

Strategies for Developing Prospective Marine Commodities in East Flores, Indonesia

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Abstract

The sea dominates the East Flores Regency landscape, which has a sizable marine area and undoubtedly great potential for marine products. This study determines which marine commodities have the greatest development potential. 2016–2022 data on the volume of marine commodities production, the value of commodities, and confirmatory data gathered through in-person interviews with key stakeholders in the business are utilized. The foundations for a robust policy formulation are the contribution classification, static and dynamic location quotients, and location quotient classification, which are cross-referenced and elaborated by breaking down the constraints and constructing the development strategies for the commodities structured from the interviews. The study finds that skipjack, pearls, common dolphinfish, and long-jawed mackerel are the prospective commodities to be developed in the future. The development was hampered primarily by nature-related constraints, including sea weather, storms, and pandemics. The progress necessitates increased government support as well as durable, long-term targeted policies.

Keywords: marine commodities; location quotient; strategy; Indonesia

JEL classification: O13, Q22

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1. INTRODUCTION

The Province of East Nusa Tenggara (NTT) has 23 districts/cities. One of them is East Flores Regency, which is in the northern part of NTT. The East Flores Regency consists of three main islands, namely Adonara Island, Solor Island and East Flores Island, which are divided into 19 sub-districts, 229 villages and 21 sub-districts. The area of East Flores Regency is dominated by marine areas (69%) or 4,174.53 square kilometers, while the land area is only 1,812.85 square kilometers (Marine and Fisheries Office of East Flores, 2015)

By having landscape that is mostly sea area, the sea becomes one of the sources of life for the people of East Flores Regency. It also has tremendous potential in the form of natural

resources and is then used as one of the capitals for regional development of East Flores Regency, one of them is fisheries. East Flores is famous for its quality fish products, and this is not only felt by the local community but by most of the people in the province, especially the people on Timor Island (Kupang City and its surroundings). This is evident based on the marine products of East Flores Regency, which is the third regency with the most marine products (fisheries) at 15,156 tons, followed by Alor Regency at 20,026.17 tons in the first and Sikka Regency at 17,186 tons in the second (Central Statistics Office of East Nusa Tenggara 2018, 2023a).

This further strengthens the fact that the fish produced by the East Flores Sea can support not only the people of East Flores Regency but most of the people of East Nusa Tenggara (Marine and Fisheries Office of East Flores, 2015) this is in line with the findings of Paulus et al. (2023). In addition to fish, pearls are other valuable marine products of East Flores Regency. The pearl commodity is cultivated on Konga Island and the western part of Adonara Island, more precisely in Oyangbarang Village, Wotan Ulumado Sub-district. These pearls are included in the best quality pearl category, since pearls from Indonesia are included in the top five of best pearls in the world. Pearls from Indonesia are known as South Sea pearls. Pearls from the East Flores Sea are one of the contributors to Indonesian pearl commodities exported abroad (Japan, Hong Kong, and Australia). It is reasonable to conclude that the East Flores Regency has excellent potential in terms of marine products. However, in line with the study conducted by Nababan et al. (2020), the problem is that the level of utilization of this potential has not been optimal. This fact is certainly ironic, amid the vast sea waters of East Flores Regency which has abundant marine products.

The community and local government have not been able to develop marine commodities properly. One of the reasons is that the fishing community and local government have difficulty in determining which commodities are feasible and need to be developed, considering that there are so many marine commodities produced by the East Flores Sea. This issue is not specific to the East Flores Regency, as evidenced by the findings of Riyadi et al.'s (2018) study, for instance. In addition, the fishing sector is still dominated by small fleet activities, resulting in an unbalanced exploitation rate between inshore and offshore waters. In addition, once the targeted commodities have been determined, they need to identify the constraints and formulate an adequate strategy to develop the commodities.

Most of the previous studies applied tools designed to determine the right sectors or commodities to be developed but they rarely looked at the obstacles and strategies for commodity development. Those tools include contribution, location quotient (LQ), shift share (SS), scalogram, Klassen typology, revealed comparative advantage (RCA), Moran index, and regression analysis. Some used only one or two tools (see, for example, Asmiani et al. 2023, Fauzi et al. 2019, and Fahmi et al. 2021), while others used more than two tools (see, for example, Ramadhani et al. 2022, Lubis et al. 2020, and Misbah et al. 2018). The results of one or a combination of several tools are then analyzed to recommend which sectors or commodities should be prioritized in development (see, for example, Wijaya et al. 2020).

Considering that choosing the sectors or commodities alone was insufficient for policy guidance, instead of using only the commodity choice tools above, some other studies added

some methods to their studies to be able to make more detailed recommendations for development policies. Saleh et al. (2020), and Handayani & Kyswantoro (2022) added strength-weakness-opportunity-threat (SWOT) analysis to their studies. Knowing the strengths, weaknesses, opportunities, and threats in a region could provide additional guidance for development policy. Diartho et al. (2019) included a product service system checklist to assess sustainability and determine repair priorities. The findings suggested that all areas supporting the long-term growth of fisheries should be improved. However, information on detailed strategies for the development of the designated commodities had not been able to be proposed from those additional tools.

