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## Competitiveness of Mangoes in Southeast Asian Region

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### Abstract

The mango is one of the world's most valuable and economically significant tropical fruits, and it is grown all over the world. Mangoes are in high demand on the global trade market, and European countries are one of the most promising growth markets for mango exports. The chairman of Malaysia's Federal Agricultural Marketing Authority (FAMA) expects "Harumanis" mangoes to be exported to Europe within the next three to four years. This brings into sharp focus the issue of mango plantation land in Malaysia, which is currently the subject of heated debate because Perlis is Malaysia's smallest state and is attempting to dominate this commodity. According to a report from Malay Mail News on June 2020, the Intellectual Property Corporation of Malaysia (MyIPO) has stated that the name "Harumanis" is only used for mango grown in Perlis. This appears to be a strategic plan that benefits Perlis by confusing consumers about which mango (*Mangifera indica* L.) to buy, and the "Harumanis" name itself has branding value in the Malaysian market. To investigate further, this study will examine the competitiveness of Malaysia compared to countries around Southeast Asia that have vast land for the agricultural and their competitiveness in exporting mango by using Revealed Comparative Advantage (RCA), Revealed Symmetric Comparative Advantage (RSCA) and export growth. Malaysia lacks a competitive advantage in both the RCA and RSCA indexes, which may be attributed to the fact that Malaysia has the least agricultural land and production of mango in comparison to Thailand, Indonesia, and Vietnam.

**Keywords:** Mango, Competitiveness, Export, Southeast Asian, Agriculture.

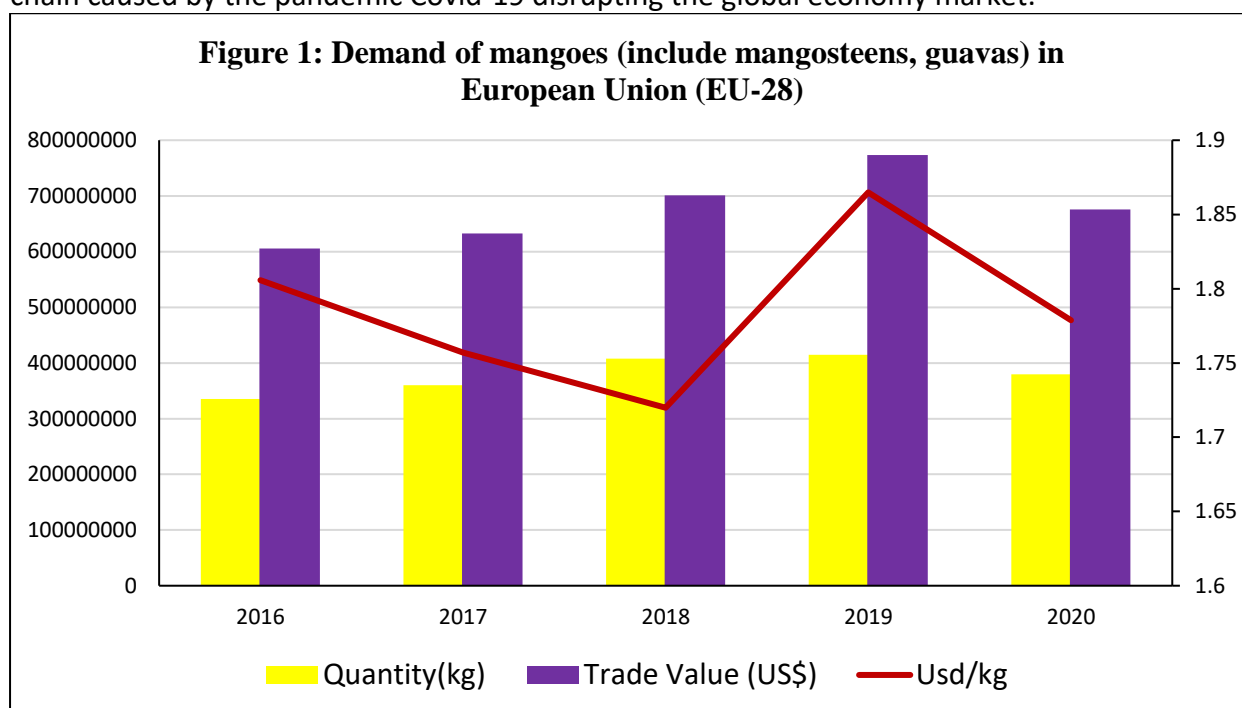
### Introduction

Mango and mangosteen are by far the world's most prolifically produced tropical fruit group, owing to the enormous volumes of mangoes produced and the fact that they are highly nutritious with vitamins. Mangoes are one of the most important and appealing tropical fruits due to their colour, aroma, flavour, and nutritional value; however, increasing mango productivity and quality is a critical goal in order to combat global population growth (Kheir et al., 2021). Furthermore, it is high in carotenoids, vitamins C, A, E, B, riboflavin, niacin,

thiamin, phenolics, carbohydrates, and minerals like Fe, P, Ca, and K (Maldonado-Celis et al., 2019).

