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Analysis of Seaweed Commodities Competitiveness Upon International Market in Bali Province

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Abstract—Seaweed is one of Indonesia's leading fisheries commodities with significant export potential, particularly in Bali Province. However, increasing global competition requires a deeper understanding of its competitiveness. This study aims to analyze the comparative and competitive advantages of Bali seaweed, identify factors influencing its competitiveness, and examine export trends in the international market. The research uses a descriptive quantitative approach with secondary time series data from 2014 to 2024. Analytical tools include production share, export share, and Porter's Diamond Model. The results show that Bali's production share experienced a decline during 2017–2019 due to environmental and socio-economic pressures but gradually recovered after 2020. Export performance is highly fluctuating, with a significant increase in 2024 indicating strong competitiveness under favorable conditions. Factors influencing competitiveness include natural resources, human resources, infrastructure, technology, demand conditions, and government support. The study implies that improving technology, infrastructure, and value-added processing is essential to strengthen Bali's global competitiveness in the seaweed industry.

Keywords—competitiveness, export, Porter's Diamond Model, seaweed, Bali

Introduction

Seaweed is one of Indonesia's leading commodities in the fisheries sector, with significant potential to drive national economic growth through export activities. As a major global producer of seaweed, Indonesia boasts internationally recognized product diversity and quality. Seaweed cultivation has a significant impact on the socio-economic conditions of coastal communities, particularly in increasing income and employment (Fariyanti et al., 2024). As a developing country, Indonesia implements an open economic system, making international trade a key driver of economic and social growth (Izzatin et al., 2023). Bali Province is one of the seaweed-producing regions with a significant contribution and is known for its potential in the agribusiness sector, particularly in seaweed cultivation and export.

The comparative advantage of Balinese seaweed lies in its product quality that meets international standards and its geographical conditions that support cultivation activities. Balinese waters are suitable for the cultivation of various seaweed species, such as *Eucheuma cottonii* and *Gracilaria*, which are used as raw materials for the food, cosmetics, and pharmaceutical industries. A strong comparative advantage empowers a region to dominate the global market under free trade conditions (Al Ghozy et al., 2017 in Izzatin et al., 2023). Global competition demonstrates the dominance of other countries, such as the Philippines and Vietnam, as major global seaweed producers.

Balinese seaweed competitiveness is influenced by various internal and external factors. These factors include product quality, price, government policies, distribution efficiency, and environmental sustainability. Supportive export policies and the presence of a local processing industry increase product added value. Export competitiveness is a crucial component in determining potential market share in the global market (Sa'diyah & Darwanto, 2020 in Mohamad & Ab-Rahim, 2024). Competitiveness reflects a country's ability to withstand global competitive pressures and maintain or increase real income (Worku et al., 2024).

Challenges in developing Balinese seaweed commodities include fluctuations in global market prices, supply chain disruptions, and the impact of climate change on production. Limited technology and infrastructure impact production quality and efficiency. These conditions highlight the need for an appropriate development strategy to maintain the sustainability of the commodity (Blikra et al., 2021).

The Balinese seaweed export trend exhibits interesting dynamics worth analyzing. Data from the Central Statistics Agency (BPS) shows an increase in Indonesian seaweed exports year after year, accompanied by increasingly intense global competition. Analysis of export volume, export value, and market share provides an overview of the commodity's competitive position. Market share performance reflects a country's comparative advantage and competitiveness (Yusoff et al., 2022). Commodity competitiveness can be measured using comparative and competitive advantage approaches (Jumiati et al., 2024). This study aims to analyze the competitiveness of Bali Province's seaweed commodity in the international market, identify factors influencing competitiveness, and evaluate export trends as a basis for formulating sustainable development strategies (Gupta & Abu-Ghannam, 2011).

Research Methods

The research was conducted in Nusa Penida and Nusa Dua, focusing on seaweed commodities in Bali Province from March to October 2025. The study used a descriptive quantitative approach with secondary data in the form of a time series from 2014–2024. Data were obtained through documentation and internet searches. Documentation was conducted through the collection of archives, official reports, and publications relevant to the research (Ardiansyah et al., 2023). Internet searches were used to obtain additional information related to the research object. The study population included seaweed production and export data from Indonesia and Bali. The sample consisted of annual data for 10 years. The study measured competitiveness through a comparative and competitive advantage approach.

