 2018).

Comparative advantage was evaluated using the Revealed Comparative Advantage (RCA) index to measure the level of comparative advantage of a commodity from one country relative to other countries (Patone et al. 2020). An RCA value greater than one indicates that a country has a comparative advantage for that commodity in the destination country's market relative to that country's competitors. RCA was calculated using the following formula:

$$RCA = (Xij / Xi) / (Xwj / Xw)$$

Notes: Xij (value of seaweed exports from country i to the international market); Xi (total export value of country i to the international market); Xwj (value of world seaweed exports); Xw (total world export value).

Competitive advantage was assessed using Export Product Dynamics (EPD) and Porter's diamond model. EPD identified the competitiveness of Indonesian seaweed exports to South Korea by categorizing them into four quadrants: Lost Opportunity, Rising Star, Retreat, and Falling Star. Porter's diamond analysis examined four attributes influencing competitive advantage: Factor Conditions, Demand Conditions, Related and Supporting Industries, and Firm Strategy, Structure, and Rivalry. The formulation of export

development recommendations for Indonesian seaweed in the South Korean market utilized a descriptive method based on trade performance and competitiveness analysis. The analysis identified gaps in current conditions and provided recommendations to enhance the export competitiveness of Indonesian seaweeds.

RESULTS

Trade performance of Indonesian Seaweed in the South Korean market

Based on the data of exporting countries to South Korea over the past five years, Indonesia has consistently held the first rank with relatively stable values. This is followed by four other countries: China, Chile, Japan, and the Philippines. Indonesia's seaweed export value in 2022 reached $16,602, which is considerably large, given that South Korea's import value was $2,741. This indicates that Indonesia accounts for a significant percentage of South Korea's seaweed imports. Over the past five years, Indonesia's total seaweed export value has averaged $11,407.2 thousand and has consistently maintained the highest value during this period (ITC Trademap, 2024). Based on the Trade Specialization Index (TSI) results for seaweed commodities, Indonesia shows a tendency to be an exporting country, and its export development stage is already in the maturity phase. The results of the TSI calculation analysis are presented in Table 1.

Based on these data, Indonesia shows a tendency to be an exporting country, as indicated by its consistently high Trade Specialization Index (TSI) values above 0.80. This value is also relatively high compared to other countries. Indonesia's average TSI value is 0.99, indicating that Indonesia is in the maturity stage and that Indonesian seaweed commodities are highly competitive, with Indonesia exporting more than importing. However, many countries have relatively high TSI values, with scores above 0.80, placing them in a mature stage with strong competitiveness. This means that the TSI of each major exporting country also indicates a strengthening of competitiveness.

Competitiveness analysis of Indonesian Seaweed in the South Korean Market

First, an analysis of Comparative Advantage was conducted using the Revealed Comparative Advantage (RCA) method. A higher RCA value for a country indicates that it has a greater comparative advantage and stronger competitiveness than other countries in the South Korean market. A comparison of RCA values for the five main exporting countries for seaweed commodities in the South Korean market is shown in Table 2.

Table 1. Results of the Trade Specialization Index (TSI) Calculation for Seaweed in the South Korean Market 2018-2022

Year	Indonesia	China	Chile	Japan	Philippines
2018	0.9996	0.9949	0.7574	0.6547	0.4523
2019	0.9996	0.9877	0.5209	0.5726	-0.7471
2020	0.9990	0.9931	0.8833	0.5859	-1.0000
2021	0.9981	0.9846	0.9713	0.4037	-0.9271
2022	0.9986	0.9833	0.9669	0.8282	0.9964
Average	0.9990	0.9887	0.8200	0.6090	-0.2451

Table 2. RCA Values of Major Seaweed Exporters in the South Korean Market

Year	Indonesia	China	Chile	Japan	Philippines
2018	22.64	1.20	4.73	0.18	2.23
2019	23.65	1.33	2.87	0.17	0.23
2020	29.60	1.40	7.95	0.17	0.00
2021	21.41	1.89	9.82	0.13	0.33
2022	28.09	1.07	4.88	0.39	3.12
Average	25.08	1.38	6.05	0.21	1.18

Over the past five years, Indonesia has consistently had the highest RCA value, with an average of 25.08. Indonesia's highest RCA value was in 2020 at 29.60, whereas its lowest RCA value was in 2018 at 22.64. The high RCA value of Indonesia indicates that Indonesian seaweed has its high comparative advantage and strong competitiveness in the South Korean market. Nevertheless, Indonesia needs to pay attention to this position because not only does it have a comparative advantage with an RCA value greater than one, but Chile, China, and the Philippines also possess this advantage. After conducting an analysis of comparative advantage, an analysis of competitive advantage was also conducted. To analyze the competitive advantage of Indonesian seaweed commodities, the Export Product Dynamic (EPD) method was used. The results of the analysis are presented in Table 3.