According to the Food and Agriculture Organisation's (FAO) report in major tropical fruits preliminary results 2020, aggregate world trade in the four major tropical fruits increased by an estimated 3.5% in 2020, reaching a record volume of USD 9.7 billion in constant 2014–2016 dollar terms. Global mango, guava, and mangosteen exports are expected to reach 2.3 million tonnes in 2020, up 5.1% (or 120 000 tonnes) from the previous year.

According to Nordey et al (2017), mango is one of the most valuable and economically significant tropical fruits in the world. Mangoes are in high demand in the global trade market, and European countries are one of the most promising growth markets for mango exports. According to Figure 1, the demand for mangoes is increasing from 2016 to 2019. Mango demand in Europe exceeds 30 million kilogram, and it is expected to exceed 40 million kilogram in 2018 and 2019. However, it showed a decrease in 2020 due to the slow market chain caused by the pandemic Covid-19 disrupting the global economy market.



Resource: Eurostat

Agriculture and horticulture, two of Southeast Asia's most important industries, contribute significantly to the region's gross domestic product (GDP) and employ a sizable proportion of the region's population. Thailand, Indonesia, Malaysia, Vietnam, and other Southeast Asian countries are among the world's largest agricultural exporters, and the region's broad markets include some of the world's largest agricultural exporters. This is due to the fact that Southeast Asian countries have a hot and humid climate all year, allowing the country to focus on producing agricultural-based items for export to the rest of the world.

According to Bernama news, the chairman of Malaysia's Federal Agricultural Marketing Authority (FAMA) intends to export "Harumanis" mangoes to European countries within three to four years. This highlights the issue of mango plantation land in Malaysia, which is currently being debated. According to a report from Malay Mail News on June 2020,

the Intellectual Property Corporation of Malaysia (MyIPO) has explained that the name “Harumanis” has only been used in Perlis since it was registered in 2011.

Mangoes can still be grown privately or in other states, but the name “Harumanis” cannot be used because it has brand value in Malaysia. This is seen as an advantage only for the state of Perlis because it has been granted the exclusive right to grow “Harumanis” mangoes, limiting the opportunity for other states to explode the commodity. Due to Perlis’s small size in relation to the rest of Malaysia, this is likely to benefit only the state, but it also means that production of “Harumanis” commodities would be less maximised.

Perlis produces 4,255.0 million tonnes of mangoes and covers an area of 2,220.3 hectares, according to Fruit Crops Statistic (2019). Mango cultivation in Persil is extremely small in comparison to the total area of oil palm cultivation in Malaysia. According to the Department of Statistics Malaysia Official (2019), which cited data from the Malaysian Palm Oil Board, 5,900,157 hectares of oil palm were planted across Malaysia in the same year.

Therefore, if Malaysia exports commodity mangoes to European countries, Malaysia should encourage the cultivation of commodity mangoes in other states, particularly those with large planting areas, in order to increase productivity and quantity of fruit production, such as through the implementation of oil palm plantations. To delve deeper, this study aims to compare Malaysia’s competitiveness to other Southeast Asian countries with vast agricultural sector, particularly commodity mango. As a result, the current study aimed to raise a few questions from the discussed situation:

- i. What is Malaysia’s current land area for agriculture in comparison to other Southeast Asian countries?
- ii. What is Malaysia’s current level of mango competitiveness in comparison to a few Southeast Asian countries that also produce the same commodity?

## Literature Review

The Southeast Asian region is blessed with a hot and humid climate that is ideal for cultivating most of the world’s crops, including mangoes. Mangoes (*Mangifera indica* L.) are one of the most widely farmed fruits in more than 100 tropical and subtropical countries (Ahmad et al., 2018; Masroor et al., 2016). It is the world’s second most widely cultivated tropical fruit and the sixth most valuable fruit crop (UNCTAD, 2016), with a high resistance to climate change (Munir et al., 2015).

