

# Export Performance and Comparative Advantage of Indonesian Tropical Fruits

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**Abstract.** Competitiveness is the critical factor to withstand in global markets. The commodity without competitiveness will defeat by other products with high competitiveness. Indonesian fruits and derivatives must have competitiveness to hold on in global markets. This research aims to measure competitiveness and analyze export performance through tropical fruits and derivatives. Normalize Revealed Comparative Advantage (NRCA), and Export Product Dynamics (EPD) are used in this research to analyze competitiveness and export performance. This research also used a time series of data to analyze tropical fruits competitiveness and export performance. The result shows that Indonesia is strongly competitive in mango, mangosteen, and guava in China, Malaysia, and Singapore. Bananas have strong competitiveness in Malaysia and Singapore, while rambutan, snakefruit and tamarind have weak competitiveness in the five destination countries compared to competing countries. Competitiveness advantages through the EPD calculation shows that the position of Indonesia's tropical fruit exports is in the Falling Star and Retreat position.

## 1 Introduction

International trade competitiveness is a major theme in the economic literature and an important issue in the agricultural market and the Indonesian economy. The concept, in particular, has become an interesting and important topic for managers, politicians and scholars because of the strong processes of regionalization and globalization in recent times. Despite the popularity of its use and research, international competitiveness is seen as the most misunderstood concept in economic theory [1–3] and the most debated regarding the definition of its determinants, perspectives, and components, especially at the macro level [4–6]. Conventional economics suggests that a country should take advantage of scarce resources and specialize in producing agricultural products, this is because it can create stronger competitiveness, profits to generate higher added value and create better social welfare. However, a country's economic, social development and welfare growth can decline if it chooses the wrong specialization [7,8].

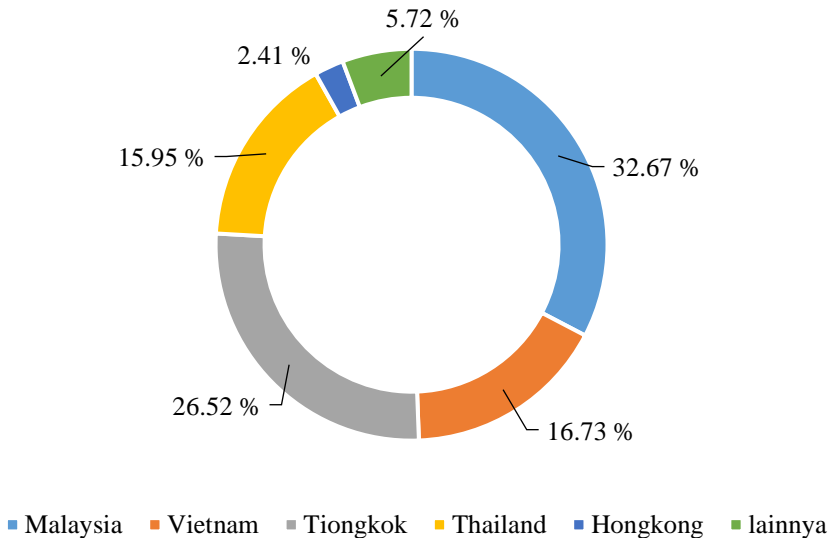
In recent decades, international trade studies have focused on investigating the

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performance of trade both statically and dynamically as a result of economic and political instability and change, strong technological developments, and global economic relations. Recent literature on economic growth and trade also explains that international trade flows and trade specialization are dynamic and endogenously evolve over time [9]. The dynamics of trade performance may ordinarily reflect deep structural changes throughout a country's economy, as resources and competitive advantages cannot change rapidly despite sudden shocks, new technologies, and institutional systems [10].

Indonesia as an agricultural country has a competitive advantage in agricultural production, namely its geographical and climatic conditions. The tropical climate of Indonesia makes Indonesia one of the producers of tropical fruits in the international market. Fruit export activities are carried out because of the difference in price levels between fruit in the local market and those exported. In 2020 the retail price of bananas is 10,694/kg IDR, snakefruit is 13,445/kg IDR, and mangoes is 17,988/kg IDR, while the export price of Indonesian bananas is 27,264/kg IDR, Indonesian snakefruit is 16,436/kg IDR, and Indonesian mangoes 36,395/kg IDR. The difference in price levels is due to the difference in quality between exported fruit and those circulating in the local market, where export fruit requires more costs to improve and maintain its quality in accordance with international standards. This price difference also becomes a penetration for fruit producers to carry out export activities because they get a larger surplus than being sold in the local market. Good quality and quantity that exceeds local demand shows that Indonesia has the ability to trade fruits in the international market. The following is the percentage of Indonesian tropical fruit export data to main destination countries in 2020.