According to the EPD analysis, all five primary seaweed-exporting nations to South Korea exhibit positive export share growth, positioning Indonesia in the "Rising Star" category an optimal market position. This classification indicates that seaweed commodities present consistently expanding export opportunities, which should be maintained and further enhanced. However, it is noteworthy that Indonesia is not unique in this favorable position; other major exporters, including China, Chile, Japan, and the Philippines, also occupy the "Rising Star" quadrant. In the context of the South Korean market, China demonstrates superior performance in both export and product share growth. Specifically, China's export share growth was 2.73%, with a product share growth of 4.44%, substantially surpassing Indonesia's figures for the same destination market. These statistics suggest that China has a robust position and plays a significant role in this market. The EPD value calculations, when represented graphically, can be visualized as illustrated in Figure 2.

The five primary exporting nations Indonesia, Chile, China, Japan, and the Philippines all occupy the "Rising Star" position, indicating strong competitive advantages. Although South Korea represents a prime target market for seaweed commodity exports, Indonesia must continually enhance its competitiveness. Beyond EPD analysis, a nation's competitive advantage can be evaluated through several conditions. The following analysis examines these competitive advantages based on four key conditions.

Factor conditions

The first factor being analyzed is natural resources. Of the total seaweed production in Indonesia, only 7% is cultivated in ponds, whereas the remaining 93% is produced in marine environments (BPS 2022). Seaweed production is widely distributed across 23 provinces, with the top five producing regions being South Sulawesi, East Nusa Tenggara, North Kalimantan, Central Sulawesi, and West Nusa Tenggara (BPS, 2020). The most commonly cultivated seaweed species in Indonesia are Eucheuma cottonii, Eucheuma spinosum, and Gracilaria spp.. This aligns well with the types of high demand in the South Korean market over the past five years (BPS, 2022).

From the human resources side, as of February 2022, 40.64 million workers were employed in the agriculture, forestry, and fisheries sectors, representing 29.96% of the total workforce of 135.61 million (BPS, 2022). However, the quality of labor in the seaweed industry remains low, with most workers having only primary education. The average wage in these sectors is relatively low at IDR2,374,788 (BPS, 2023). For science and technology, key challenges in seaweed development include non-uniform quality and suboptimal postharvest handling. The government, through the BRIN (National Research and Innovation Agency), is working to develop seaweed for various applications. However, technology adoption in the fisheries sector remains slow (E-fishery, 2022).

Table 3. Results of EPD Value Analysis for seaweed exporters in the South Korean market

Country	Export Market Share Growth (%) (X-Axis)	Product Market Share Growth (%) (Y-Axis)	Market Position
Indonesia	1.215502378	0.3504041198	Rising Star
China	2.739496908	4.447058012	Rising Star
Chile	5.711670481	0.1681082279	Rising Star
Japan	0.7869982763	1.488514817	Rising Star
Philippines	0.5219260533	0.08551159144	Rising Star

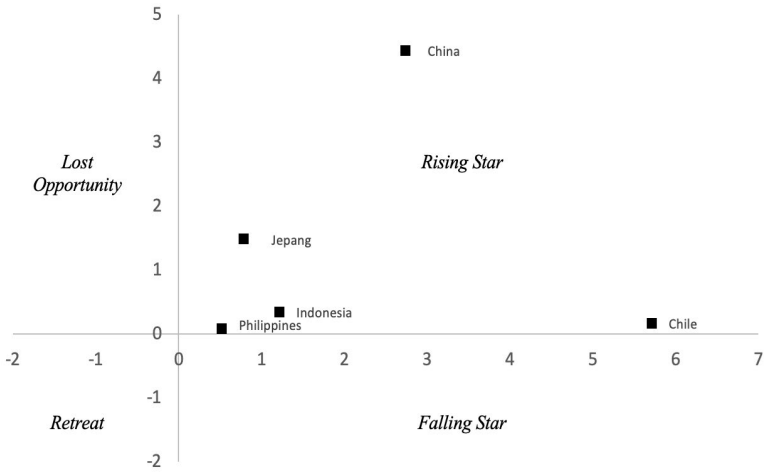

Figure 2. Quadrant of EPD values for major seaweed exporter to South Korea

Analysis of the capital for the fisheries sector, including seaweed cultivation, is not among the top five sectors for investment realization. In Q1 2023, it ranked among the three lowest sectors for both foreign and domestic investment. Investment growth shows an increasing trend, but remains Java-centric despite its potential in other regions (DPR, 2022).