According to Yasunaga et al. (2018), mangoes are widely available and are a natural commodity grown in many parts of the world, including Asia (Philippines, Malaysia, and India), Latin America (Brazil, Chile, and Venezuela), and even Africa (Egypt and South Africa). Mangoes are also a popular natural fruit among consumers and a significant source of economic gain, as they are sold in a variety of countries around the world. Mangoes’ international exchange markets have grown in recent years, owing to the proliferation of mango varieties that have spread around the world (Lo’ay et al., 2021; Sivakumar et al., 2011).

Many research papers have been written that compare the competitiveness of various commodities and countries using a variety of analytical methods. According to Naseer et al. (2019), the world’s top 15 exporters of mandarin from 2007 to 2016 were compared using revealed symmetric comparative advantage (RSCA). Other researchers compared the competitiveness of tropical fruits such as pineapple, banana, and watermelon between Malaysia, Indonesia, the Philippines, Thailand, China, and India (Rozana et al., 2017). Other commodities that are not food products have also been compared using revealed symmetric comparative advantage (RSCA). Mohamad and Zainuddin (2021) conducted a comparative

advantage for natural rubbers between Malaysia, Indonesia, Thailand, and Vietnam, also using revealed symmetric comparative advantage (RSCA) to compare market share for the four countries chosen.

There have also been previous researchers who have focused their research on mango trade in terms of competitiveness. Ayyaz et al (2019) conducted an analysis of Pakistan's mango competitiveness in comparison to other countries that also produce mango. In terms of mango exports in 2017, Pakistan is ranked seventh out of the top ten countries (after Mexico, India, Thailand, Peru, Brazil and Netherlands). The study employs revealed comparative advantage (RCA) indices, specifically inversion revealed comparative advantage (InRCA), revealed symmetric comparative advantage (RSCA), and competitive export performance (CEP) for each country in comparison to the Philippines, Thailand, Mexico, and other countries from 2010 to 2016. According to the findings, Pakistan's mango exports have a strong comparative advantage, but there has been less consistency in export competitiveness to European and British markets from 2014 to 2015.

The analyses of the export competitiveness of Pakistan's major vegetables and fruits, including mango, dates, onions, potatoes, and citrus, using Balassa's index of revealed comparative advantage (RCA) from 2001 to 2018, revealed positive results in RCA for citrus, mango, and dates. However, the competitive index results for onion and potatoes were negative (Ahmad et al., 2021). Centione and Castano (2020) also conduct mango commodity research in order to identify factors that would improve the integration of the mango global value chain in the Philippines.

Kousar et al (2019) conducted a study on mangoes and compared it to citrus and dates by using revealed comparative advantage (RCA), revealed symmetric comparative advantage (RSCA), relative export advantage index (RXA), and log of relative export advantage (InRCA) index to measure the competitive index between these three fruits in Pakistan. According to the study, when it comes to the export of mangoes, citrus, and dates, Pakistan has had positive RCA values for the entire period under review (2001 to 2018). However, the research study shows that Pakistan lacks export competitiveness for the EXA and InRCA for three specific commodities.

With the world becoming more modern and free-trade economic, global agricultural commerce has seen an increase in competitiveness, resulting in a rise in the relative productivity of various economies. The analysis of comparative advantage is critical for determining the extent and potential of mango exports. There is a plethora of literature on the comparative advantage of mangoes exports, which is understandable given that it is one of the most common fruits on the global market. However, there is a lack of previous research that has examined Malaysia's mango export competitiveness, particularly when compared to mango markets in Thailand, Indonesia, and Vietnam. The goals of this study are to compare Malaysian mango exports to those of other Southeast Asian mango exporter countries in order to determine Malaysia's comparative advantage in terms of exporting mango, as Malaysia is planning to export it to the European market in the future.

## **Methodology**

The purpose of this research is to look at the competitiveness of the mango sector in the few Southeast Asian countries that produce mangoes, namely Malaysia, Indonesia, Thailand, and Vietnam. The basic pattern of trade, according to Ricardian trade theory, is determined by the relative advantage of the parties involved. It is more likely to export a commodity in which the country has a comparative advantage than to import a commodity



in which the country has a comparative disadvantage. Due to the complex and time-consuming calculation of production costs, Balassa (1965) introduced the concept of revealed comparative advantage (RCA).