**Fig. 1.** Percentage of Indonesian fruit exports to main destination countries in 2020.

Based on the data in Figure 1, Malaysia absorbs 32.67% of the Indonesian tropical fruit market, followed by China at 26.52%, Vietnam 16.73%, Thailand 15.95%, Hong Kong 2.41%, and the remaining 5.72% is absorbed by other countries. Figure 1 shows which countries are potential markets for tropical fruit commodities. This market potential is an opportunity for tropical fruit producing countries that can be used as a penetration to increase exports of tropical fruits that are in demand by international consumers. One of the countries that can take advantage of this opportunity is Indonesia. Indonesia has exported tropical fruits to foreign countries, meaning that Indonesian tropical fruits are in demand by foreign people. Several studies have shown that Indonesian tropical fruits contribute to the availability of

tropical fruits in the international market such as pineapple, mangosteen and banana [11–13].

Table 1 explains which destination countries have the largest export values in 2021 for the three groups of rambutan, snakefruit, and tamarind; banana; and mango, mangosteen and guava. These fruit groups are Indonesian tropical fruits with the highest export volume in 2021 which are then grouped according to the Harmonized System (HS) code. Based on the data in Table 1, Malaysia is the largest importer of Indonesian rambutan, snakefruit and tamarind fruit with an export value of 20.72% of the total export value of the rambutan, snakefruit, and tamarind fruit group. Then, the largest importer of Indonesian bananas with an export value of 16.46% of the total export value of bananas is Singapore. The mango, mangosteen and guava fruit groups have the largest export value in China with an export value of 62.09% of the total export value of mango, mangosteen and guava.

**Table 1.** Percentage of Indonesia's leading tropical fruit exports in 2021.

<b>Countries</b>	<b>Bananas</b>	<b>Guavas, mangoes, and mangosteens</b>	<b>Salacca, rambutan, and tamarin</b>
Malaysia	5.00	0.93	20.72
China	8.66	62.09	18.68
Netherland	0.70	0.67	6.68
United Arab Emirates	0.67	1.12	8.26
Qatar	9.22	0.14	3.06
Singapore	16.46	0.87	1.25
United Kingdom	0.16	0.30	0.48
Oman	12.96	0.01	0.19
Saudi Arabia	4.55	0.02	3.84

Source: [7]

The data in Table 1 also shows that most of Indonesia's tropical fruit importing countries are developed countries. These countries have their own qualifications for imported goods entering their country, including tropical fruits from Indonesia. This qualification is an example of a non-tariff trade barrier. For fruits, the application of non-tariff barriers can be in the form of fruit feasibility tests, such as Sanitary and Phytosanitary (SPS) and Technical Barriers to Trade (TBT). Cases of non-tariff barriers have occurred in Indonesia's exports of snakefruit and mangosteen commodities to China. The cases experienced by the two export fruit commodities were due to the discovery of plant-disturbing organisms (OPT), the presence of heavy metal content in the fruit outside the standard limits, and production activities that were not in accordance with the Standard Operational Procedure for Good Agriculture Practice (SOPGAP) set by China.

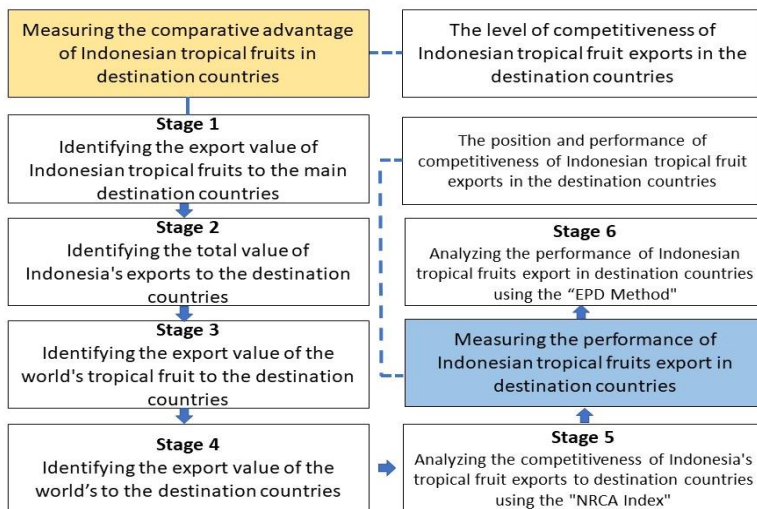
Increasing the competitiveness of Indonesia's tropical fruit exports needs to be done because the country of Indonesia has a good opportunity to meet the supply of tropical fruits in the international market. These conditions indicate that it is necessary to conduct an analysis of the competitive position of Indonesia's tropical fruit exports and examine the performance of Indonesia's tropical fruit exports in international trade. The results of the analysis are expected to determine the priority policy strategies in improving the competitiveness and export position of Indonesian fruit in the international market. Based on the background and problems that have been described, the problems that will be analyzed in this study can be formulated as follows: 1. How is the competitiveness of Indonesian tropical fruits? 2. How is the performance of Indonesia's tropical fruit exports in destination countries.

