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Analysis of Demand and Competition for Indonesia's Eel in the International Market

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Abstract. Indonesia is one of the main exporters of eels in the international market. Over the past few years, Indonesia has experienced a decrease in eel exports, despite a rise in world demand. This has triggered fierce competition between Indonesia and other exporting countries. This research aims to identify the demand and market competition for Indonesian eels in the international market. The analysis method used is the Almost Ideal Demand System (AIDS) Model. The data used is secondary data from Indonesia, China, Malaysia, the United States, India, Denmark, and the Netherlands in the last 11 years (2012 - 2023). The results of this research show that there is tight competition between Indonesia, China, India, and the United States in the international market. Meanwhile, the relationship between Indonesia's frozen eels and frozen eels from Malaysia, Denmark, and the Netherlands tends not to compete in the international market. Frozen eel from Indonesia is a normal good, so when the price increases, it will cause a decrease in demand. Frozen eel from Indonesia is an inelastic commodity with the lowest elasticity value among other major exporters, so this can be an opportunity for Indonesia to determine the desired price. Overall, Indonesia is the third-largest exporting country that benefits the most when there is an increase in frozen eel export expenditure in the international market.

Keywords: AIDS Model; eels; export; Indonesia; international trade

INTRODUCTION

Indonesia is one of the highest and most fish-producing countries in the world. Indonesia is located in the middle of the Indo-Pacific region, which makes its waters highly biodiverse (Tsukamoto et al., 2023). Based on FAO (2018) data, Indonesia is the second largest fish-catching country in the world after China, with a contribution of 8% to the total global fish catch. This reflects Indonesia's important role in meeting the world's food needs, especially in the fisheries sector.

One of the fish species farmed in Indonesia is the eel. There are at least 19 species of eel in the world and 9 of them are found in Indonesia, namely *Anguilla bicolor bicolor*, *Anguilla bicolor pacifica*, *Anguilla nebulosa nebulosa*, *Anguilla marmorata*, *Anguilla celebensis*, *Anguilla ancentralis*, *Anguilla interioris*, *Anguilla obscura*, and *Anguilla borneensis* (Muthmainnah et al., 2020). Eel is one of the fish species with high economic value, the price of eels at the consumer level ranges from IDR 130,000 - 300,000 / kg (Aulia et al., 2019). Eels has a high price because of its good nutritional content and also because of its complex life cycle (Saleh et al., 2022). However, because the level of local utilization of eels is still low, the domestic consumption of eels is still very low (R. E. Aulia et al., 2020). Therefore, most of Indonesia's eel production is exported abroad.

Indonesian eels are marketed in the international market in three types of products, namely live eels, fresh/chilled eels and frozen eels. The type of eel with the highest proportion exported from Indonesia to international markets is frozen eel, which accounts for 87% of total eel exports to international markets (**Figure 1**). Frozen eels exported to international markets do not include fillets or other derivative products.

Based on the International Trade Centre (2024), Indonesia is the world's main exporting country of frozen eel, with the total value of eel exports to the international market reaching US$11.8 million in 2022. Indonesia controls about 29% share of the global frozen eels market, with total exports

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reaching 6,540.17 tons in 2022. The destination countries for Indonesian eel exports are China, Hong Kong, and other Asian countries (**Figure 2**). The main destination country for Indonesian eel exports is China, with export values reaching US$11 million and controlling 94% of Indonesian eel exports to the international market as a whole.

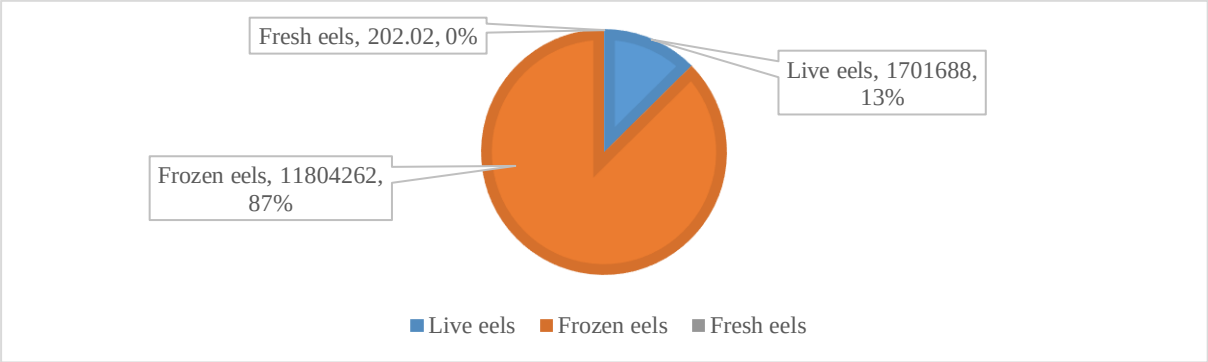

Figure 1. Proportion of Indonesian eel exports to the international market in 2022 (International Trade Centre, 2024)

Although Indonesia is one of the main exporters of eels in the international market, the reality is that Indonesia has not been able to control half of the frozen eels market in international trade. Competition among countries exporting frozen eel in the international market is fierce, as shown by the fluctuating share of Indonesia in the international market (**Table 1**). Over time, the share of other major exporting countries, such as China, has increased. The share value of other countries outside the major exporting countries (ROW) is also increasing, indicating that more countries are involved and the value of other exporting countries in the eel trade in the international market is increasing.