### Revealed Comparative Advantage (RCA) Index

Balassa's RCA index (1965) of revealed comparative advantage was used to assess the RCA in the agriculture sectors of Malaysia, Thailand, Indonesia, and Vietnam in terms of mango commodity competitiveness. The Balassa's (RCA) are extremely useful in determining a country's competitiveness and specialisation in commodities that it produces. Which is capable of accomplishing the study's objectives and conducting analysis for the four Southeast Asian nations considered for this research. The Relative Competitiveness (RCA) index, constructed using historical trade data, can be used to determine a country's Comparative Advantage (CA). Additionally, a commodity's competitiveness can be tracked over time to determine how it changes.

The original formula for RCA is as follows:

$$RCA_{im}^t = \frac{X_{im}^t / X_i^t}{X_{wm}^t / X_w^t} \quad (1)$$

### Revealed Symmetric Comparative Advantage (RCA) Index

The formula for RSCA is as follows:

$$RSCA_{im}^t = [(X_{im}^t / X_i^t) / (X_{wm}^t / X_w^t) - 1] / [(X_{im}^t / X_i^t) / (X_{wm}^t / X_w^t) + 1] \quad (2)$$

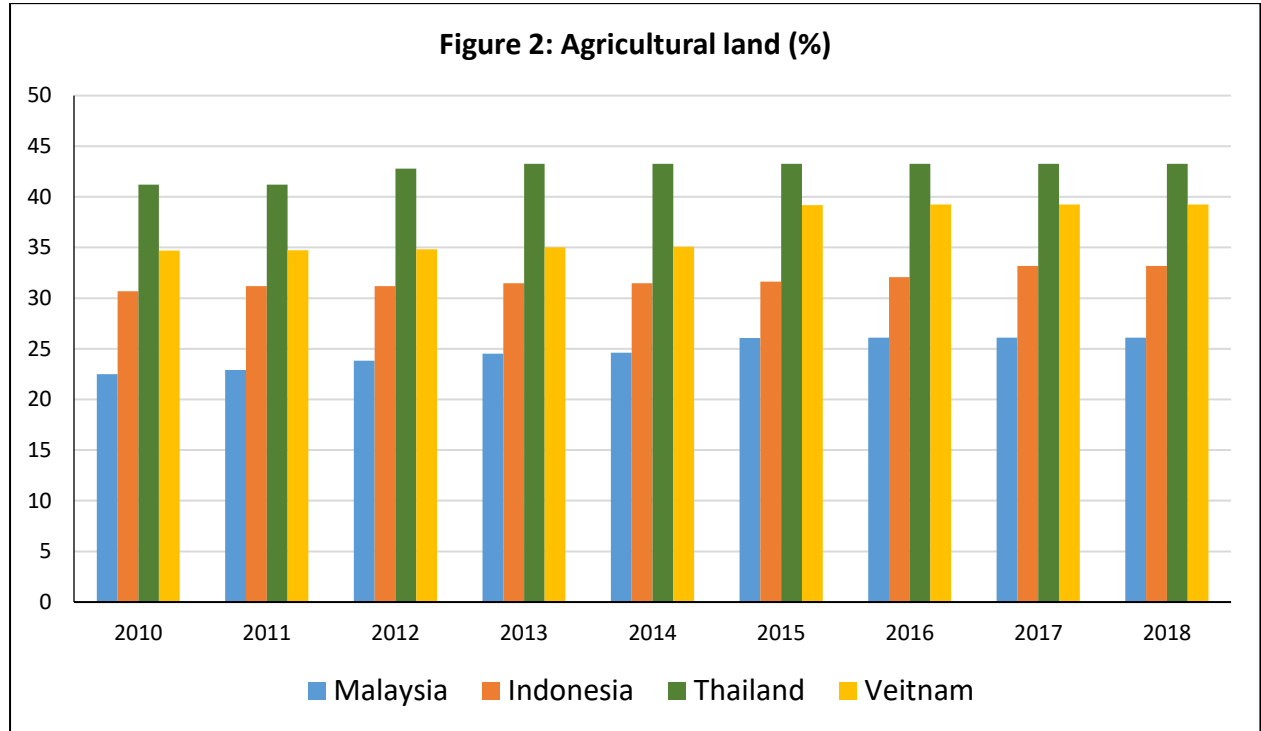
Where  $RCA_{im}^t$  and  $RSCA_{im}^t$  are almost identical but the  $RSCA_{im}^t$  known as revealed symmetric comparative advantage have construct the value of 1 to -1. Based on the formula, the country is  $i$ , for product is  $m$  at year  $t$ ;  $X_{im}^t$  are the export for country  $i$  for product  $m$  at year  $t$ ;  $X_i^t$  are the total export for country  $i$  at year  $t$ ;  $X_{wm}^t$  are the world export for product  $m$  at year  $t$ ;  $X_w^t$  are the total world export at year  $t$ .  $RSCA_{im}^t$  have a range between a negative one and a positive one, where if RSCA is more than zero, the country has a comparative advantage in that product and otherwise for less than zero. Product  $m$  represents the commodity under consideration for this study: mangoes. This study computes the RSCA using annual data from 2001 to 2020.