The research variables consisted of production share, export share, and competitiveness factors based on Porter's Diamond Model, which encompasses conditions, demand conditions, related and supporting industries, structure and competition, government role, and opportunities. Data analysis was conducted using Microsoft Excel through calculations of production share and export share, as well as descriptive analysis of competitiveness factors. Porter's model was used to identify factors influencing the competitive advantage of Balinese seaweed commodities in the international market.

Table 1
Production Share and Export Share Variables

No	Variable	Indicator	Measurement Scale
1	Share production and exports	Balinese and Indonesian seaweed production	Ratio
		Seaweed export value from Bali and Indonesia	Ratio

Source: Processed data (2025)

Table 2
Porter's Diamond Model Variables

No	Element Model Porter	Variable	Indicator	Scale
1	Conditional factors	Natural resources	Seaweed production volume	Ratio
	Demand conditions	Human resources	Production and marketing skills	Nominal
	Related and supporting industries	Science & technology	Utilization of production and marketing technology	Nominal
	Strategy, structure, and competition	Capital	Capital availability and policies	Nominal
	Government role	Infrastructure	Availability of production and distribution facilities	Nominal
2	Opportunities	Domestic demand	Domestic market demand	Ratio
3	Conditional factors	Global demand	International market demand	Nominal
4	Demand conditions	Supporting industries	Interindustry relationships	Nominal
4	Related and supporting industries	Market structure	Type and level of competition	Nominal
	Strategy, structure, and competition	Strategy	Industry development strategies	Nominal
5	Government role	Policy	Regulation, assistance, and training	Nominal
6	Opportunities	Market changes	Global trends and preferences	Nominal

Source: Processed data (2025)

Results and Discussions

Seaweed Production Share and Export Share in Bali Province

Seaweed production share is an important indicator in assessing a region's contribution to total national production. This indicator reflects production capacity and the sustainability of the aquaculture sector. Changes in production share indicate structural dynamics influenced by environmental and socioeconomic factors, as well as coastal development policies. Analysis of Bali's seaweed production share during the 2014–2024 period provides insight into Bali's position within the national production system and its resilience to various external pressures.

Table 3
Share of Bali Province's Seaweed Production in Indonesia

Year	Bali Production (Ton)	Indonesia Production (Ton)	Share (%)
2014	84.336	10.242.437	0,823
2015	107.209	10.608.180	1,010
2016	100.856	11.600.000	0,869
2017	59.770	9.746.045	0,613
2018	10.675	9.187.331	0,116
2019	850	8.547.212	0,0099
2020	17.145	8.445.264	0,203
2021	11.657	7.245.731	0,161
2022	11.756	7.837.856	0,150
2023	11.793	8.253.918	0,143
2024	12.489	9.853.604	0,127

Source: Processed data (2025)