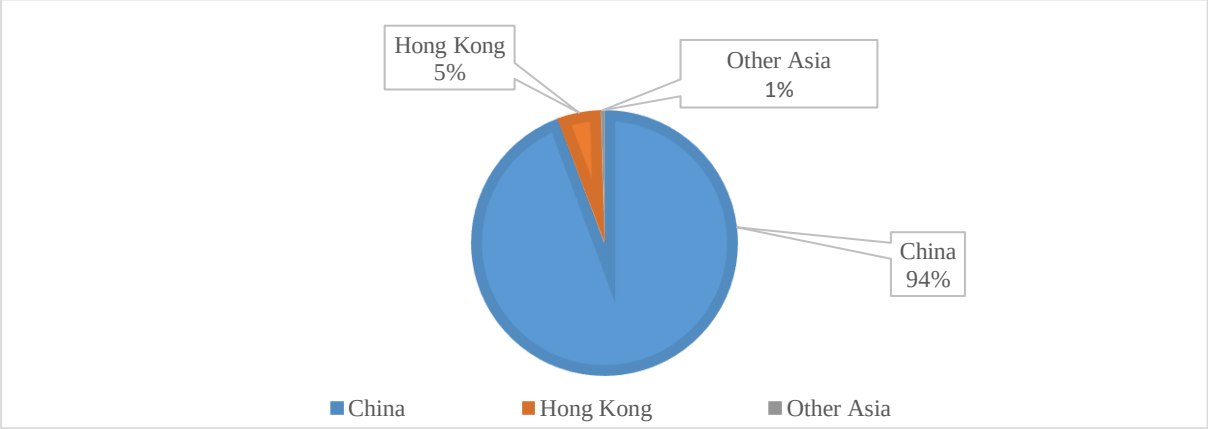

Figure 2. Destination markets for Indonesian eel exports in 2022 (International Trade Centre, 2024)

Currently, eel production is intensive in several regions in Indonesia, such as East Java, Central Java, West Java, South Sulawesi, and Central Sulawesi. However, to date, the application of existing culture technology in these areas in Indonesia is still small-scale and conventional and is still limited to the rearing stage to produce elvers, as well as the enlarging stage to produce consumption-size eels, which sometimes do not meet the specifications for export (Hadie et al., 2021). This is in stark contrast to the technology that has been implemented in other eel-producing countries, such as Japan and China, where the latest technology has been adopted and has contributed to enhancing eel productivity (Ahmed & Turchini, 2021; Miyanishi & Nagano, 2022).

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In terms of demand, it can be seen that there has been a trend of increasing world demand for frozen eel since 2018, and is projected to increase over time, even though the last few years have experienced a decline (**Figure 3**). This can be a great opportunity for Indonesia as the main exporter of eel in the world. This is supported by conditions where there are export restrictions on several types of eels, such as eels from the United States, Japan, and Europe (Nijman & Stein, 2022; Shiraishi, 2024). However, at the same time, it will be a challenge for Indonesia to increase its productivity to meet the increasing global demand under sub-optimal domestic eel farming conditions.

Table 1. Share value of frozen eel exporting countries in the international market

Year	Share value of major exporters of frozen eel in the international market						
2018	PER	IDN	CHN	USA	IND	MYS	ROW
	23%	20%	12%	11%	8%	5%	21%
2019	IDN	USA	CHN	PER	IND	MYS	ROW
	27%	13%	13%	9%	8%	7%	22%
2020	IDN	MYS	CHN	IND	NZL	PAK	ROW
	37%	11%	10%	8%	5%	5%	24%
2021	IDN	CHN	MYS	IND	DNK	PAK	ROW
	24%	15%	15%	7%	6%	5%	28%
2022	IDN	CHN	MYS	PAK	IND	DNK	ROW
	29%	24%	7%	7%	5%	4%	24%

Source: Data processed from International Trade Centre (2024)
Note: IDN = Indonesia, PER = Peru, CHN = China, USA = United States of America, MYS = Malaysia, NZL = New Zealand, PAK = Pakistan, DNK = Denmark, ROW = *Rest of the world*

The decline in demand for frozen eel in the international market (2021 - 2023) is thought to be related to an increase in the average price of major exporters that dominate the international market. Increased prices can affect people's purchasing power, so of course it will have an impact on demand itself. However, price changes do not always significantly impact changes in demand, so it can be assumed that various other factors affect the demand for frozen eels, especially Indonesian frozen eels in the international market.