### Export Growth Rate

$$\text{Export Growth Rate} = \left( \left( \frac{\sum_{mpw} X^{1mw}}{\sum_{mpw} X^{0mw}} \right)^{\frac{1}{n}} - 1 \right) \times 100 \quad (3)$$

The export growth rate is defined as the yearly compound percentage difference in export total production over two years. Using the percentage growth rate, it will take between -100 percent (if exchange ceases) and +. By using mango data exporter from selected country to the world ( $mpw$ ) and total world export for the same commodity( $mw$ ).

## Discussion



Data source: World Development Indicators

Figure 2 shows the descriptive results for agricultural land, which refers to the proportion of land area that is arable, under permanent crops, and under permanent pastures. Overall, Thailand has shown dominant land that has been used for agriculture from 2010 to 2018, which is more than 40% of the land in Thailand is purposely used to agricultures economic with a variety of commodities in including mangoes. Vietnam follows, with a strong improvement in the percentage of land used from 2010 (less than 35%) and a positive annual increase until 2018, when nearly 40% of land was used for agriculture. Indonesia ranks third in terms of land use percentage, despite the fact that it is one of Asia's largest countries. Thus, even if the percentage of land used in Indonesia is only 30% to 40%, it may exceed the area per kilometre in Vietnam. Malaysia reported the lowest percentage of land used for agriculture from 2010 to 2018, never exceeding 30%.