Realizing the need for a development strategy for the marine and fisheries sectors in East Flores Regency, this study combines four tools for choosing the commodities to be developed with a method to summarize the strategies for developing the commodities. The tools to choose the prospective commodities include contribution level, static location quotient (SLQ), dynamic location quotient (DLQ), and classification of SLQ and DLQ analysis, and structured interviews with key stakeholders. The formulation of the strategies to develop the chosen commodities, along with the identification of the constraints, are summarized from the structured interviews with stakeholders in the selected commodities. Thus, the novelty of this study comes mainly from the method that combines the tools for choosing the targeted commodities with the method for designing a strategy for developing them as well as identifying the constraints of the commodities.

Therefore, this study is designed to find out which marine subsector commodities have the potential to be developed into superior commodities in the East Flores Regency. The method is developed to find out how much each commodity contributes to the marine subsector, which marine commodities are prospective to be developed, the constraints in developing the commodities, and the strategies carried out to develop the main marine subsector commodities in East Flores Regency.

2. RESEARCH METHOD

2.1 Data

The methods are based on analyzing data on the industry in East Flores and East Nusa Tenggara and the findings from interviews with key stakeholders in the industry. Data on the value of marine products (rupiahs) from 2018 - 2021 which consists of skipjack, tuna, seaweed, shrimp, and other catches is obtained in the reports on Nusa Tenggara Timur Dalam Angka 2020 - 2022 from the Central Statistics Agency. Data on the volume (kilograms) of marine products from 2016 - 2022 is obtained from the East Flores Regency Maritime and Fisheries Office. These secondary data are primarily analyzed to determine the most prospective commodities to be developed in the East Flores Regency.

Primary data used in this research was obtained directly through interviews with key stakeholders in the industry. The interviews are designed to provide information necessary to construct a detailed strategy for developing the commodities suggested in from the analysis of the secondary data. In process, the constraints in the development of the commodities are also identified to produce a well-informed strategy. In order to identify the key informants,

first, the Location Quotient (LQ) are calculated to determine the primary commodities. Then, we identify key individuals involved in the production and development of these primary commodities. The selected informants were visited directly for interviews. The in-person interviews with the East Flores Regency Marine and Fisheries Office officials took place at the Marine and Fisheries Office, the head of the fishermen community in Larantuka City carried out at the Fish Auction Place (TPI) Office, Oyangbarang Village officials at the Oyangbarang Village Office, and representatives of PT Mutiara Adonara at the pearl cultivation site (operations office) of PT Mutiara Adonara were conducted on May 2023.

The questions used in this research are organized based on the following basic production function (Adetutu & Ajayi 2020):

$$Y = f(K, L, N, A) \dots\dots\dots (1)$$

where Y is output, K is physical capital, L is labor, N is natural resources, A is the level of technology. The function is then adjusted for the production in marine subsectors as:

$$q = f(k, l, n, e) \dots\dots\dots (2)$$

where q represents the output of a particular marine product during a period, k represents capital (tools, buildings, ships, roads) used in the cultivation and capture of marine subsector commodities, l represents labor (number of workers, wages) involved in the production, n represents natural resources (sea conditions or requirements required for the production), and e represents the industrial environment (competitors, buyers, and local government). This is done to obtain constraints and strategies in the development of potential and superior commodities.

The results are presented in Table 1, which outlines a series of questions that serve as the foundation for conducting interviews and a reference to determine the interview structure. The implementation of the interviews was carried out flexibly, allowing for the adaptation of questions based on the progress of the commodities being discussed and the potential relevance of additional subjects. Some questions were posed quickly, while others were explored in greater depth and supplemented with more detailed sub-questions. The interview data were obtained through direct interviews with relevant parties, and the selection of informants was based on their involvement in the management and development of these commodities.

In analyzing the results of the interview, each conversation was reviewed to ensure no information was overlooked. The information obtained was aligned with the guiding questions outlined in Table 1. Relevant answers were grouped into specific categories to facilitate analysis, such as responses related to challenges and strategies for procuring tools and government efforts in commodity development, which were categorized under aspects of capital and policy. Thematic analysis was conducted to identify variations in responses and relationships between emerging points, thereby allowing for conclusions regarding the

impact of production factors and the business environment on the success of resource management.

Specific steps were taken to maintain and test the validity of the data, including obtaining information from various informants to reduce subjective bias. During the interviews, several key points were re-confirmed with the informants to ensure the accuracy of the researcher's understanding, particularly concerning complex answers. The results of the interviews were also evaluated by trusted individuals and team members to assess the relevance and consistency of the data interpretation within the context of the research. Interview flexibility was maintained by ensuring that any adaptations of questions remained relevant to the research objectives, with additional questions tailored to align with the leading research focus.