## 2 Methodology

This study uses quantitative analysis methods. The analytical method used is the Normative Revenue Comparative Advantage (NRCA). The NRCA analysis method was used to analyze the level of competitiveness of Indonesian tropical fruits. Then, to find out the market share position of Indonesian tropical fruits, using the Export Product Dynamics (EPD) analysis method. The tropical fruit groups that are the focus of this research include mango, mangosteen, guava, banana, rambutan, snakefruit, and tamarind. The tropical fruit groups in the HS code of export products are grouped into three groups, namely HS 080450 (mango, mangosteen, and guava), HS 080390 (banana), and HS 081090 (rambutan, snakefruit, and tamarind). The export destination countries analyzed in this study include China, Malaysia, Singapore, Oman, and the United Arab Emirates. These countries were chosen because Indonesia continuously exports tropical fruits, and the export value is the largest. The data used in this study are data on the volume and value of exports in the period 2016 to 2021. An explanation of the relationship between the objectives, the data used, and the research analysis can be seen in Table 2.

**Table 2.** Matrix of linkage of research objectives, data, and analysis.

No.	Research purposes	Data	Analysis
1.	Analyzing the competitiveness of Indonesia's tropical fruits	Data type: Secondary Source: UNCOMTRADE	<i>Normative Revenue Comparative Advantage (NRCA)</i>
2.	Analyzing the export performance of Indonesia's tropical fruits	Data type: Secondary Source: UNCOMTRADE	<i>Export Product Dynamics (EPD)</i>



Information:

— : analysis result  
 → : stages of the analysis process

**Fig. 2.** Research flowchart

To answer the research questions in the introduction, an analysis was carried out using two methods, namely NRCA and EPD. The analysis stage using the NRCA method is carried out by identifying data on Indonesian tropical fruit exports to the destination country and then

calculating it using the NRCA formula. This is also done to determine the export performance of Indonesia's tropical fruit in the destination country, the difference is the formula used is the EPD formula. An explanation of the stages of the research can be seen in Figure 2 below.

Normalized revealed comparative advantage (NRCA) The term normalized NRCA originally appeared in Dunning's work and is defined as the ratio of NRCA exports to NRCA FDI as an indicator of firm ownership of profits [14]. However, the application of Dunning's NRCA in this case is not comparable to the measure applied in this study which focuses more on relative export advantages rather than corporate ownership advantages which is consistent with the work of Yu et al. [15]. In an attempt to provide an index with a stable means across commodities and countries, as well as a stable distribution over time, Yu et al. introduced the NRCA [15].

The Normalize Revealed Comparative Advantage (NRCA) method is used to improve the limitations of the Balassa Revealed Comparative Advantage (BRCA) index method. The advantages of the NRCA method include being able to compare and rank the level of strength of comparative competitiveness between commodities, destination countries, and periods. Through this method is expected to describe the pattern of trade in a country. In addition, the NRCA method can identify types of commodities that have the potential to be traded in the market and at a certain time. The NRCA competitiveness analysis method has been widely used to examine the strength of the comparative competitiveness of agricultural export products in the international market [16–18]. Mathematically, the NRCA method can be calculated by the formula:

$$NRCA_j^i = \Delta E_j^i / E = E_j^i / E - E_j E^i / EE \quad (1)$$

NRCA is symmetrical around zero and its deviation from zero indicates a country of comparative advantage or disadvantage. Although the NRCA is relatively new, early empirical applications indicate the stability of the index across countries, commodities and over time [19–21]. According to Eq. (1),  $NRCA_{ij} > 0$  (or  $NRCA_{ij} < 0$ ) indicates that country I exports commodity j ( $E_{ij}$ ) more (or less) than its neutral level comparative advantage ( $E_{ij}$ ), which means that country I has a comparable advantage (or disadvantage) in commodity j. The larger (or smaller) the value of  $NRCA_{ij}$ , the stronger the comparative advantage. Since the relative concept is comparative advantage, the interpretation of the magnitude of the NRCA is more meaningful as far as comparative advantage is concerned in a comparative context. For example,  $NRCA_{ij} = 0.01$ , and  $NRCA_{ik} = 0.05$  means that the comparable advantage in commodity k is five times the relative strength of country i in commodity j.