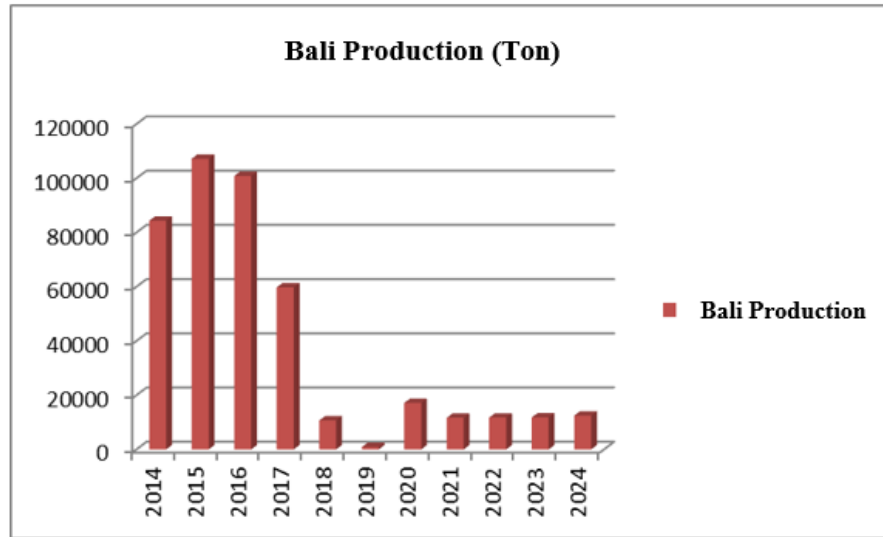


Figure 1. Bali Production Graph/Year

Bali's seaweed production share exhibited a fluctuating pattern, with a downward trend at the beginning of the observation period. 2015 recorded a peak of 1.010 percent, reflecting relatively optimal production capacity. The period from 2016 to 2019 showed a significant decline. The share reached its lowest point in 2019 at 0.0099 percent. This condition indicates Bali's weakening contribution to national production. The decline was influenced by degradation of aquatic environmental quality, rising sea temperatures, and the onset of ice-ice disease, which inhibits seaweed growth (Rimmer et al., 2021; Andréfouët et al., 2021; Windrawati et al., 2022). Pressure from the tourism sector led to a shift in labor from the cultivation sector to the service sector, reducing production capacity.

The period from 2020 to 2024 showed a recovery phase. The share value increased in 2020 to 0.203 percent. This condition is related to changes in the economic structure during the COVID-19 pandemic, which pushed the workforce back to the primary sector. The decline in tourism activity has impacted the quality of the coastal environment. Production stability began to emerge the following year, although its contribution to national production remained relatively low. Rising commodity prices and government policy support contributed to the recovery process. This situation demonstrates the potential for Bali's seaweed sector to thrive again if supported by appropriate environmental conditions and policies.

Export share is an indicator used to measure the competitiveness of a commodity in the international market. This indicator reflects a region's ability to utilize production to meet global demand. Changes in export share reflect the dynamic interaction between production, international prices, trade policies, and the efficiency of the logistics system. Analysis of Bali's seaweed export share provides insight into Bali's competitive position within the national export structure.

Table 4
Share of Bali Province's Seaweed Exports to Indonesia

Year	Bali Export (Ton)	Indonesia Export (Ton)	Share (%)
2014	3.062	118.759	2,58
2015	1.625	156.390	1,04
2016	10.690	100.972	10,59
2017	115	146.573	0,08
2018	1.014	176.481	0,57
2019	50	181.596	0,03
2020	0	168.364	0,00
2021	50.300	187.336	26,85
2022	72	206.058	0,03
2023	27.008	219.605	12,30
2024	121.121	212.551	56,98

Source: Processed data (2025)

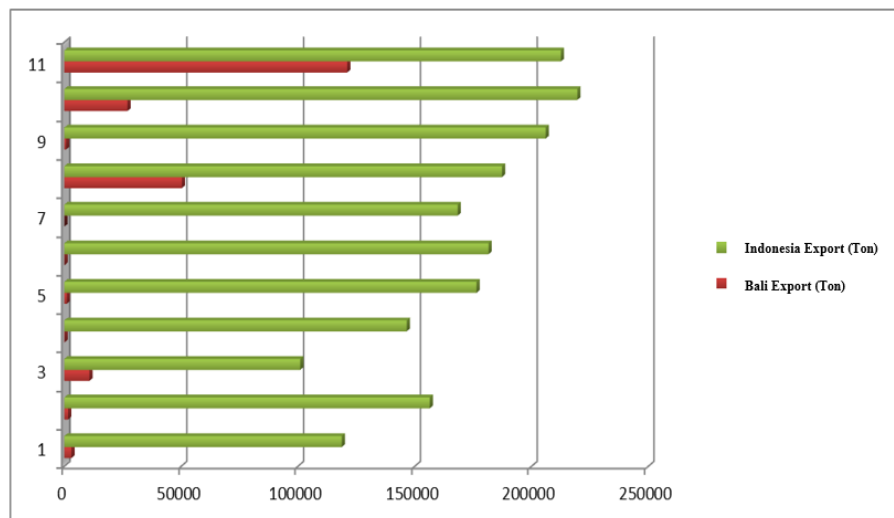


Figure 2. Comparison Chart of Seaweed Exports

Bali's seaweed export share fluctuated significantly during the observation period. In 2016, it recorded a significant increase of 10.59 percent, driven by rising global prices due to reduced supply from competing countries. The period from 2017 to 2019 showed a drastic decline, with a very small share. This reflects Bali's weak position in the national export structure. High logistics costs and distribution practices through ports outside Bali prevent some exports from being recorded as regional exports. Decreased production quality due to environmental factors also impacted export performance.