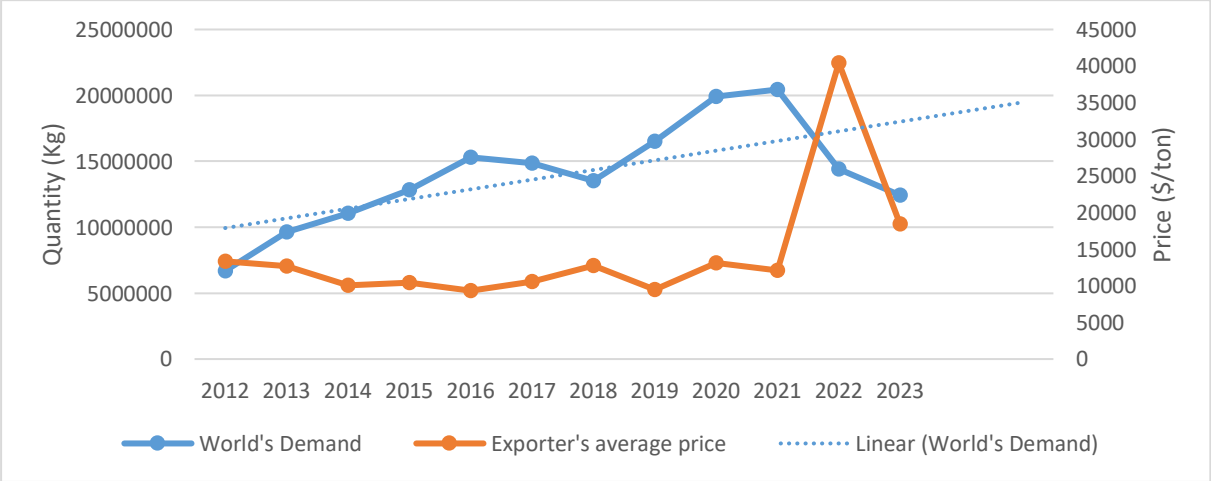

Figure 3. Trends in demand for frozen eel in the world from 2012 – 2022 (*Source:* International Trade Centre (2024))

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Based on previous research, it is known that the majority of eel farming still depends on catching seeds in nature, so the life expectancy is quite low (Aulia et al., 2019). In contrast, Japan has developed various technologies such as induced reproduction techniques, biofilters, and phenotypic plasticity analysis to increase domestic eel production (Miyanishi & Nagano, 2022). Therefore, this is one of the obstacles for Indonesia to meet the global demand for eel. In the future, it will also be a challenge for Indonesia to maintain its position as an exporter that dominates the global frozen eel market.

So far, there is no research that discusses demand analysis and market competition for Indonesian eel in the international market. Analysis related to demand and market competition for Indonesian eel in the international market can basically be the first step to identify the competition that occurs among eel exporting countries in the world. Based on the previous description, the purpose of this study is to identify the demand and market competition for Indonesian eel in the international market.

METHODS

The research approach adopted in this study is quantitative, with a secondary data set as the primary source of analysis. The following section provides a detailed elaboration of the research methodology employed:

Data

The data used in this study is secondary data sourced from Trade Map. The HS code used is 030326 "Frozen eels". The data used is in the form of monthly time series data with a time span of 2012 - 2023. The data used in this study are export value (US$) and export quantity (kg). The countries used as a comparison for the Indonesian market are China, India, Malaysia, Denmark, the United States of America, and the Netherlands; if the total value of export is accumulated, they can control> 70% of the frozen eels trade in the international market.

The method used in this research is quantitative analysis using the Almost Ideal Demand System (AIDS) model. The AIDS model is a model initiated by Deaton & Muellbauer (1980). The AIDS model is popularly used to determine the demand system because the model is flexible to use (Gostkowski, 2018). As science and research develop, the AIDS model is not only used to analyze demand but also to identify the level of country competition in international trade (Pinto et al., 2022). The AIDS model used in this study is shown in Equation 1.

$$w_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \log P_j + \beta_i \log\left(\frac{x}{p^*}\right) \quad \text{.....1)}$$

Note:
w = export share of the i-th exporting country in the world
P = price of origin of the exporting country
x = total world import value
p* = geometric price index stone = ∑wi.pi

According to the theory of demand systems, several conditions must be met, specifically shown in Equation 2, Equation 3, and Equation 4:

Adding up

$$\sum_{i=1}^{n} \propto_i = 1, \quad \sum_{i=1}^{n} \gamma_{ij} = 0, \quad \sum_{i=1}^{n} \beta_i = 0 \quad \text{...2)}$$

Homogeity

$$\sum_{i=1}^{n} \gamma_{ij} = 0 \quad \text{.....3)}$$

Simmetry

$$\gamma_{ij} = \gamma_{ji} \quad \text{.....4)}$$

Furthermore, based on the estimation results of the AIDS model, the elasticity of own price (Equation 5), cross-price (Equation 6), and expenditure (Equation 7) will be calculated. The mathematical equation used is:

Cross price elasticity (*compensated*)

$$e^*_{ij} = -\delta_{ij} + \frac{\hat{\gamma}_{ij}}{\bar{w}_i} + \bar{w}_j \quad \text{.....5)}$$

Own price elasticity (*uncompensated*)

$$e_{ij} = -\delta_{ij} + \frac{\hat{\gamma}_{ij}}{\bar{w}_i} - \hat{\beta}_i\left(\frac{\bar{w}_j}{\bar{w}_i}\right) \quad \text{.....6)}$$

Expenditure elasticity

$$\eta_i = 1 + \frac{\hat{\beta}_i}{\bar{w}_i} \quad \text{.....7)}$$

Where: $\hat{\gamma}_{ij}$= frozen eel's price parameter in market-j; $\hat{\beta}_i$ = total value of frozen eels exports in market-j; wi = share of frozen eel from Indonesia; wj = share of frozen eel other countries; δ is the

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kronecker delta where δ = 1 for i=j and δ = 0 for i≠j

RESULTS AND DISCUSSION

Market Share of Eel Exporting Countries in the International Market

The world demand for frozen eel is mainly dominated by countries in the East Asian region. East Asian countries such as Japan, China, Korea, and Hong Kong are the main importers of frozen eel in the international market. This is due to the background of the food culture of these countries, which makes eel as a basic ingredient of various food menus to traditional foods (Shiraishi & Crook, 2015). Besides being a basic food ingredient, eel is also a basic ingredient of pharmaceutical products, especially traditional medicine products (Righton et al., 2014).

Indonesia is one of the major exporters of eels in the international market. In fact, Indonesia is the exporter with the largest export value in the international market from 2018 to 2022 (International Trade Centre, 2024). However, Indonesia is not the only country with a large market share in the international market. The market shares of the largest exporting countries of frozen eel in the international market can be seen in **Table 2**.

Over the past decade, there are 10 countries that hold a dominant position in the global frozen eel export market. China has led the market in the last 10 years with 25% market share, marking its dominance. On the other hand, Indonesia holds the second-largest share with 20% share, showing its potential as a strong competitor in the International market. The distance between the market share of China and Indonesia with other exporting countries is quite wide because other exporting countries can only control <10% of the average market share of eel exports in the world. This shows that based on the average market share, Indonesia is still less competitive with China, but still has a considerable opportunity to compete.

Table 2. Market share of frozen eel exporting countries in the international market (2012 – 2023)

Country	Average Market Share
China	25%
Indonesia	20%
Malaysia	7%
United States of America	7%
India	7%
Denmark	5%
New Zealand	5%
Netherlands	3%
Germany	2%
Sweden	2%
Rest of the World (ROW)	18%

Source: Data processed from International Trade Centre (2024)

Although China is the country with the largest market share of frozen eel exports in the international market overall, China's market share has decreased significantly since 2016 (**Figure 4**). This can be seen from the development of Indonesia's market share, which has tended to increase since 2018, replacing China's position as the country with the largest market share of frozen eel exports in the international market. This provides a good opportunity for other competing countries, including Indonesia.

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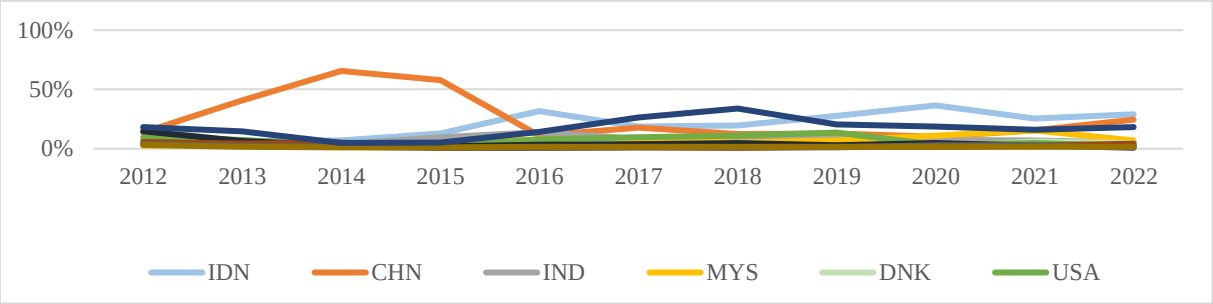

Note: Note: IDN = Indonesia, CHN = China, IND = India, MYS = Malaysia, DNK = Denmark, USA = United States of America

Figure 4. Average market share development of eel exporters in the international market (*Source: Data processed from International Trade Centre (2024))*

AIDS Model Analysis Results

The results of the AIDS model analysis show that the equations of the 7 main countries of frozen eel exporters in the international market identified are considered significant. **Table 3** shows that the AIDS model equations for all countries are considered significant at the 1% level because the p-value is <0.001. The significance of these identified variables will show that the independent variables together can explain the dependent variable, namely the variable share of exporting countries in the international market (Pinto et al., 2022).