The Export Product Dynamics (EPD) method is used to analyze and identify the competitive advantage of a commodity and measure the market position of a country's product for a particular market purpose. If it is known that there is export growth from commodities that are studied in a sustainable manner with a value above the average export growth, then these commodities can be used as a source of foreign exchange income for the country. In addition, if a commodity has good growth in the export destination country, it can be an opportunity to increase exports of similar products in that country [22–24]. The EPD method describes the position of product export performance into four categories, namely Rising Star, Falling Star, Lost Opportunity, and Retreat. The EPD method can be calculated using the following formula:

X-axis: Growth of business strength or export market share:

$$\frac{\sum_{t-1} \left[ \left( \frac{X_{ij}}{W_{ij}} \right)_t \times 100\% - \left( \frac{X_{ij}}{W_{ij}} \right)_{t-1} \times 100\% \right]}{T-1} \quad (2)$$

Y-axis: Growth market appeal or market share of the product:

$$\frac{\sum_{t=1}^t \left[ \left( \frac{X_t}{W_t} \right)_i \times 100\% - \left( \frac{X_t}{W_t} \right)_{t-1} \times 100\% \right]}{T-1} \quad (3)$$

Where (in this case):

- $X_{ij}$  = total export value of Indonesian tropical fruits to export destinations (US\$)  
 $X_t$  = total value of Indonesian exports to the export destination countries (US\$)  
 $W_{ij}$  = total export value of world tropical fruits to export destinations (US\$)  
 $W_t$  = total value of world exports to the country of export destination  
 $j$  = export destination country  
 $i$  = export product to destination country  
 $t$  = number of years (n= 2016,2017,...,2021)  
 $T$  = number of years of analysis used

### 3 Result and report

The NRCA method analyzes the comparative competitiveness of Indonesian tropical fruits in the destination country market. An NRCA value greater than one means that the fruit under study is strongly competitive in the destination country, while if the value is less than zero, the fruit is not competitive or has weak competitiveness in the destination country. In this study, tropical fruits which were the main focus were divided into three groups based on the HS code, namely HS 080450 (mango, mangosteen, and guava), HS 080390 (banana), and HS 081090 (rambutan, salacca, and tamarind).

**Table 2.** NRCA values of Indonesian mango, mangosteen, and guava in international markets 2016-2021

Year	Country of destination				
	China	Malaysia	Oman	Singapore	UEA
2016	0.000312	0.000105	0.000070	0.000142	0.000027
2017	0.000353	0.000072	0.000089	0.000271	0.000014
2018	0.000001	0.000177	0.000082	0.000198	0.000028
2019	0.000011	0.000263	0.000081	0.000141	0.000012
2020	0.000003	0.000667	0.000090	0.000158	0.000027
2021	0.000004	0.000638	0.000044	0.000151	0.000019
Average	0.000114	0.000320	0.000076	0.000176	0.000021

Table 2 shows the development of the competitiveness of Indonesian mangoes, mangosteens, and guavas in the international market. These fruits are comparatively competitive in five destination countries, namely China, Malaysia, Oman, Singapore, and the United Arab Emirates, which are marked by the NRCA average value from 2016 to 2021 which is worth more than zero. Based on the average NRCA value, it shows that Indonesian mango, mangosteen and guava fruit products have the strongest comparative competitiveness in Malaysia with an NRCA value of 0.000320 and have the lowest comparative competitiveness in the United Arab Emirates with an NRCA value of 0.000021. An NRCA value that is more than zero indicates that a commodity has comparative competitiveness in the market of the destination country [25]. In the markets of Oman and the United Arab Emirates, mango, mangosteen, and guava from Indonesia have weak comparative daylight with average NRCA values of 0.000076 and 0.000021, respectively.