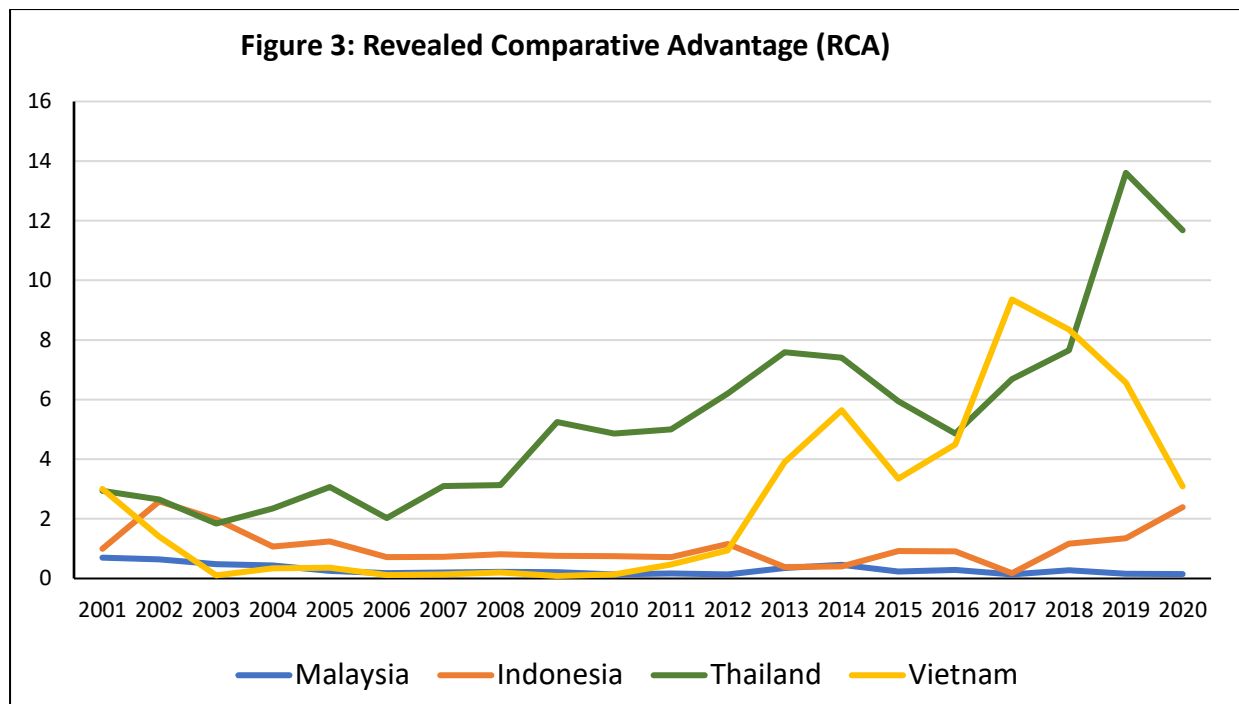


Figure 3 shows Balassa’s RCA index (1965) of revealed comparative advantage when four countries are compared on the mango commodity. Thailand has the greatest comparative advantage over the other three countries when it comes to exporting mangoes to the international market. Even though Thailand has experienced a slight decline in recent years, it has maintained an upward trend in comparison to other countries. It clearly demonstrated Thailand’s progress from 2001 to 2008, when it began with a moderate comparative advantage; however, Thailand also had a year with a weak comparative advantage in 2003.

Since 2009, Thailand has been in stage four, regaining a strong comparative advantage in mango exports to the rest of the world. In terms of exporting mangoes to the international market, Vietnam is considered Thailand’s closest competitor in the Southeast region. Vietnam started slowly in comparison to Thailand, and from 2003 to 2012, Vietnam was in stage one, with no comparative advantage. In the event of a significant fluctuation, Vietnam is able to reach stage two in the middle of 2012, break through level three in 2013, and gain a greater comparative advantage in 2014 (stage 4). However, the inability to maintain the comparative advantage level resulted in a drop to stage 3 in 2015.

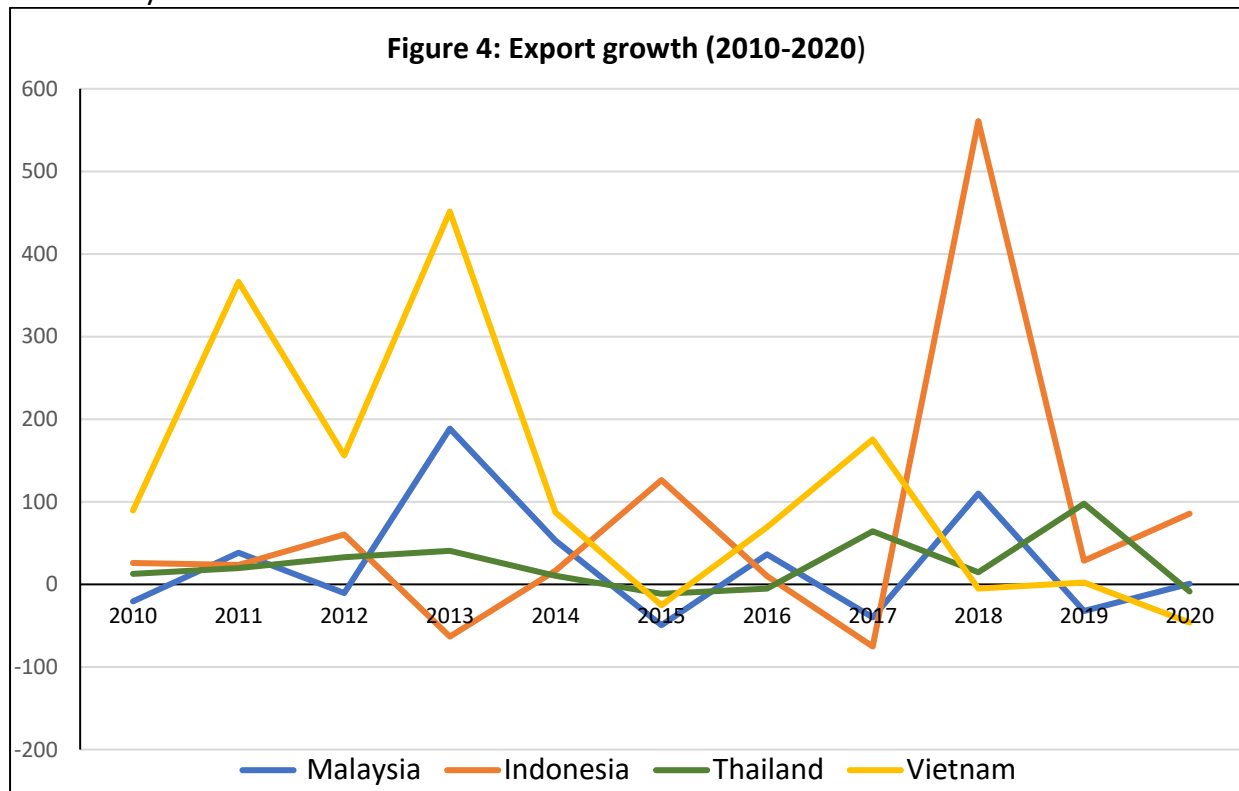
Despite the fact that Thailand lost competitiveness in 2017, it is still in stage four, which is highly competitive, and Vietnam has surpassed Thailand in terms of comparative advantage. Thailand, on the other hand, has shown improvement from 2016 to 2020, while Vietnam has shown a significant decline (2017-2020). Malaysia and Indonesia are nearly on the same level one, with no comparative advantage in many years. However, Indonesia is still able to move from zero comparative advantage to low comparative advantage.