Table 1. List of Basic Questions Summary

Questions (Tranlated into English)	Informant
Factor of Production: Capital	
- What tools and buildings are needed for the cultivation/catching?	PT Mutiara Adonara officials, chairman of the fishing community.
- How much money is spent on the tools and buildings?	
- What obstacles are faced in obtaining tools and buildings?	
- What are the strategies taken to overcome these obstacles?	
Factor of Production: Labor	
- What is the amount of labor per output required in each period?	PT Mutiara Adonara officials, chairman of the fishing community.
- What are the types of labor required? How difficult is it to find them?	
- How much is the wage earned by labor in each period?	
- What are the obstacles and strategies for obtaining workers?	
Factor of Production: Natural Resources	
- What are the sea conditions that support commodity?	PT Mutiara Adonara officials, chairman of the fishing community.
- What are the constraints to commodity cultivation/catching?	
- What strategies are used to overcome these constraints?	
Factor of Production: Business Environment	
- What has the government done to develop the commodities?	PT Mutiara Adonara officials, chairman of the fishing community, Head of the Fisheries and Maritime Office of East Flores Regency, Basrani Village officials
- Are the government's efforts enough to develop the commodities?	
- What strategies can the government implement in the future to support?	
- What are the impacts on the community from the commodities?	
- What is the marketing strategy? What is the distribution process?	
- Where do the buyers of the commodities come from?	

Questions (Tranlated into English)	Informant
- What is the selling price of the commodities?	
- What are the characteristics of buyers?	
- What is the quantity of the commodities sold in a year?	
- Who are the competitors?	
- Who are targeted as the most promising buyers in the future?	
- What are the obstacles and strategies to overcome them?	

Source: Authors

2.2 Empirical Strategy

The analysis is carried out in two steps. The first step is employing tools to determine the prospective commodities to be focused on in the development of East Flores Regency's marine subsectors. Determining the commodities to be developed is carried out through three analytical tools: analysis of the contribution level of each commodity, location quotient which consists of static location quotient analysis and dynamic location quotient analysis, and location quotient classification analysis. The second step is using the results from the structured interviews with stakeholders to identify the constraints and strategies to develop the chosen commodities.

2.2.1 Contribution Level of Commodity

The method used is the classification of commodity role criteria (Yapanto & Olilingo 2020) to determine the level of contribution level of each marine subsector commodity each year from 2016 to 2022. The classification can also identify the development of the contribution during those years. The role of each marine subsector commodity is calculated as the following:

$$K_i = \left(\frac{X_i}{Y_n} \right) \times 100\% \dots\dots\dots (3)$$

where K_i is the role of marine subsector commodity i 's production, X_i is gross regional domestic product of marine subsector commodity i , and Y_n is gross regional domestic product of all marine subsector commodities. The role of each commodity's production is then classified as 'very low', 'low', 'moderate', 'fairly high', 'high', or 'very high' as listed in Table 2. The commodity with the highest contribution level is recommended as the commodity to be developed in the region.

Table 2. Contribution Level: Classification of Marine Subsector Commodity Role Criteria

Percentage	Contribution Level
0 to 10%	Very Low
Above 10 up to 20%	Low

Percentage	Contribution Level
Above 20 up to 30%	Moderate
Above 30 up to 40%	Fairly High
Above 40 up to 50%	High
above 50%	Very High

Source: Authors

2.2.2 Static Location Quotient

Static Location Quotient measures the relative contribution of a commodity in East Flores Regency's marine subsectors when compared to the contribution of that commodity in East Nusa Tenggara Province. The calculation is made separately or static for each year without a built-in comparison with another year. The static location quotient is calculated as (Basuki & Budiarto, 2021 and Tallo et al. 2018)

$$SLQ_{if} = \frac{\frac{X_{if}}{\sum X_{if}}}{\frac{X_{in}}{\sum X_{in}}} \dots\dots\dots (4)$$

where SLQ_{if} is the static location quotient of marine subsector commodity i in East Flores Regency (f), X_{if} is the gross regional domestic product of marine subsector commodity i in East Flores Regency (f), $\sum X_{if}$ is the total gross regional domestic product of all marine subsector commodities in East Flores Regency (f), X_{in} is the gross regional domestic product of marine subsector commodity i in East Nusa Tenggara Province (n), and $\sum X_{in}$ is the total gross regional domestic product of all marine subsector commodities in East Nusa Tenggara Province (n).

2.2.3 Dynamic Location Quotient

Instead of only measuring the location quotient separately each year, DLQ measures the relative contribution in growth of a commodity in East Flores Regency's marine subsectors when compared to the contribution in growth of that commodity in East Nusa Tenggara Province. Since the calculation is based on the contribution of growth, the formula has already accommodated a built-in mechanism for comparing the contribution in one year with the previous one. The dynamic location quotient is calculated as (Basuki & Budiarto 2021 and Tallo et al. 2018)

$$DLQ_{if} = \left[\frac{(1+g_{if})}{\frac{(1+g_n)}{(1+g_{if})}} \right]^t \dots\dots\dots (5)$$

where DLQ_{if} is the dynamic location quotient of marine subsector commodity i in East Flores Regency (f), g_{if} is the rate of growth of gross regional domestic product of marine subsector commodity i in East Flores Regency (f), g_f is the average rate of growth of all marine

subsector commodities in East Flores Regency (f), g_{if} is the rate of growth of gross regional domestic product of marine subsector commodity i in East Nusa Tenggara Province (n), g_n is the average rate of growth of all marine commodities in East Nusa Tenggara Province (n), and t is the difference between the end and the beginning of the year of the data used.