Regarding infrastructure, Indonesia's Logistics Performance Index (LPI) score is relatively low, ranking 61st globally. The country scores well in timeliness (3.3) but poorly in customs (2.8), infrastructure (2.9), and logistics competence (2.8) (World Bank, 2023).

Demand conditions

The low domestic consumption of seaweed in Indonesia results in a higher proportion of raw seaweed exports (KKP, 2021), whereas in the South Korean market, seaweed is in high demand for both food and cosmetic applications. Table 4 presents the data on trade developments.

Based on these data, Indonesia's trade balance with South Korea has always been positive. Although exports have been quite volatile, with the increasing population of South Korea, the potential of Indonesian seaweed in South Korea is also increasing. The types of seaweed most exported to South Korea are Euchema Spinosum, Euchema Cottonii, and Gracilaria sp. This is because these three seaweed species are not massively produced in South Korea, resulting in a demand from South Korea to Indonesia as a country that produces these three types of seaweed in large quantities (Hwang and Park, 2020).

Related and supporting industry conditions

The processing of seaweed from upstream to downstream plays an important role in supporting a good seaweed output. In this case, the seaweed supply chain becomes a matter that requires attention. According to Hermalena et al. (2022), supply chain management has not yet reached the development of production center areas for derivative products to meet the availability of raw materials sustainably.

Structure and competition

Based on the ISP value, Indonesia is at maturity in the South Korean market, with export volumes also increasing significantly. However, when compared in terms of export market share and product share growth, Indonesia still lags far behind China, which has a very high export share and product share growth in South Korea. Moreover, China has more capable infrastructure, making it a strong main competitor that could replace Indonesia's position.

Recommendations to Increase the Competitiveness of Indonesian Seaweed Exports

To increase the competitiveness of Indonesian seaweeds, recommendations are focused on improving competitive advantage by enhancing competitiveness in factor conditions, demand conditions, related and supporting industry conditions, and structure and competition conditions.

Table 4. Development of Indonesian seaweed trade in South Korea

Year	Export Volume	Impor Volume	Trade Balance
2018	12.369	2.327	10.042
2019	8.615	2.188	6.427
2020	9.618	5.112	4.506
2021	5.403	4.969	434
2022	15.823	11.327	4.496

Source: ITC Trademap (2024)

Factor conditions improvement

Indonesia's current factor conditions still have development potential that can be further maximized. The following recommendations can be made to improve Indonesia's factor conditions for seaweed in terms of natural resources, human resources, capital resources, science and technology, and infrastructure.

Among the natural resources, seaweed produced by Indonesia is also a type of seaweed that is not produced in South Korea, namely Euchema Spinosum (HS code: 12122111), Euchema Cottonii (HS code: 12122112), and Gracilaria sp. (HS code: 12122113). However, this production is still centered on sea cultivation, accounting for 93% of the total Indonesian seaweed production (BPS 2021). Meanwhile, seaweed cultivation in ponds is still minimal, or only approximately 7%, and needs to be promoted again, one of which is by cultivating Gracillaria sp. (Safrini *et al.* 2022), which is included among the seaweed species that are in high demand in South Korea.

In terms of human resources, the low quality of resources from workers in the seaweed business sector plus the lack of interest in knowing about training held by the government makes it necessary to have two important things that must be addressed, namely increasing wage standardization and resource development through a system with an approach to local communities.

For capital resources, the initiative that could be implemented is by increasing capital resources both through investment in terms of PMDA and PMDN needs to be improved through coordinated investment policies between central and regional governments and not Java-centric, because potential areas and seaweed producers are mostly located in provinces outside Java. In addition, government incentives are offered to the fisheries sector to become more attractive. In addition, capital through the People's Business Credit (KUR) scheme also needs to be increased by simplifying lending procedures, ease of business legality, loan guarantees, and assistance to business groups, especially for household groups.