Table 3. Results of AIDS model analysis of frozen eel export demand share in the international market

Equation	*R-sq*	*p-value*
Indonesia	0,2470	0,0000
China	0,4255	0,0000
India	0,1383	0,0004
Malaysia	0,1135	0,0000
Denmark	0,1164	0,0032
United States of America	0,2249	0,0000
Netherlands	0,2049	0,0000

Elasticity Estimation Results

The results of the elasticity estimation will illustrate the level of competition and the level of demand for frozen eel products in the international market. The estimation results of cross-price elasticity can be seen in **Table 4**, while the estimation results of own price elasticity and expenditure elasticity can be seen in **Table 5**.

The estimation results of cross-price elasticity will illustrate the product relationship of exporting countries and identify how much demand will increase or decrease if there is a change in prices in other frozen eels exporting countries (Dewanti et al., 2020). The cross-price elasticity of Indonesian and Chinese eels is positive (**Table 4**), meaning frozen eels from Indonesia and China are substitutes (Mankiw, 2018). This indicates that there is competition between frozen eels from Indonesia and China in the international market. If there is a 1 percent increase in the price of Chinese frozen eel, ceteris paribus, it will increase the demand for frozen eel from Indonesia by 0.072 percent. On the other hand, if there is an increase in the price of frozen eel from Indonesia by 1 percent, ceteris paribus, it will reduce the demand for frozen eel from China by 0.056 percent in the International Market.

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Table 4. Cross-price elasticities of the main countries exporting frozen eel on the international market

Country	Indonesia	China	India	Malaysia	Denmark	USA	Netherlands
Indonesia	-	0.072	0.166	-0.053	-0.132	0.047	-0.003
China	0.056	-	0.006	0.005	0.080	0.136	0.069
India	0.514	0.024	-	-0.160	-0.160	-0.091	0.043
Malaysia	-0.152	0.019	-0.149	-	-0.034	0.292	0.602
Denmark	-0.540	0.424	-0.211	-0.049	-	0.010	0.040
USA	0.142	0.534	-0.089	0.308	0.008	-	0.230
Netherlands	-0.017	0.589	0.091	1.378	0.065	0.500	-

The relationship between Indonesian and Indian frozen eels is substitutive. This is because the value is >0 or positive (**Table 4**), so the relationship is mutually competitive. If an increase of 1 percent occurs in the price of Indian frozen eel, ceteris paribus, there will be an increase in demand for Indonesian frozen eel by 0.166 percent. On the other hand, if there is a 1 percent increase in the price of frozen Indonesian eel, ceteris paribus, it will increase the demand for Indian frozen eel by 0.514 percent in the International Market.

The relationship between Indonesian frozen eel and the United States is also substitutable. The same thing was also found by Natalia et al. (2024) and Surbakti et al. (2024), that states the positive value of the calculation reflects the relationship between the two products being substitutes. This is because the results of the calculation of cross-elasticity is >0 or positive (**Table 4**), so the relationship between the two tends to experience competition. A 1 percent increase in the price of the USA's frozen eel, ceteris paribus, will increase the demand for Indonesian frozen eel by 0.047 percent. On the other hand, if there is a 1 percent increase in the price of Indonesian eel, ceteris paribus, there will be an increase in demand for the USA's frozen eel by 0.142 percent in the International Market.

The relationship between Indonesia's frozen eel and Malaysia's frozen eel is complementary, so there tends to be no competition between the two countries. This is known from the elasticity value, which is <0 or negative (Mankiw, 2018). The same thing was also found by Nurzakiah et al. (2024), that states the negative value of the calculation reflects the relationship between the two products are complementary. If there is an increase in the price of Malaysian frozen eel by 1 percent, ceteris paribus, the demand for Indonesian frozen eel will decrease by 0.053 percent in the International Market. Meanwhile, if there is an increase in the price of Indonesian frozen eel by 1 percent, the demand for Malaysian frozen eel will decrease by 0.514 percent in the International Market.

The relationship between Indonesian frozen eel and Denmark's frozen eel is also complementary, as the elasticity value is <0 (**Table 4**). Thus, the relationship between Denmark and Indonesia in terms of frozen eel trade in the international market tends not to compete with each other. Therefore, if there is an increase in the price of Denmark frozen eel by 1 percent, ceteris paribus, there will be a decrease in the demand for Indonesian frozen eel by 0.132 percent. Meanwhile, if there is an increase in the price of Indonesian frozen eel by 1 percent, ceteris paribus, it will decrease the demand for Denmark frozen eel in the International Market by 0.540 percent.

The relationship between the Indonesian frozen eel and the Netherlands frozen eel is complementary because the elasticity value is <0 (**Table 4**). Therefore, the relationship between the Netherlands and Indonesia tends not to compete in the international market. An increase of 1 percent in the price of the Netherlands frozen eel, ceteris paribus, will decrease the demand for Indonesian frozen eel by 0.003 percent in the international market. Meanwhile, if there is an increase in the price of frozen eel from Indonesia by 1

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percent, ceteris paribus, there will be a decrease in demand for frozen eel from the Netherlands by 0.017 percent.