In 2020, the figure showed zero, reflecting the cessation of export activity due to the COVID-19 pandemic. Disruptions to the global supply chain, limited containers, and reduced demand from the processing industry caused exporters to halt export activities. Recovery occurred in 2021, with a share of 26.85 percent. This was influenced by the normalization of global economic activity and increased demand from major importing countries. In 2024, the figure showed a significant surge of 56.98 percent, reflecting Bali's increasing competitiveness in the international market. Driving factors include improved product quality, logistics efficiency, and increased global demand for seaweed. The high fluctuations indicate that Bali's export competitiveness is still heavily influenced by external factors, necessitating a more sustainable strengthening strategy.

Comparative and Competitive Advantages of Bali Seaweed

Analysis of the comparative and competitive advantages of Bali seaweed was carried out using Porter's Diamond Model approach, which includes conditions, demand, supporting industries, competitive structure, as well as the role of government and opportunities. Condition factors show that Bali has quite large natural resource potential with cultivation areas such as Nusa Penida and Nusa Lembongan, which have water characteristics suitable for seaweed development. Human resources are labor-intensive, with the involvement of coastal communities as the main actors, although managerial and marketing capacity is still limited. Limited capital and traditional cultivation technology mean that productivity is not yet optimal. Production and distribution infrastructure also does not fully support supply chain efficiency, which has an impact on quality and production costs.

Demand conditions indicate that there are quite large market opportunities both domestically and globally. Domestic demand is increasing along with the development of the seaweed processing industry, which requires large quantities of raw materials. Global demand comes from industrial countries such as China, South Korea, Japan, and the United States, which use seaweed as a raw material for the food, cosmetics, and pharmaceutical industries. Related and supporting industries play a role in providing seeds, production facilities, and processing of derivative products that increase added value. A market structure that tends to be oligopolistic causes farmers' bargaining position to be relatively weak, so that prices are determined more by large traders and exporters.

The government's role can be seen through cultivation development policies, capital assistance, training, and industrial downstream programs. This support contributes to increasing production capacity and strengthening competitiveness. The opportunities for future development are quite large through innovation in seaweed-based products such as bioplastics and environmentally friendly products, which have high demand in the global market.

Potential investment in the processing sector also opens up opportunities to increase added value and create jobs. The results of the analysis show that Balinese seaweed has a strong comparative advantage in terms of natural resources, while competitive advantages still require strengthening in aspects of technology, infrastructure and distribution efficiency to improve its position in the international market.

Conclusion and Suggestion

The results of this study indicate that Balinese seaweed competitiveness fluctuates, with a tendency to recover towards the end of the observation period. Its share of national production remained relatively small, with a sharp decline in 2017–2019, before recovering in 2020, reflecting adaptation to environmental pressures and changes in the economic structure. Export share demonstrated high competitiveness under certain conditions, marked by a significant surge to achieve dominance in 2024, reflecting Bali's significant potential as an export driver when supported by optimal production conditions and logistics systems. Analysis based on Porter's Diamond Model indicates that Bali's comparative advantage lies in its natural resource availability and high market demand, while its competitive advantage is limited by simple technology, an inefficient market structure, and pressures from land conversion. Strengthening competitiveness requires integrated efforts through the protection of cultivation areas, modernization of production and post-harvest technology, optimization of logistics infrastructure, acceleration of industrial downstreaming to increase added value, and strengthening farmer institutions in the supply chain. These efforts have the potential to propel Bali into a center for sustainable seaweed production and derivative industries at the national and global levels.

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