In science and technology, challenges still evolve in the minimal integration of technology in the fisheries sector, including seaweed, making it important to use technology to increase the productivity of Indonesian seaweed. Remote sensing is an example of a technology that can be used to map the suitability of water quality and cultivation for seaweed types. Spatial analysis of water quality can help map the right areas for seaweed cultivation so that Indonesian seaweeds have a high productivity level.

The logistics and infrastructure aspects in Indonesia need to be improved again. This is especially true on the loading and unloading sides, logistics, and infrastructure in the aquaculture sector.

Demand conditions improvement

Marketing strategies such as trade exhibitions and strategic partnerships with Korean private and government parties, for example with the development of seaweed as a raw material for cosmetics and processed foods, are also driven by the trend of the South Korean government, which is starting to focus on developing the seaweed industry not only in terms of quantity, but also in terms of quality (Hwang and Park, 2020).

Related and supporting industry conditions: Improvement of related and supporting industry conditions begins with the process of integrating seaweed processing from upstream to downstream. In the upstream part, increased training to improve the abilities of community-based seaweed farmers can be implemented. In the on-farm section, seaweed cultivation can be increased with a more efficient

system, such as the use of technology. In the downstream section, Indonesia also needs to adjust to the demand for seaweed in South Korea. Hwang and Park (2020) found that important indicators in the South Korean seaweed industry are related to the safety of seaweeds used as food ingredients and industries that support sustainability in the management process.

Structure and competition conditions improvement

To maintain its position as a country with comparative and competitive advantages, Indonesia needs to take advantage of strategic cooperation with South Korea. The Indonesia-Korea Comprehensive Economic Partnership Agreement (IK-CEPA) strategic cooperation agreement is beneficial for Indonesian trade to South Korea, as well as ease of investment in both countries (Rahim et al. 2023).

Managerial Implications

To enhance the competitiveness of Indonesian seaweed exports to South Korea, key strategic actions must be undertaken. First, improving production efficiency through better cultivation methods, increased access to capital, and the adoption of advanced technology is crucial. Investing in workforce development through training programs also enhances productivity and quality. Additionally, optimizing supply chain logistics and infrastructure, including streamlining export procedures and upgrading port facilities, can help reduce costs and improve export efficiency.

Second, market expansion strategies should focus on product diversification and branding. The development of value-added seaweed products for the food, cosmetics, and pharmaceutical industries is expected to increase demand. Leveraging trade agreements, such as the Indonesia-Korea Comprehensive Economic Partnership Agreement can further facilitate market access. Strengthening partnerships with Korean importers and active participation in international trade exhibitions will enhance Indonesia's market presence. Finally, ensuring compliance with South Korean quality and safety standards will solidify Indonesia's reputation as a reliable supplier, securing long-term competitiveness in the global seaweed market.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

In terms of trade performance, the export value of Indonesian seaweed is still far superior to that of other exporting countries. Indonesia also tends to be an exporting country rather than an importing country. This is because, based on the TSI calculation results, Indonesia has a TSI value of more than 0.80, which indicates that Indonesia is at the maturity stage. Indonesian seaweed commodities have a strong comparative advantage in South Korea. This is because, based on RCA calculations, Indonesia's RCA value is more than 1. Indonesia's RCA value is also the highest compared to other major exporting countries because of its superior natural resources. Indonesian seaweed commodities also have a strong competitive advantage in the South Korean market. This is evidenced by the EPD calculation, which positions Indonesia in a rising star position due to positive growth in product share and export share, making South Korea an ideal market for export destinations. However, Indonesia is still less competitive than China as one of the main seaweed-exporting countries in the South Korean market. The formulation of recommendations for increasing the competitiveness of Indonesian seaweed is focused on increasing the attributes that form a competitive advantage. This is achieved by increasing competitiveness under several conditions. These include factors, demand, related and supporting industries, and structure and competition conditions.

Recommendations

The government must strive to increase the competitiveness of Indonesian seaweed commodities, especially in terms of their competitive advantage. This is because, although Indonesia is highly competitive, other major exporting countries also have strong competitive advantages with growing export shares. Further research can discuss more deeply the factors that play an important role in the export of Indonesian seaweed commodities with weighting and mapping recommendations with short term, medium term, and long term with mapping on relevant stakeholders, so that the resulting recommendations can become more comprehensive.

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