Table 5. Own price elasticity and expenditure elasticity of major countries exporting frozen eel in the international market

Country	Own Price Elasticity	Expenditure Elasticity
Indonesia	-0.751	0.682
China	-1.549	3.425
India	-1.136	3.441
Malaysia	-0.938	0.308
Denmark	-0.869	-0.868
United States of America	-0.971	-0.378
Netherlands	-1.002	0.221

Based on the results of the calculation of the price elasticity of frozen eel from the ten main exporting countries in the international market, namely Indonesia, China, India, Malaysia, Denmark, the United States of America, and the Netherlands have negative values. This corresponds to the basic theory of demand, namely when there is an increase in the price of a good, it will cause a decrease in the demand for that good (Mankiw, 2018). So if there is an increase in the price of frozen eel from the main eel exporting countries, it will have an impact on reducing the amount of demand in the international market.

Based on the results of the calculation of own price elasticity (**Table 5**), it is known that frozen eel from China, India, and the Netherlands has elastic traits, which means that it is very sensitive to price changes. This can be seen from the value of its own price elasticity, which has an absolute value ≥ 1 (Mankiw, 2018). In this case, China is the most sensitive exporter to price changes in the international market. If the price of frozen eel from China increases by 1 percent, ceteris paribus, the demand for frozen eel from China in the international market decreases by 1.549 percent. The same thing happens in India, if there is a 1 percent increase in the price of frozen eel from India, ceteris paribus, there will be a 1.136 percent decrease in the demand for frozen eel from India in the international market. Similarly, for the Netherlands, if there is a 1 percent increase in the price of Netherlands frozen eel, ceteris paribus, there will be a 1.002 percent decrease in the demand for Netherlands frozen eel in the International Market.

In contrast to China and India, other major frozen eel exporting countries such as Indonesia, Malaysia, Denmark, the United States, and the Netherlands, have inelastic or relatively insensitive characteristics. This can be seen from the value of their own price elasticity, which has an absolute value <1, so that changes in the quantity of demand tend to be smaller than changes in price (Mankiw, 2018). According to Ximenes et al. (2022), in the theory of demand, the purchasing behavior of consumers in response to price sensitivity will affect the quantity demanded. There are levels of consumer importance in the market: some consumers are more concerned about quality than price, and some are more concerned about price than quality. Marketing, advertising, and promotion are strategies to shift consumer focus from price to other factors such as product offerings, benefits, and other values (Salvatore, 2019)

In this case, Indonesia is the least sensitive to price changes in the international market. If there is a 1 percent increase in the price of frozen eel from Indonesia, ceteris paribus, the decrease in demand in the international market is 0.751 percent. This tends to be smaller than other exporting countries. This can be a good opportunity for Indonesia because it means that Indonesia as an exporter can set prices. After all, international market demand tends to be

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insensitive to prices. Importing countries of frozen eel from Indonesia tend not to consider price changes and will continue to buy despite price increases.

The same thing happens in Malaysia, if there is a 1 percent increase in the price of Malaysian frozen eel, ceteris paribus, it will reduce demand in the international market by 0.938 percent. Meanwhile, if there is a 1 percent increase in the price of frozen eel from Denmark, ceteris paribus, it will reduce demand by 0.869 percent. If there is a 1 percent increase in the price of frozen eel from the United States, ceteris paribus, it will reduce demand by 0.971 percent.

Furthermore, the results of the expenditure elasticity analysis in **Table 5** show that there are differences in the classification of frozen eel products in the main countries exporting frozen eel to the international market. Frozen eels from Indonesia, China, India, Malaysia, and the Netherlands are classified as normal goods. This can be seen from the elasticity value of exporters' expenditure > 0 or positive (Harianto et al., 2022). Thus, if there is an increase in the expenditure of frozen eel importing countries, it will cause an increase in the amount of demand for frozen eel.

The value of expenditure elasticity of frozen eel in China and India is more than one (expenditure elastic), while the value of Indonesia, Malaysia, and the Netherlands is less than one (expenditure inelastic) (Aulia et al., 2019). Thus, if the importing country increases its expenditure on importing frozen eel, both China and India will benefit. If there is a 1 percent increase in export expenditure on frozen eel in the international market, ceteris paribus, it will lead to a 3.425 percent increase in export demand for frozen eel from China. Meanwhile, if there is a 1 percent increase in export expenditure of frozen eels in the international market, ceteris paribus, it will cause an increase in export demand for frozen eels from India by 3.441 percent.