Based on the results of the calculation of the NRCA value of Indonesian bananas in table 3, it can be seen that Indonesian bananas have strong competitiveness in Malaysia and Singapore. The average NRCA value for Indonesian bananas was highest at 0.000178 in Malaysia and the lowest in Oman at 0.000005. Overall, Indonesian bananas in the

international market have comparative competitiveness because the five destination countries have an average NRCA value of more than zero. An NRCA value that is less than zero means that the country does not specialize in the commodity in the destination country's market or in other words, its competitiveness is weak compared to its competitors in the destination country [16].

**Table 3.** NRCA value of Indonesian bananas in the international market in 2016-2021

Year	Country of destination				
	China	Malaysia	Oman	Singapore	UEA
2016	0.000012	0.000019	-0.000002	0.000114	-0.000002
2017	0.000039	0.000021	-0.000002	0.000001	0.000032
2018	0.000149	0.000056	0.000003	0.000119	0.000050
2019	0.000068	0.000212	-0.000002	0.000173	0.000066
2020	0.000024	0.000380	0.000002	0.000159	0.000019
2021	0.000032	0.000382	0.000031	0.000033	0.000009
Average	0.000054	0.000178	0.000005	0.000099	0.000029

Table 4 shows the development of the competitiveness of snakefruit, rambutan, and tamarind from Indonesia in the international market. Based on these data, snakefruit, rambutan, and tamarind from Indonesia have comparative competitiveness in the five destination countries. This can be seen from the average value of Indonesia's NRCA which is worth more than zero in all destination countries. An NRCA value of more than zero means that the commodity has comparative competitiveness so that it has the opportunity to be developed in the international market.

**Table 4.** NRCA values of salacca, rambutan, and Indonesian tamarind in the international market in 2016-2021.

Year	Country of destination				
	China	Malaysia	Oman	Singapore	UEA
2016	0.000024	0.000026	0.000010	0.000115	0.000031
2017	0.000020	0.000026	0.000009	0.000097	0.000029
2018	0.000024	0.000062	0.000017	0.000065	0.000028
2019	0.000020	0.000027	0.000012	0.000088	0.000022
2020	0.000015	0.000037	0.000007	0.000075	0.000049
2021	0.000008	0.000023	0.000018	0.000023	0.000074
Average	0.000018	0.000033	0.000012	0.000077	0.000038

Indonesia is not the only country that supplies tropical fruits to the international market. Other countries that have the same or better ability in producing tropical fruits also trade between countries. Competitor country data is in Table 5.

Based on the data in Table 5, the competing countries for the export of this group of fruits are separated by destination country and the group of tropical fruit exported. These countries are countries with the largest export value of tropical fruits in destination countries in 2021. The main suppliers for the mango, mangosteen and guava fruit groups in the markets of these five countries come from China (Hongkong SAR), Pakistan, Malaysia, and India. Competing exporting countries for the banana group in the markets of China, Malaysia, Oman, Singapore, and the United Arab Emirates come from the same countries, namely the Philippines and Ecuador. In the five countries, Indonesia is also not the main supplier for the rambutan, salacca and tamarind fruit groups, but comes from China, China (Hongkong SAR), Malaysia, and India.

**Table 5.** Comparison of the export value of Indonesia and its competitors in destination countries in 2021.

Importing Country	Total export value per fruit group from exporting country (USD 1000)					
	Mango, mangosteen, guava		Banana		Rambutan, salacca, tamarind	
	Indonesia	Competing country	Indonesia	Competing country	Indonesia	Competing country
China	45,115.22	36,641.58 <sup>f</sup>	330.81	388,247.44 <sup>a</sup>	535.41	229,169.89 <sup>f</sup>
Malaysia	673.48	1,107.65 <sup>e</sup>	191.14	2,806.47 <sup>a</sup>	593.83	5,718.36 <sup>g</sup>
Oman	7.42	8,223.29 <sup>c</sup>	495.43	3,119.78 <sup>a</sup>	5.56	1,384.90 <sup>e</sup>
Singapore	633.68	6,564.54 <sup>d</sup>	628.99	10,022.60 <sup>a</sup>	35.83	11,858.45 <sup>d</sup>
UEA	811.63	32,889.99 <sup>c</sup>	25.66	55,070.52 <sup>b</sup>	236.59	26,350.33 <sup>e</sup>

Information:

a = Philippines; b = Ecuador; c = Pakistan; d = Malaysia; e = India; f = China, Hongkong SAR; g = China

