



## Competitiveness of Malaysia's Fruits in the Global Market: Revealed Comparative Advantage Analysis

Nik Rozana, N. M. M., Suntharalingam, C. \* , and Othman, M. F.

*Economics and Social Science Research Centre, Malaysian  
Agricultural Research and Development Institute (MARDI),  
Malaysia*

*E-mail: [chuba@mardi.gov.my](mailto:chuba@mardi.gov.my)*

*\* Corresponding author*

### ABSTRACT

Malaysia practices an open market system and is a proponent of free trade. Its openness in embracing trade liberalization is evidenced by the signing of bilateral, regional and multilateral trade agreements. Being a signatory to various free trade agreements, Malaysia has been offered the opportunity to market its agricultural produce including tropical fruits, globally. Tropical fruits are considered exotic and have been found to offer health benefits. As such, demand for tropical fruits globally is increasing but the pool of players supplying these fruits is relatively small. Hence, the purpose of this paper was to assess the competitive position of Malaysia's selected tropical fruits in comparison to five major tropical fruit exporters. Three of these exporters are from ASEAN, namely Indonesia, Philippines and Thailand, and two are from Asia, i.e., China and India. The findings of this study demonstrate that Malaysia has a competitive edge in selected fruit types. In order to sustain its competitive position in the watermelon market, Malaysia should venture into downstream processing so as to add value, instead of focusing solely on marketing a whole fruit or minimally processed fruit.

**Keywords:** Competitiveness, international trade, fruits, Revealed comparative advantage, policy.

## 1. Introduction

Trade agreements offer the means to achieve quicker and higher levels of liberalization that would create effective market access between signatories (see MATRADE (2015)). In response to the global trend towards trade liberalization and integration, Malaysia continues to accord high priority to the rule-based multilateral trading system under the WTO (World Trade Organisation). The WTO is an international body that deals with the rules of trade between nations at a global level. Its main function is to ensure that trade flows occur smoothly and freely as possible. In addition, Malaysia also pursues plurilateral, regional and bilateral trade arrangements to complement the multilateral approach towards trade liberalization. A plurilateral agreement refers to a multinational legal or trade agreement between countries. In other words, it is an agreement between more than two countries, but not too many countries which would then be referred to as multilateral agreement. A bilateral trade involves two signatories.

Malaysia is a member of the Association of South East Asian Nations (ASEAN). ASEAN was established on 8 August 1967 in Bangkok, Thailand, with the signing of the ASEAN Declaration (Bangkok Declaration) by the founding countries of ASEAN, which includes Indonesia, Malaysia, Philippines, Singapore and Thailand. Brunei Darussalam then joined on 7 January 1984, Viet Nam on 28 July 1995, Lao PDR and Myanmar on 23 July 1997, and Cambodia on 30 April 1999, making up what is today the ten Member States of ASEAN. Its aim and purpose of establishment were about cooperation in the economic, social, cultural, technical, educational and other fields, and in the promotion of regional peace and stability. As a region, ASEAN has signed regional Free Trade Agreements (FTAs) with China, India, Korea, Japan, New Zealand, Australia and The European Union (see MITI (2015)).

The push for trade liberalization is a reflection of Malaysia's outward looking policies in achieving national, regional and global growth. The continued involvement and pursuance of Malaysia in free and preferential trade agreements demonstrates the country's commitment towards freer trade. This is in accordance with the fact that international trade is a fundamental requisite that forms one of the critical foundations of the Malaysian economy (see Nik Rozana et al. (2013)).

As a result of trade liberalization, regions and countries that produce similar agricultural produce, e.g., tropical fruits, compete with one another in marketing their produce globally (Suntharalingam et al., 2011) (Suntharalingam et al., 2011). This is true for Malaysia as well. Over the years, Malaysian tropical fruits have faced heightened competition from other Asian countries such as The Philippines, Thailand, India, China and Indonesia. These countries produce and trade similar fruits as Malaysia, making them Malaysia's closest competitors. To understand how Malaysia fares on fruits export trade, in relation to these countries, this study was undertaken. This paper aims to assess Malaysia's competitiveness level in comparison to these five Asian rivals.

Tropical fruits were selected to be the focus in this study based on two reasons:

- (a) Their importance in the National Agricultural Policy 3 or NAP3 (1998-2010) and the National Agrofood Policy or also known as DAN (2011-2020). Collectively, the NAP3 and DAN identified banana, watermelon, papaya, pineapple, starfruit and mango as potential fruits to be developed for Malaysias export markets. As such this study will focus on these fruit types only.
- (b) The increased demand of tropical fruits in recent years. DAN forecasted that demand for local tropical fruits will increase to 2.7 million metric tonnes by 2020 with a growth rate of 2.3% per annum. The market for fresh fruits is growing, driven by consumers preference towards cultivating healthy eating habits.

This study aims to contribute to the competitiveness literature pertaining to international trade of tropical fruits among Asian players. Assessing Malaysias competitiveness level in relation to our closest competitors would offer us the understanding of our performance in comparison with our rivals. This is important so as to assist us decide our action plans, i.e., whether to formulate strategies to maintain our competitive position or undertake improvement activities so as to better position ourselves in the future.