Furthermore, Indonesia is the third country with the highest expenditure elasticity value among other exporting countries. This indicates that Indonesia will be the third most favored country if there is an increase in expenditure to import frozen eel in the international market. Ceteris paribus, if there is a 1 percent increase in expenditure to export frozen eels in the international market, it will cause an increase in demand for frozen eel exports from Indonesia by 0.682 percent. Meanwhile, if there is a 1 percent increase in expenditure to export frozen eel in the international market, ceteris paribus, it will cause an increase in export demand for frozen eel from the Netherlands by 0.221 percent and Malaysia by 0.308 percent.

In contrast to other exporting countries, the results of the expenditure elasticity analysis for Denmark and the United States show that frozen eel from these countries is classified as an inferior good. This is indicated by the value of the expenditure elasticity, which is <0 or negative (Harianto et al., 2022). If there is an increase in export expenditure on frozen eel, it will reduce the amount of demand for frozen eel in the exporting country. Differences in the type of goods can be affected by differences in preferences or tastes, because basically what most determines demand is the taste of consumers (Mankiw, 2018; Pindyck & Rubinfeld, 2018). In this case, each eel exporting country exports different eel species, which can lead to preferences for eel species (Righton et al., 2014).

If there is a 1 percent increase in export expenditures for frozen eels in the international market, ceteris paribus, it will cause a 0.868 percent decrease in export demand for frozen eels from Denmark. Similarly, if there is a 1 percent increase in export expenditure on frozen eels in the international market, ceteris paribus, it will cause a 0.378 percent decrease in export demand for frozen eels from the United States.

CONCLUSION

Indonesia has the second largest market share of frozen eel exports in the international

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market, after China. Indonesia's frozen eels tend to compete with frozen eels from China, India and the United States. While the relationship between Indonesian frozen eel with frozen eel from Malaysia, Denmark, and the Netherlands, tends not to compete. Therefore, Indonesia should cooperate with Malaysia, Denmark, and the Netherlands, to take advantage of complementary market conditions. Cooperation can take the form of policies that can support price stabilization or form export alliances that can improve Indonesia's bargaining power in export destination countries. Frozen eel from Indonesia is an inelastic good with the lowest elasticity value, so this can be an opportunity for Indonesia to set the price as desired. This also needs to be supported by improving and maintaining the quality and quantity of Indonesian frozen eel. Indonesia must be aware of competing countries such as China, India and the United States, and catch up with Indonesia, especially in terms of technology.

The application of technology from the production side such as Artificial Reproduction Techniques, Larval Rearing Systems, Recirculating Aquaculture Systems (RAS), Genetic Selection and Breeding Programs can help the eel reproduction system to be more productive and no longer depend on natural catch seeds. Technological improvements on the marketing side are also needed so that Indonesia's cold-chain export infrastructure can excel, so that the quality of exported frozen eel fish is also maintained. Overall, Indonesia is the third most advantaged exporting country when there is an increase in export expenditure of frozen eel in the international market. Indonesia must be wary of competing countries such as China, India and the United States, and catch up with them in terms of technology. Frozen eel exports can be diversified in the form of fresh and live or processed eel, to increase its value. However, this needs to be supported by technology upgrades that can support this. In addition, it also needs to be supported by government programs in the form of downstream industries for processed eel products.

REFERENCES

Ahmed, N., & Turchini, G. M. (2021). Recirculating aquaculture systems (RAS): Environmental solution and climate change adaptation. *Journal of Cleaner Production*, *297*, 126604. https://doi.org/10.1016/j.jclepro.2021.126604

Aulia, R. E., Kusmiati, A., & Hapsari, T. D. (2020). Analisis Pendapatan Dan Keberlanjutan Usaha Budidaya Ikan Sidat Di Desa Kraton Kecamatan Yosowilangun Kabupaten Lumajang. *SEPA: Jurnal Sosial Ekonomi Pertanian Dan Agribisnis*, *16*(2), 99. https://doi.org/10.20961/sepa.v16i2.27350

Aulia, R. U., Harianto, H., & Novianti, T. (2019). Analisis Posisi Pasar Indonesia Pada Pasar Refined Palm Oil (RPO) Di Negara Importir. *Jurnal Penelitian Kelapa Sawit*, *27*(1), 1–12. https://doi.org/10.22302/iopri.jur.jpks.v27i1.56

Deaton, A., & Muellbauer, J. (1980). An Almost Ideal Demand System. *The American Economic Review*, *70*(3), 312–326. https://doi.org/10.3909/rind0249a

Dewanti, R. P., Harianto, H., & Nurmalina, R. (2020). Analisis Permintaan Dan Persaingan Minyak Kelapa (Crude Coconut Oil) Indonesia Di Pasar Internasional. *Jurnal Agribisnis Indonesia*, *8*(1), 69–82. https://doi.org/10.29244/jai.2020.8.1.69-82

FAO. (2018). *State of Fisheries and Aquaculture*.