2.2.4 Location Quotient Classification

The results of analysis using SLQ can be different from those using DLQ. Determining which commodity to choose becomes tricky. This difficulty can be overcome by making a classification using SLQ and DLQ simultaneously. Table 3 classifies the location quotient calculation results based on the two methods above into 'lagging', 'potential', 'leading', and 'superior'. The highest classification level is superior, namely when the SLQ and DLQ are greater than one, and conversely, the lowest level is called 'lagging' when both indicators are less than 1.

Table 3. Marine Subsector Commodity Classification Based on SLQ and DLQ

Criteria	SLQ < 1	SLQ > 1
DLQ > 1	Leading	Superior
DLQ < 1	Lagging	Potential

Source: Authors

2.2.5 The Growth of Production

The monetary value in gross regional domestic product of the commodity served as the foundation for the four prior measurements used to identify prospective commodities. Those metrics have the advantage of being able to incorporate market viewpoints into the values. But it's possible to ignore the supply side of the problem. Production-related obstacles like bad weather at sea or trouble recruiting workers during a pandemic may go unnoticed. To determine which commodities should be produced in the area, it would be helpful to have a gauge of the growth in physical production of each commodity in the maritime subsector. The growth in volume of production of each of the 15 commodities in the marine subsector is determined using data from the East Flores Marine and Fisheries Office for the years 2016 to 2022. The opposite will happen if the analysis uses, for example, location quotient based on production volume indicators (Gunawan et al. 2018 and Pratama et al. 2024). The favored commodity may be weak in terms of economic value due to price issues. This study can avoid the two problems above because both production indicators and commodity market values are utilized.

2.2.6 Constraints and Development Strategy Interviews

The next stage involves the analysis of constraints and development strategies based on interviews with stakeholders of the proposed essential commodities, which were identified from contribution level analysis, static location quotient analysis, dynamic location quotient analysis, and location quotient classification analysis. This analysis is

conducted solely using the results of descriptive qualitative interviews without involving any other analytical tools. The analysis process consists of two main stages: the first stage is the identification of prospective commodities using quantitative analytical tools to determine the most potential commodities. The second stage involves development strategies and constraint mapping, where structured interviews help identify technical barriers, environmental conditions, and resource limitations faced in the development of these commodities. The insight from the stakeholders explains more deeply the marine subsector commodities in East Flores Regency, particularly the constraints for development and the development strategy. After assessing the information in location quotients, Surya et al. (2021) similarly created an interview-based technique; however, this study was unrelated directly to marine commodities.

3. RESULTS AND DISCUSSION

3.1 Results

3.1.1 The Role of Each Marine Subsector Commodity

The top two commodities in terms of the average contribution are pearls and other marine catch, as indicated by the contribution levels in Table 4. Their average annual contributions from 2018 to 2021 were only slightly different: 26.75% and 26.76%, respectively. These two commodities were categorized as having a moderate level of contribution. Seaweed and skipjack only came in third and fourth place in this regard, contributing an average of 23.31% and 10.97% annually, respectively. Nonetheless, skipjack was the top performer in terms of the change in contribution (25.47 percentage points), followed by seaweed and other marine catch. Other marine catch can be set aside when a specific product needs to be selected, resulting in skipjack and pearls being the top two performers.

Furthermore, the contribution level of almost all marine subsector commodities in East Flores Regency varies greatly from one year to the during the study. Table 4 demonstrates that, on the one hand, the contribution level of five commodities in the maritime subsector decreased throughout that time. Miscellany was the commodity with the most decline in contribution. In 2018, this group of commodities had a contribution value of 37.67% and was classified as 'fairly high' and dropped to only 0.01% ('very low') in 2021. This was a decrease in contribution of 33.16 percentage points. Meanwhile, skipjack, seaweed, and other marine catch experienced an increase of 25.47, 9.39, and 2.95 percentage points, respectively.