**Table 1: revealed comparative advantage (RCA) stage**

Stage	Range	Level comparative
4	$4 < RCA$	High comparative advantage (Strong)
3	$2 < RCA \leq 4$	Moderate comparative advantage (Medium)
2	$1 < RCA \leq 2$	Low comparative advantage (weak)
1	$0 < RCA \leq 1$	No comparative advantage (Zero)



The RCA result is relatively related to the export value for these four countries. Table 2 shows that Malaysia has the lowest rate of decline among all countries over a five-year period beginning in 2016 and ending in 2020. As a result, Malaysia considers less mango production and is unlikely to supply a large quantity of mango to other countries. In comparison, Thailand produces a lot of mangoes and can support the mango supply market in the international market. For Thailand to be recognised as one of the world’s largest mango exporter countries, it must first establish itself as having a large mango stock market and overproduction in their own country, after which it is natural for Thailand to export this commodity to the international market.



In figure 4, shown the analysis for export value growth for the selected countries and the data emphasis starting from 2010 to show a dramatically increasing comparative advantage for Vietnam. In RCA have proven that Vietnam increase trend starting 2010 to 2017 have to do with the export growth in mangoes and the shape decreasing trend in Vietnam competitive advantage (RCA) also linked with the down trend of export growth for Vietnam. Indonesia strongly increasing for the mangoes export growth from 2017 also indicate the reasons of Indonesia improving to stage two in the competitive advantage (RCA) index.