Gostkowski, M. (2018). Elasticity of Consumer Demand: Estimation Using a Quadratic Almost Ideal Demand System. *Econometrics*, *22*(1), 68–78. https://doi.org/10.15611/eada.2018.1.05

e-ISSN 2655-853X
https://doi.org/10.37637/ab.v8i2.2048

Hadie, L. E., Kusnendar, E., & Kusdiarti. (2021). Kajian dan Implikasi Kebijakan Pengelolaan Budidaya Ikan Sidat (Anguilla bicolor). *Jurnal Kebijakan Perikanan Indonesia*, *13*(2), 71–84.

Harianto, H., Rifin, A., & Rosiana, N. (2022). *Ekonomi Manajerial*. IPB Press.

International Trade Centre. (2024). *Trade Map Frozen Eels "Anguilla spp." Export*.

Mankiw, N. G. (2018). Principles of Microeconomics. In *Cengage Learning* (8th ed.). Cengage Learning.

Miyanishi, H., & Nagano, N. (2022). Reproductive farming technology in Japanese eel and chub mackerel. *Aquaculture and Fisheries*, *7*(5), 595–600. https://doi.org/10.1016/j.aaf.2022.03.003

Muthmainnah, D., Suryati, N. K., Pamungkas, Y. P., & Mulyani, Y. S. (2020). Western Region of Indonesia : the Nucleus of Anguillid Eel Fisheries and Trade. *Fish for the People*, *18*(2), 37–42. http://hdl.handle.net/20.500.12066/6562

Natalia, E., Simangunsong, B., & Manurung, E. G. T. (2024). Indonesia's Pulp Export Performance In the China Market: An Analysis Using Almost Ideal Demand System Approach. *Agro Bali : Agricultural Journal*, *7*(1), 92–103. https://doi.org/10.37637/ab.v7i1.1628

Nijman, V., & Stein, F. M. (2022). Meta-analyses of molecular seafood studies identify the global distribution of legal and illegal trade in CITES-regulated European eels: Distribution of trade in European eels. *Current Research in Food Science*, *5*(December 2021), 191–195. https://doi.org/10.1016/j.crfs.2022.01.009

Nurzakiah, S., Rifin, A., & Nurmalina, R. (2024). Posisi Pasar Karet Indonesia di Pasar Internasional. *Forum Agribisnis*, *14*(2), 166–175. https://doi.org/https://doi.org/10.29244/fagb.14.2.166-175

Pindyck, R., & Rubinfeld, D. (2018). Microeconomics. In *Pearson Education Limited*.

Pinto, J. da S., Suharno, S., & Rifin, A. (2022). Kinerja Ekspor Cengkeh Indonesia di Pasar India: Pendekatan Linear Approximate Almost Ideal Demand System (LA/AIDS). *Jurnal Agribisnis Indonesia*, *10*(2), 262–279. https://doi.org/10.29244/jai.2022.10.2.262-279

Righton, D., Roberts, M., McCarthy, T. K., Rindom, S., Tomkiewicz, J., Munk, P., Aarestrup, K., Damm Als, T., Ingemann Pedersen, M., Graver, C., Anderberg, C., van den Thillart, G., Feunteun, E., & Robinet, T. (2014). *Eels and Humans* (K. Tsukamoto & M. Kuroki (eds.); Humanity, Issue August 2014). Springer. https://doi.org/10.1007/978-4-431-54529-3

Saleh, A. R., Sri, R., & Azizah. (2022). Perkembangan Penelitian dan Pemetaan Bidang Kajian Ikan Sidat di Indonesia. *Jurnal Pustakawan Indonesia*, *21*(2), 72–87. https://doi.org/10.29244/jpi.21.2.72-87

Salvatore, D. (2019). *International Economics* (13th ed.). John Wiley & Sons, Inc.

Shiraishi, H. (2024). Early warning of an upsurge in international trade in the American Eel. *Marine Policy*, *159*(105938). https://doi.org/https://doi.org/10.1016/j.marpol.2023.105938

Shiraishi, H., & Crook, V. (2015). *Eel market dynamics : An Analysis of Anguilla Production, Trade and Consumption in East Asia* (Issue July). WWF Japan.

Surbakti, D. P. S. B., Supriana, T., & Wibowo, R. P. (2024). Analisis Permintaan dan Persaingan Ekspor Pisang Indonesia, Filipina dan Thailand di Pasar China dengan Menggunakan

e-ISSN 2655-853X
https://doi.org/10.37637/ab.v8i2.2048

Model Almost Ideal Demand System (AIDS). *Agro Bali : Agricultural Journal*, *7*(1), 194–204. https://doi.org/https://doi.org/10.37637/ab.v7i1.1558

Tsukamoto, K., Kuroki, M., & Watanabe, S. (2023). *Eel Science*. The Springer. https://doi.org/10.1007/978-981-99-5692-0

Ximenes, I. do R., Nurmalina, R., & Rifin, A. (2022). Demand for Indonesia's Coconut Crude Oil in the Netherlands: Application of LA/AIDS Model. *Open Journal of Business and Management*, *10*(01), 144–154. https://doi.org/10.4236/ojbm.2022.101009