Table 4. Commodity Contribution of Marine Subsector Production in East Flores Regency 2018 - 2021

Commodity	Contribution to Total Marine Subsector Production					Average Contribution (%)	Contribution Level
	2018 (%)	2019 (%)	2020 (%)	2021 (%)	Change in Contribution (Percentage Points)		
Skipjack	0.14	1.55	6	1	25.47	10.97	Low
Tuna	1.32	0.01	0.14	0.22	-1.10	0.43	Very Low
Mackerel Tuna	1.32	0.03	0.33	0.51	-0.81	0.55	Very Low
Seaweed	23.49	3.14	1	8	9.39	23.31	Moderate
Shrimp	1.72	0.00	0.00	0.00	-1.72	0.43	Very Low
Pearls	1.16	91.95	4	0.14	-1.02	26.75	Moderate
Other marine catch	37.67	2.46	7	2	2.95	26.76	Moderate
miscellany	33.17	0.86	9.24	0.01	-33.16	10.82	Low

Source: Authors

3.1.2 Superior Commodities of Marine Subsector

Table 5 shows that skipjack is the only commodity with both SLQ and DLQ greater than one. In second place with relatively high SLQ but with less than one DLQ are pearls. The SLQ and DLQ of the other commodities in the marine subsector are much lower than skipjack and pearls, and both indicators show values of less than one. Thus, these location quotient indicators, which are based on the monetary value of sales, support the idea that skipjack and pearls are the two commodities worth attention and resources for the development of marine subsector in East Flores.

Table 5. SLQ and DLQ of Marine Subsector Commodities

Commodity	SLQ	DLQ
Skipjack	4.31	57.37
Tuna	0.27	0.01
Mackerel Tuna	0.19	0.01
Seaweed	0.70	0.04

Commodity	SLQ	DLQ
Shrimp	0.29	-
Pearls	5.93	0.03
Marine catch	0.85	0.02
miscellany	0.44	0,00

Source: Authors

The relative position of each commodity in the marine subsector, in terms of their monetary value of the sales, is further examined using the classification of SLQ and DLQ shown in Table 6. Skipjack is the only commodity classified as superior, while pearls are the only commodity classified as potential. None of the commodities can be classified as leading and unfortunately other commodities in the marine subsector fall under the lagging classification. Hence, this classification confirms the conclusion from Table 5 that the resources of the East Flores marine subsector development should be focused on skipjack and pearls. Moreover, these two commodities are precisely the same as the two commodities that the contribution level analysis in the preceding section recommended. Both commodities, namely pearls and skipjack tuna, have significant development potential in East Flores Regency, as evidenced by Table 4, which shows an increase in their contribution to marine yields over four years (2018–2021). This potential is supported by a strategic production location in coastal areas with natural conditions that favor the growth of these commodities. For instance, skipjack tuna demonstrated a significant increase in contribution to marine yields from 2018 to 2021, with production reaching 2,001 tons in 2022, far surpassing other commodities, such as mackerel at 746 tons and tuna at 143 tons (Badan Pusat Statistik Nusa Tenggara Timur, 2023b). Besides its abundant production, skipjack tuna can be processed into high-value local food products and has the potential to become a leading export commodity. On the other hand, as shown in Table 4, pearls rank as the second-highest contributor after other marine catches. The high potential of pearls allows for their development through the tourism sector, such as pearl farming tourism, and as high-value local handicraft products.

Table 6. Classification of SLQ and DLQ

Creteria	SLQ < 1	SLQ > 1
DLQ > 1	Leading: -	Superior: Skipjack
DLQ < 1	Lagging: Tuna, Mackerel Tuna, Seaweed, Shrimp, Marine Catch, Miscellany	Potential: Pearls

Source: Authors

3.1.3 The Growth of Production of Each Marine Subsector Commodity

Table 7 shows that during the seven-year period from 2016 to 2022, the average yearly output increase of most marine commodities in East Flores Regency was negative. Just five commodities saw growth that was positive: cutlassfish, squid, spanish mackerel, long-jawed mackerel, and common dolphinfish. The common dolphinfish and long-jawed mackerel production expanded much faster (110.31% and 25.11% annually) than the other three commodities. Therefore, the commodities suggested in this growth in production analysis are common dolphinfish and long-jawed mackerel.

Particular attention needs to be given to the fact that some commodities rise considerably more quickly than others. Long-jawed mackerel and common dolphinfish have at least had an advantage in terms of production potential over the last seven years, even though their potential is not as high as that of commodities that were previously classified based on contribution level, SLQ, DLQ, and location quotient classification. Important insight on skipjack and pearls selected to be developed in earlier sections is also provided by Table 7. Given that these commodities' growth in production has been negative, they may pose certain production-related challenges. Other challenges that may impact the sustainability of these commodity productions include a continued decline in production, which could reduce local supply and disrupt the incomes of fishers and businesses dependent on these commodities. Additionally, this negative trend affects investment attractiveness in commodity development, as investors are often reluctant to invest in sectors with declining production prospects. The decrease in production also indicates potential environmental constraints, such as habitat degradation or climate change, which impede productivity. To ensure the sustainability of the marine sector, more effective management strategies and technologies are needed to address the factors causing this decline.