**Table 6.** NRCA values of competing countries for mango, mangosteen, and guava in international markets in 2016-2021.

Year	Country of destination				
	China*	Malaysia**	Oman***	Singapore****	UEA***
2016	0.003698	0.001505	0.002261	0.000365	0.001717
2017	0.004687	0.001377	0.002110	0.000479	0.002048
2018	0.004306	0.001372	0.002106	0.000523	0.002486
2019	0.003739	0.001302	0.001908	0.000562	0.004637
2020	0.003158	0.001382	0.001902	0.000503	0.002826
2021	0.003985	0.001600	0.002022	0.000526	0.002233
Average	0.003928	0.001423	0.002051	0.000493	0.002657

Information:

\* = China, Hongkong SAR; \*\* = India; \*\*\* = Pakistan; \*\*\*\* = Malaysia

Data on the NRCA values of competing countries for the mango, mangosteen, and guava fruit groups can be seen in table 6. Competing countries for these fruit groups in the five destination countries come from different countries. In China, most of the supply of this fruit group comes from China, Hong Kong SAR. In the United Arab Emirates and Oman, the most supply comes from Pakistan, Malaysia gets the most supply from India, while in Singapore the main supplier comes from Malaysia. The NRCA value of China, Hong Kong SAR on the Chinese market shows a value that tends to be stable, although there are slight increases and decreases, the value still shows more than zero. Meaning mango, mangosteen, and guava from China, Hong Kong SAR has strong competitiveness in China. The value of Pakistan's NRCA in the United Arab Emirates and Oman markets shows a value that tends to be stable, while the Malaysian market fluctuates but still shows that mango, mangosteen, and guava originating from India are strongly competitive in the Malaysian market. The NRCA value fluctuation was also experienced by Malaysia in the Singapore market, but the value tends to be stable at 0.0004-0.0005. This indicates that Malaysian mangoes, mangosteens, and guavas are highly competitive in the Singapore market.

The data in Table 7 is the NRCA value of the Philippines and Ecuador in the export destination countries. The five destination countries for importing bananas mostly come from the Philippines, except for the United Arab Emirates with suppliers from Ecuador. Based on the calculations in Table 7, it shows that Philippine bananas have strong competitiveness in the export market in four destination countries, namely China, Malaysia, Oman and Singapore, while Ecuador has strong competitiveness in the United Arab Emirates market.



**Table 7.** NRCA value of competing countries for bananas in international markets in 2016-2021

Year	Country of destination				
	China*	Malaysia*	Oman*	Singapore*	UEA**
2016	0.007568	0.009555	0.004254	0.051378	0.041489
2017	0.008877	0.009086	0.005224	0.047581	0.043310
2018	0.006393	0.009850	0.004980	0.036019	0.035618
2019	0.005634	0.008567	0.004037	0.045213	0.029356
2020	0.006426	0.008360	0.003284	0.031160	0.022548
2021	0.006788	0.007278	0.002498	0.015814	0.020702
Average	0.006947	0.008782	0.004046	0.037860	0.032170

Information:

\* = Philippine; \*\* = Ecuador

**Table 8.** NRCA values of competitor countries for rambutan, salacca, and tamarind in the international market in 2016-2021

Year	Country of destination				
	China*	Malaysia**	Oman***	Singapore****	UEA***
2016	0.005512	0.000948	0.000182	0.000386	0.001414
2017	0.006182	0.001275	0.000188	0.000533	0.001519
2018	0.006860	0.001120	0.000233	0.000635	0.002167
2019	0.004207	0.001041	0.000191	0.000750	0.005279
2020	0.003129	0.000859	0.000213	0.000698	0.002524
2021	0.002406	0.001139	0.000207	0.000648	0.001728
Average	0.004716	0.001063	0.000202	0.000608	0.002438

Information:

\* = China, Hongkong SAR; \*\* = China; \*\*\* = India; \*\*\*\* = Malaysia

Most supplies of rambutan, salacca and tamarind in China come from China, Hong Kong SAR, Malaysia gets the most supplies of rambutan, salacca, and tamarind from China, while Singapore's main suppliers come from Malaysia and other countries. Oman and the United Arab Emirates the main suppliers are from India. Based on Table 8, China's NRCA value, Hong Kong SAR on the Chinese market experienced a downward trend, while China's NRCA value tended to fluctuate. Malaysia's NRCA value in the Singapore market only ranges between 0.0005-0.0007, meaning that although it has strong competitiveness, the Singapore market imports rambutan, salacca, and tamarind fruits with small values. The main suppliers of the fruit group in the countries of Oman and the United Arab Emirates are mainly Indian suppliers. The NRCA value in the export destination market in table 8 shows fluctuations in rambutan, salacca, and tamarind but is still highly competitive.