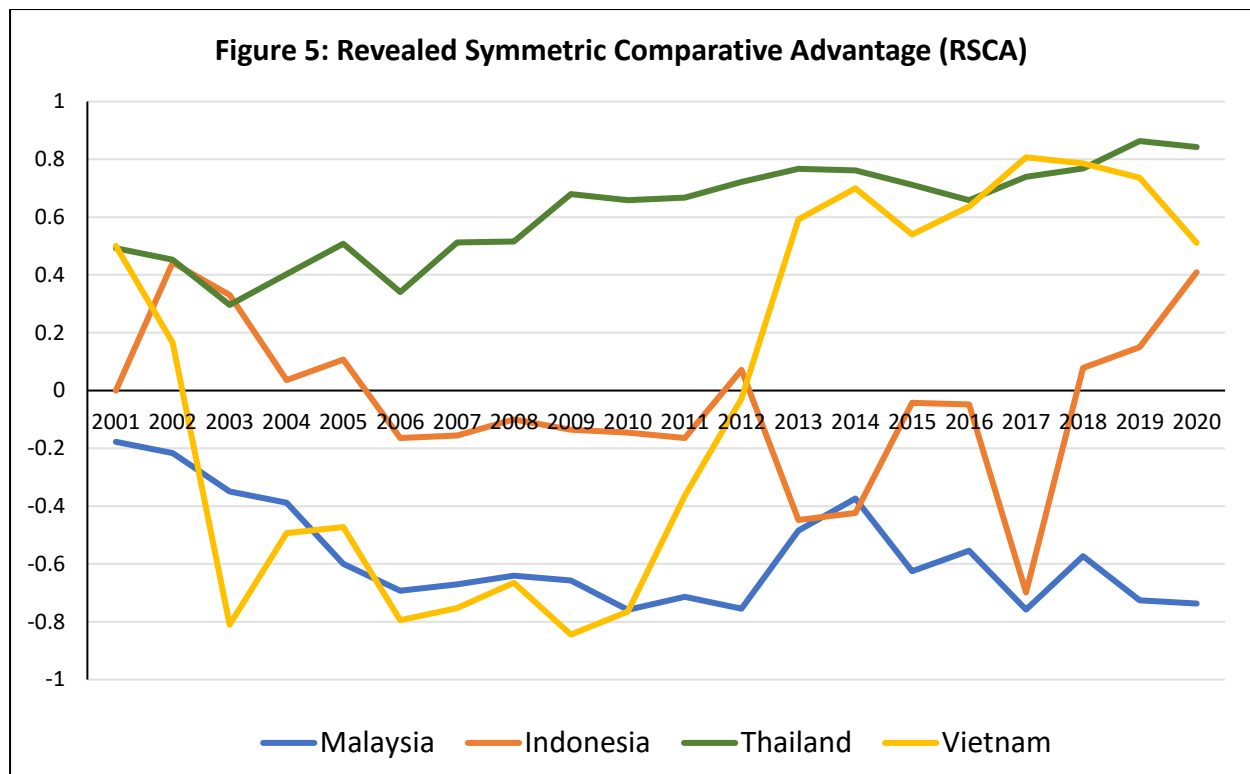


Figure 5 depicts the revealed symmetric comparative advantage (RSCA) Index, which is nearly identical to the RCA. The RSCA, on the other hand, has made a minor adjustment to keep the comparative index range between 1 and -1. If a country’s RSCA score is greater than zero and has a positive value, it indicates that the country has a comparative advantage in mango exports. If the value is negative, there is no comparative advantage level. This means that Malaysia has clearly had no comparative advantage from 2001 to 2020, as the results of RSCA have consistently shown Malaysia to be in the negative range.

Among these four countries, Thailand is the only one that has maintained a positive value from 2001 to 2020, indicating that Thailand is a top supplier of mangoes to the international market in the Southeast region. This demonstrates that Thailand earns a lot of money from mango exports to other countries when compared to the other three. Indonesia and Vietnam exhibit high inconsistency and fluctuation, but both countries have gained either a negative or positive value from 2001 to 2020. Vietnam had a positive RSCA value from early 2001 to 2002 and from 2012 to 2020. Nonetheless, Indonesia had a positive value from 2001 to the middle of 2005, then fell to a negative value before regaining a positive value from 2018 to 2020.

**Table 2: Mango (included mangosteen, guava) trade value**

Years	Malaysia	Indonesia	Thailand	Vietnam	World
2016	8706.707	21072.255	167783.058	127479.959	2361061.8820
2017	5238.15	5224.753	275542.728	351109.435	2928056.8380
2018	10998.761	34528.165	315950.632	333495.055	3007886.2940
2019	7436.268	44421.655	624724.493	341252.05	3496109.7080
2020	7488.264	82375.379	570388.087	183458.793	3496535.9970

Source: Calculate by author using Comtrade data

The RCA result is relatively connected with the export value for these four countries. Table 2, indicated Malaysia is clearly the lowest among others in almost five years starting 2016 to 2020. Therefore, that mean Malaysia consider less production for mango and hardly to supply mango in rich quantity to others countries. Compare to Thailand that highly producing mango and able to support the supply market for mango in the international market. For the Thailand become recognize as one of the biggest mango exporter country in the world, there must start from established to be known having a lot of stock market of mango and with overproduction in their own country, then it is natural for the Thailand to export of this commodity to the international market.

### Conclusion

This study compares Malaysian mangoes to three selected countries (Thailand, Indonesia, and Vietnam), all of which export mangoes to the rest of the world. The results clearly show that Malaysia needs to improve its exports and gain market share for mangoes. However, when compared to Thailand, Indonesia, and Vietnam, Malaysia has the lowest percentage of land used for agriculture, which does not exceed 35% of land in Malaysia. The reason Malaysia has no comparative advantage is that its mango production is considered small in terms of quantity compared to other years. With less mango production in the Malaysian market, Malaysia may not be able to supply a large quantity of mangoes to the international market.

The scenario of allowing only Perlis to use the name “harumanis” could be considered a strategy for obtaining exclusive rights to mango production. Thus, if Malaysia is serious about competing with global mango exporters, the best practice is to strengthen agriculture economics by encouraging more land areas to plant mangoes and allowing all states to have the opportunity to explode the mangoes “harumanis”. This indeed same scenario during dairy markets crisis in Europe, which the European counter the oversupply of dairy with export is counter to others countries (Pouch & Trouvé, 2018). With all the states planting mangoes “harumanis,” the supply and production of these mangoes will undoubtedly increase, allowing Malaysia to compete in the global mango market.

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