Table 7. Marine Subsector Production East Flores Regency 2017 - 2022

Commodity	Production Growth (%)						Annual Average
	2017	2018	2019	2020	2021	2022	
Baby Tuna	-0.16	-0.29	-0.25	-0.88	-0.87	24.91	-0.14
Tuna	0.38	0.64	0.02	-0.69	-0.35	0.85	-0.02
Demersal ¹	7.36	-0.89	0.55	-1.00	179.15	-0.93	-0.16
Skipjack Tuna	0.68	-0.44	-0.15	-0.54	-0.70	-0.18	-0.15
Mackerel Tuna	-0.66	1.52	-0.30	3.91	-0.90	-1.00	-0.17
Squid	-0.69	27.68	-1.00	n.a.	5.60	5.81	5.00
Mackerel Scad	-0.75	1.34	3.13	-0.75	-0.68	-0.52	-0.15
Bali Sardinella	-0.61	1.14	0.04	0.35	-0.20	-1.00	-0.17
Octopus	0.44	0.95	-0.25	-0.79	-0.52	-0.92	-0.16
Long-Jawed Mackerel	n.a.	2.03	-1.00	n.a.	-0.63	205.72	25.11 ²

Commodity	Production Growth (%)						Annual Average
	2017	2018	2019	2020	2021	2022	
Common Dolphinfinh	-1.00	n.a.	-1.00	n.a.	n.a.	n.a.	110.31
Cutlassfish	n.a.	6.19	1.61	-0.66	-0.06	-0.69	0.14 ²
Spanish Mackerel	-1.00	n.a.	0.55	-0.83	-1.00	n.a.	0.18
Halfbeak	-0.69	3.50	-1.00	n.a.	-1.00	n.a.	-0.17
Pearls	971.08	-1.00	224.25	-1.00	-0.90	0.44	-0.16

Notes:

n.a.: not available

¹ includes parrot, grouper, deho, giant trevally, semah

² 5-year average

Source: Authors

3.1.4 Constraints and Strategies for Fish Commodities Development

The three fish commodities outlined in the preceding sections—skipjack, common dolphinfish, and long-jawed mackerel—need more focus to grow the marine subsector in East Flores Regency. The findings from the interviews with the stakeholders in the industry indicate that the main constraints facing the fishermen in running their business came from technical problems related to the tools for fishing, nature, and selling price, such as shown by one of the statements in the interviews as follows.

"Based on our experience as fishermen, skipjack tuna fishing often encounters various challenges, particularly related to engine failures on pole-and-line vessels. When the boat's engine breaks down, fishermen face the choice of either returning to the home port or docking at the nearest port for repairs. This engine repair process is crucial to ensure the continued operation of the vessel, especially considering the limited availability of replacement parts while at sea." (fisherman's head).

Based on interviews, we identified the main challenges faced by fishermen as follows: a) technical issues: the main issue faced by fishermen in catching skipjack tuna is related to engine malfunctions in their fishing equipment. When the engine breaks down, there is no specific strategy to address the issue. The fishermen typically choose to dock at the nearest port to repair the engine. However, if the engine is severely damaged, the only solution is to replace the broken engine with a new one. b) natural challenges: the primary challenge faced by fishermen in catching skipjack tuna is weather, particularly storms. There is no specific strategy to overcome this challenge. Fishermen usually opt to dock at the nearest harbor and wait for the weather to improve before continuing their fishing activities.

Workers were usually not an issue. Pole and line boat owners or captains could usually easily get workers or fishermen to go to sea. Fishermen or workers came forward to the boat

owner or captain to apply for the jobs. These jobs did not require special skills. The requirements were just physically and mentally healthy workers.

In the process of catching fish, particularly the skipjacks, fishermen often experienced obstacles related to the damaged pole and line boat engine. If the problem was the engine, the fishermen had no choice but to return to their port of departure or immediately dock at the nearest port to repair the damaged engine.

The obstacles that fishermen often faced in connection with nature were weather and storms. For example, in April 2021, there was a lotus storm centered in the NTT region, and one of them was the Flores Sea. As a result, for a period of around 1–2 months, no fishing took place. To face these obstacles, the fishermen had no choice but to stay away from the sea and wait until natural conditions were friendly again and it was safe to go to sea.

There was no special strategy applied by fishermen had in selling their catch. The location for unloading the fishing boat was the place for auctioning or selling the catch. Food companies, marine catch export companies, marine catch resellers, and household consumers had been in there for a long time. The main targeted buyers were companies because the prices offered by the companies were usually higher than the prices offered by household consumers. Competitors in fishing business are fellow fishermen inside and from outside the district, including from Sikka, Lembata, Ende, Nagekeo, West Manggarai, and Kupang.

In developing strategy for the fishing business, the important role of the East Flores Regency Maritime and Fisheries Office included providing technical guidance to groups of fishermen, both small, medium, and large, especially pole and line fishermen, and providing the location for unloading and auctioning the fishermen's catch (TPI) located in Amagarapati Village, Larantuka District. The government also became a facilitator in managing the transaction between fishermen and the companies. The pole and line fishermen community were also established under the supports of the office. Furthermore, PT Tradisa Adi Pratama Putra was a fish flour company fostered by the local government in Nurri Village, Ile Bura District, designed to provide an additional alternative for fishermen to sell their catch at a competitive price.

In the future, the strategy carried out by the East Flores Regency Maritime and Fisheries Office was to modify fishing gear and supporting facilities (for example, increasing the size of pole and line vessels). Collaboration with companies engaged in the processing of fish to make new products in the form of crackers and fish oil located in Heras, Larantuka, had also been projected.