**Table 9.** Comparison of the average NRCA values of Indonesian tropical fruits and competing countries in 2016-2021

Importing Country	Total export value per group of fruit from exporting countries					
	Mango, mangosteen, guava		Banana		Rambutan, salacca, tamarind	
	Indonesia	Competing country	Indonesia	Competing country	Indonesia	Competing country
China	0.000062	0.003928	0.000054	0.006947	0.000018	0.004716
Malaysia	0.000332	0.001423	0.000178	0.008782	0.000033	0.001063
Oman	0.000073	0.002051	0.000005	0.004046	0.000012	0.000202
Singapore	0.000167	0.000493	0.000099	0.037860	0.000077	0.000608
UEA	0.000018	0.002657	0.000029	0.032170	0.000038	0.002438

The comparison of the NRCA value of Indonesian tropical fruits with competing countries in the destination countries can be seen in table 9. Based on the results of the NRCA calculation, it is known that Indonesia's tropical fruit exports to the five destination countries have not been able to meet the needs of tropical fruits in the five destination countries by optimal, both in terms of quantity and quality. This is indicated by the difference between Indonesia's NRCA values in the three tropical fruit groups and competing countries.

### 3.1 Export Dynamic Product (EPD)

The EPD method is used to describe the dynamics of exports and the market position of tropical fruit in the market of destination countries. The results of the EPD analysis show the dynamic level of export growth over a certain period which is categorized into four market positions, namely Rising Star, Falling Star, Lost Opportunity, and Retreat. The following are the results of the calculation of the EPD of Indonesian tropical fruits.

**Table 10.** EPD calculation results for Indonesian tropical fruits in destination countries 2016-2021

Importing Country	Tropical fruits		
	Mango, mangosteen, guava	Banana	Rambutan, salacca, tamarind
China	Retreat	Falling Star	Retreat
Malaysia	Falling Star	Falling Star	Retreat
Oman	Retreat	Falling Star	Falling Star
Singapore	Retreat	Falling Star	Falling Star
UEA	Retreat	Falling Star	Retreat

In Table 10, the EPD results for the mango, mangosteen, and guava fruit groups in the international market show that only one country occupies the Falling Star position, namely Malaysia. China, Singapore, United Arab Emirates, Saudi Arabia, and Kuwait are in the Retreat position. Indonesian bananas have a Falling star position in five export destination countries, namely China, Malaysia, Oman, Singapore, and the United Arab Emirates. Based on the results of the EPD calculation in table 10, the rambutan, snakefruit, and tamarind fruit groups from Indonesia are in the Falling Star and Retreat positions. The Oman and Singapore markets are in the Falling Star position, while Retreat is in China, Malaysia and United Arab Emirates markets.

Retreat conditions indicate that a decline in the market share of commodity exports in destination countries is followed by a decrease in demand for these commodities [11]. The Falling Star position indicates that the export market share of a commodity continues to increase but the demand for that commodity declines. Based on these results, there was a decline in the export market share of Indonesian mango, mangosteen and guava fruit followed by a decrease in demand for these fruit groups in China, Singapore, United Arab Emirates, Malaysia, and Oman [24].

Based on the statement of Wiranthi and Mubarok [24], the export position of Indonesian bananas in China, Malaysia, Oman, Singapore, and the United Arab Emirates shows that the market share of Indonesian bananas is increasing but is not accompanied by demand for Indonesian bananas in the five destination countries. the.

Based on the results of the EPD calculation in table 10, rambutan, salacca, and tamarind in the Oman and Singapore markets are in the Falling Star position, while the Retreat position is experienced in China, Malaysia, and United Arab Emirates markets. Indonesia's export position in the markets of China, Malaysia and the United Arab Emirates shows that Indonesian rambutan, salacca and tamarind are no longer desirable in the markets of these destination countries.

**Table 11.** EPD calculation results for tropical fruits competing in international markets

Importing Country	Tropical fruits		
	Mango, mangosteen, guava	Banana	Rambutan, salacca, tamarind
China	Rising Star	Lost Opportunity	Rising Star
Malaysia	Falling Star	Lost Opportunity	Falling Star
Oman	Retreat	Lost Opportunity	Lost Opportunity
Singapore	Retreat	Lost Opportunity	Rising Star
UEA	Falling Star	Lost Opportunity	Lost Opportunity

In Table 11, the EPD results for the mango, mangosteen, guava fruit groups of competing countries in the international market show that China (Hong Kong, SAR) occupies the Rising Star position in China. The country of India occupies the position of Falling Star in the country of Malaysia. Pakistan occupies the Retreat and Falling Star positions in Oman and the United Arab Emirates, while Malaysia occupies the Retreat position in Singapore.