The findings above show that, for now or at least in the short term, the obstacles faced by fishermen related to technical issues, selling prices and nature will still have to occur. From the fishermen's side, this study did not find any systematic efforts to overcome these obstacles. On the other hand, efforts to overcome these obstacles from the government side, such as increasing the size of ships and developing marine product processing companies, are more of a plan that will not provide benefits soon.

3.1.5 Constraints and Strategies for Pearl Commodity Development

The major constraints in running the pearl commodity business came from natural obstacles. The second problem was related to the time required to obtain equipment and materials for production. Workers and marketing were usually not considered as main issues. Most of the labor could be supplied from the surrounding regions, such as Oyangbarang Village and villages around Wotan Ulumado sub-district. For daily workers, the foreman would decide how many workers were needed, and then coordination was carried out with the party responsible for recruiting daily workers. For contract workers, the contract would be renewed at the end of each year. Permanent workers were appointed based mainly on the length of time worked and their performance.

The marketing activities did not encounter major constraints too. The marketing process is mainly conducted in Jakarta, which is the head office of PT Adonara Mutiara in Indonesia. The marketing system was carried out using an individual marketing system for each consumer. The buyers were domestic consumers as well as overseas foreigners. They usually became regular customers and were ready to buy the pearls produced if they complied with the specified quality. The pearls produced, especially those cultivated by medium and large companies, could easily be absorbed in the market, both domestic and international.

The biggest obstacle was related to nature, especially when storms came. Other natural constraints included a broken net due to the bite of small fish. The strategy carried out by PT Mutiara Adonara during storms was to postpone operation and maintenance until the sea became stable again. Thus, the longer the storm, the greater the damage and loss it creates. The strategy to overcome a broken net was to send employee divers to repair or replace the broken net.

The number of pearls marketed each year varied greatly (Table 8), very much depending on the quantity of cultivation produced in each year. For example, in 2020 and 2021, PT Mutiara Adonara did not cultivate and harvest pearls at all due to the COVID-19 pandemic and the lotus storm disaster at the beginning of 2021. Cultivation resumed in 2022, although sales were still far from the before the pandemic level.

Table 8. PT Mutiara Adonara's Pearl Commodity Sales

Year	Volume (Kg)
2016	257.4
2017	112,130.0
2018	154.8
2019	10,323.2
2020	-
2021	-
2022	17.0

Source: PT Mutiara Adonara

During the COVID-19 pandemic, daily and contract workers were difficult to find because they chose not to work to avoid the spread of the COVID-19 virus. Consequently, the number of pearl cultivation products plummeted. Apart from labor, another constraint was the shortage of pearl oyster seeds obtained from Pare Pare and Lombok due to the absence of shipping activities. To deal with this seed problem, in 2023, the company conducted a sea survey to determine sea locations that could be used as their own nursery in the Adonara area. In approximately one month, a suitable location was finally found, which is Meko Island Beach, Pledo Village, Witiham District. Hurricane Seroja, around March to May 2022, hit almost the entire East Flores Regency area, including Adonara Island, so that pearl cultivation and harvesting were not carried out. Sea conditions did not support production activities, where pearl cultivation required stable sea conditions, clean sea conditions, calm waves and currents, and no excessive rainfall.

The constraints related to equipment and materials needed to run the pearl business came from the time needed to bring them in for operation. It took around 2–3 months to have the equipment or materials ready for operation since they had to be sent from afar, such as from Japan or Jakarta. In addition, the manufacturing of floating houses required around 3 to 4 weeks. The strategy applied by PT Mutiara Adonara was to order the equipment and materials before they ran out. When the equipment or materials were already around 70–80% utilized, an order would have to be made immediately. For floating houses, monitoring was carried out every month to ensure they were all in good condition so that repairs could be carried out immediately.

The main positive impact for the local community, especially the Oyangbarang Village, was employment opportunity, because almost 75% of the labor was from the village and the remaining local labor was from the surrounding villages in the Wotan Ulumado District. Apart from that, the company contributed 6 million rupiah per year in levy to Oyangbarang Village. The company also contributed in-kind support for the village (cement, sand, stone, etc.) in the development projects conducted in the village, such as churches, roads, and schools.

The findings above show that the major constraints in developing the pearl commodity in the marine subsector were nature-related obstacles, and the second was the time required to obtain equipment and materials for production. The company has developed a viable plan to get around the second constraint, but the issue with nature has only been partially resolved. The seed problem has been overcome by developing a nursery location on Meko Island Beach. Despite the feasibility of this new nursery for seed production must be proven for a longer period, nature will still be a challenge in the future. If a huge natural challenge, such as a storm or pandemic, comes, there are no better alternatives than ceasing production, which will be very costly to the company and the surrounding community's economy. This is exactly where the role of the government is expected to take place. Providing alternative economic activities for the surrounding villages, such as tourism, is one of the options that can be developed.

3.2 Discussion

3.2.1 Development Opportunities for Fish Commodities

The analysis of location quotients and contributions above has shown that skipjack, common dolphinfish, and long-jawed mackerel have the basis to develop as the main commodities of the marine subsectors in East Flores Regency. These results extend the findings from Alwasifah & Rahayu (2022) that the contribution of the fisheries sector in general was still low and needed strengthening to boost economic growth in Sumbawa Regency, one of the neighboring regencies of East Flores in East Nusa Tenggara Province. In developing these commodities, the biggest obstacles, particularly skipjack, are nature-related constraints. The government and the fishermen have been identified as the two key stakeholders that can contribute to the development.

With the support of the government, fishermen can increase the number of catches or production by adding pole and line vessels, modifying existing vessels to be larger, and supplying more modern fishing equipment and better engines so that they are stronger to withstand bad weather. Purnama et al. 2021 also mentioned the necessity for further government assistance for the growth of capture fisheries in Aceh Province's Pidie Regency. Efforts can also be directed at increasing the number of pole and line fishermen through training programs, so that the number of fishermen involved in the fishing business increases and catches also increase. From a larger number of catches, these fish commodities can be processed into semi-finished products or finished products such as flour, crackers, meatballs, beef jerky, or shredded meat, where this processed product has a higher selling value than sales without processing it first. This could be a typical regional dish or a souvenir from the East Flores Regency. The government can develop the skipjack fishing business into tourism by opening sea fishing tourism while enjoying the marine nature of East Flores Regency. The interest of tourists and investors can also be attracted to the East Flores Regency.

However, the study did not find any systematic efforts from the fishermen to overcome the obstacles they faced. Thus, the challenge in developing the potential of these fish commodities may come from the resistance of the community, which refuses to change its simple mindset and is unable to understand economic opportunities. The obstacle from the local government side is that the government may not be persistent enough with the development plan for these fish commodities since the limited resources may also be attracted to support other areas of life in society. For example, training programs that are only held once or twice will not be enough to support the development of commodities because what is needed is a consistent, long-term run program. This guidance on the strategy to develop the performance of marine subsectors was not found in most of previous studies (see, for example, Yapanto & Olilingo, 2020 or Tallo et al. 2018).

3.2.2 Development Opportunities for Pearl Commodities

In analyzing the marine sectors in East Nusa Tenggara, pearl commodity was never paid specific attention to its potential and development opportunities, such as in Tallo et al. (2018) or Alwasifah & Rahayu (2022). The results of the analysis in this study show that pearl commodity has the potential to be developed, and the most influential obstacles faced

by cultivators are nature-related obstacles. Currently, despite the efforts that have been made to solve the problem, nature will still be a huge challenge in the future. Alternative activities, especially when unfriendly nature hits pearl production, are needed as a buffer for the economy. For instance, the government can collaborate with local communities, village officials, and companies in the pearl tourism business. The pearls produced can be exhibited to the public or promoted by a pearl jewelry business. The pearls produced do not have to be exported outside the region but sold in the form of jewelry to domestic consumers. A pearl-based tourism industry can be initiated to attract enthusiasts, tourists, and consumers to support the local economy.

In addition, the government can be involved in solving the challenges to increase the amount of pearl cultivation production by expanding the sea area used for cultivating pearl seeds. One of the challenges was that the proposal to expand the sea area for cultivation was rejected by neighboring villages. The rejection was on the grounds that the fees offered were insufficient and the management of pearl cultivation company was a foreign-owned company.

4. CONCLUSIONS

The huge potential of the marine subsector in East Flores Regency requires an appropriate development strategy. However, the limited resources of the government and the community will eventually lead to choices about the priority commodities or activities to be developed. Although studies on superior commodities have been conducted in many regions of Indonesia, they are usually based on choosing the superior commodity alone. This study uses two approaches at once, namely location quotient combined with information gathering through structured interviews with stakeholders. The information from stakeholders is to confirm the accuracy of the location quotient results and, at the same time, elaborate on constraints and strategies that can be developed in the future. This study goes beyond concluding the superior commodity or sector but also provides more accurate recommendations on the superior sector and details of its constraints and development strategies. The developed strategies may even be more thorough than those developed in earlier research using SWOT, as Nurlina et al. (2023) or Puspitaningrum & Sudrajat (2021).

The findings show that four commodities in the marine subsector in East Flores Regency have the most potential to be developed in the future: skipjack, pearls, common dolphinfish, and long-jawed mackerel. The main constraint in developing the commodities were nature-related obstacles, such as storms, hurricanes, and pandemics. In facing these natural obstacles, the fishermen and pearl cultivators did not have an adequate strategy that could fully overcome the problem. The government has also made considerable efforts to assist in overcoming the obstacles, and the policies have to some extent prevented the stakeholders from experiencing the worst negative impacts of the obstacles. However, more assistance as well as persistent and longer-term oriented policies from the government are needed for the development of the commodities. Finally, a more thorough feasibility study on each project to develop these commodities is necessary to ascertain an efficient and effective spending of resources from the government as well as from the community.

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