The Rising Star position shows that the export share growth in destination countries is increasing in line with the increase in demand for commodity exports, which is experienced by China (Hong Kong, SAR) in China [13]. Furthermore, the Falling Star position shows that exporting countries experience commodity market growth in importing countries but demand for commodities declines, which is experienced by India and Pakistan in Malaysia and the United Arab Emirates [26]. Retreat conditions indicate that the exporting country's commodities to the importing country did not experience growth in market share and export demand, which was experienced by Pakistan and Malaysia in Oman and Singapore [26]. In Table 11, the EPD results for bananas from competing countries in the international market show that bananas from the Philippines and Ecuador are in the Lost Opportunity position in China, Malaysia, Oman, Singapore, and the United Arab Emirates. The Lost Opportunity position shows that exporting countries are experiencing a decline in their export market share in a dynamic market, meaning that the Philippines and Ecuador are missing the opportunity to optimize dynamic markets, namely China, Malaysia, Oman, Singapore, and the United Arab Emirates, to gain profits [16].

In table 11, the results of the EPD for groups of rambutan, snakefruit, and tamarind in competing countries in the international market show that the Rising Star position is experienced by China (Hong Kong, SAR) in China and Malaysia in Singapore. The position of Falling Star is experienced by China in Malaysia. The position of Lost Opportunity is experienced by India in the countries of Oman and the United Arab Emirates. The Rising Star position shows that there is an increase in export share of rambutan, snakefruit, and tamarind in destination countries followed by an increase in export demand, which is experienced by China (Hong Kong, SAR) in China and Malaysia in Singapore. The Falling Star position experienced by China in Malaysia shows that the export share of rambutan, snakefruit and tamarind fruit continues to increase but demand for these fruits actually decreases. The Lost Opportunity position shows that the exporting country has experienced a decline in its export market share in a dynamic market, meaning that India has lost the opportunity to optimize the dynamic market in Oman and the United Arab Emirates for profit.

The data in table 12 represents the comparative and competitive advantages of tropical fruits in 2016-2021. Based on these data, it can be seen that mango, mangosteen and guava, banana and rambutan fruit, snakefruit, and Indonesian tamarind have strong competitiveness in Malaysia and Singapore. The results of the EPD calculation show that the position of Indonesia's tropical fruit exports is in the Retreat and Falling Star positions. This condition is because the market share value of tropical fruit (y axis) is always negative. The reason is that the total value of exports from Indonesia as a whole in 2016-2019 and increased in 2020-2021, while the total value of exports from the world to destination countries fluctuates every year.

**Table 12.** Combination of NRCA and EPD of Indonesian tropical fruits in international market

Importing Country	Tropical fruits					
	Mango, mangosteen, guava		Banana		Rambutan, salacca, tamarind	
	NRCA	EPD	NRCA	EPD	NRCA	EPD
China	0.000062	Retreat	0.000054	Falling Star	0.000018	Retreat
Malaysia	0.000332	Falling Star	0.000178	Falling Star	0.000033	Retreat
Oman	0.000073	Retreat	0.000005	Falling Star	0.000012	Falling Star
Singapore	0.000167	Retreat	0.000099	Falling Star	0.000077	Falling Star
UEA	0.000018	Retreat	0.000029	Falling Star	0.000038	Retreat

## 4 Conclusions

Based on the results obtained, it can be concluded regarding the competitiveness and export performance of Indonesia's tropical fruit commodities, as follows:

1. Comparative advantages through NRCA calculations shows that Indonesia is strongly competitive in mango, mangosteen, and guava in China, Malaysia, and Singapore. Bananas have strong competitiveness in Malaysia and Singapore, while rambutan, snakefruit and tamarind have weak competitiveness in the five destination countries compared to competing countries.
2. Competitiveness advantages through the EPD calculation shows that the position of Indonesia's tropical fruit exports is in the Falling Star and Retreat position.
3. This study shows export performance based on trade data on the export value of Indonesia's tropical fruit commodities only. In order to obtain more in-depth study results, in the future an analysis of agricultural production activities, supply chain analysis, and government policies is needed to support the competitiveness of Indonesia's tropical fruits.

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