This paper is organized into six sections. The next section discusses the competitiveness and comparative advantage theories. This is followed by a discussion on the major Asian export players of fresh tropical fruits to the world market, and lastly offers insights on the nutritional content and health benefits of the six selected fruits to be studied. This paper then provides a brief overview of the production status of these fruits in Malaysia. This is followed by the methodology section which offers the method used in assessing the competitiveness of Malaysian tropical fruits in relation to its five competitors identified above. The paper then continues with findings and discussion, followed by summary and recommendations.

## 2. Literature Review

### 2.1 Competitiveness and Comparative Advantage Theories

The economic theory of 'comparative advantage' was first coined by David Ricardo. The theory explains the reason countries engage in international trade even when one country's workers and resources are more efficient at producing everything than workers in other countries. The principal idea of comparative advantage is that under free trade, one will produce more of and consume less of a good for which one has a comparative advantage. Basically, it urges nations to specialize in areas where they have the highest level of competitiveness.

The comparative advantage theory contrasted the earlier concept of ‘absolute advantage’ by economist Adam Smith. The absolute advantage theory explains the reason countries should specialize in doing what they are best at producing most cheaply (see Thornton (2014)). The argument is that a nation having the ability to produce more with the most minimum resources, shall have the absolute advantage to produce. On the other hand, if a foreign country can supply us with a commodity more cheaply than we can make it, it would be better to buy it using the revenue created by our production of something we are more efficient in. In the case of one having no absolute advantage in anything, then no trade will occur. Ultimately, it was Ricardo’s comparative advantage concept that drove most of international trade.

One of the first attempts to measure comparative advantage was (Balassa (1965)) Revealed Comparative Advantage (RCA) index using the variables generated from the post-trade equilibria. It basically measures normalized export shares, with respect to the exports of the same industry in a group of reference countries. Since then, it has been widely used and accepted in analyses of comparative advantage. Revealed Comparative Advantage measurement is still valid and comparable in determining comparative advantage across nations (see Ana Shohibul (2013)).

This paper is not the first to use international trade data to measure competitiveness. Several other studies have also used Balassa index to identify a country’s strong sectors (see Ferto and Hubbard (2002), Civan and Serin (2008), Suntharalingam et al. (2011) and Nur Fazliana et al. (2015)).

The RCA index has been proven to be a useful tool in identifying comparative advantages of Malaysia in the fruit industry. Suntharalingam et al. (2011) measured Malaysia’s competitive position for four selected fruits (banana, watermelon, papaya and pineapple) during the 2000-2008 period. This current study uses data set between 2009 and 2014 for these four fruits to complement the initial study that was undertaken. Since the period in which this current study was undertaken is more recent, hence, the findings of this study depicts the current state of Malaysia’s fruit exports. Additionally, this current study added on two fruits, i.e., starfruit and mango, as they were identified in the national food policy to be important in contributing to the nation’s fruit exports. Collectively, both study findings, previous and current studies, offer a better insight to Malaysia’s competitiveness performance for the last fifteen years. Further, this current study shows the performance of our fruits trade in comparison with the performance demonstrated in the study that was undertaken by Suntharalingam et al. (2011) for the four fruits. Between these two studies, we are able to determine whether our tropical fruit exports competitiveness has improved or left to be desired.

## 2.2 Major Asian Export Players of Tropical Fruits Globally

The export shares of tropical fruits to the world market among Asian countries are shown in Figure 1. Three of these exporters are from ASEAN, namely

The Philippines, Thailand and Indonesia, and two are from Asia, i.e., China and India. Collectively, the export share of these six fruits is dominated by The Philippines (46%), followed by Thailand (23%), India (16%), China (10%), Malaysia (4%) and Indonesia (1%).

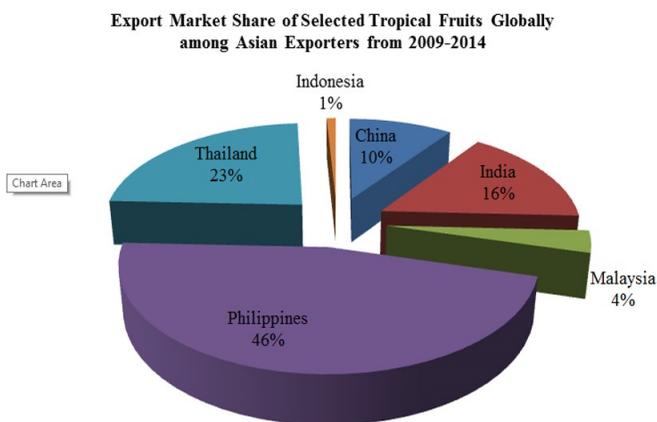


Figure 1: Export market share of selected tropical fruits globally among Asian exporters, 2009-2014.  
Source: Author's calculation from UN COMTRADE

### 2.3 Nutritional Content and Health Benefits of Selected Tropical Fruits

According to Devine et al. (1998), fruits are found to be nutritious as they are enriched with vitamins, minerals and other essential nutrients. Fruits are also found to be naturally low in calorie content and offer dietary fiber needed for human bodies. Its low energy density substance makes it a good choice for those in search of a reduced-calorie diet for weight management purposes. Demand prospects for fresh tropical fruits are expected to be favorable, due to the increasing number of health-conscious consumers.

Most of the following discussion on the nutritional content of the selected fruits is obtained from the National Nutrient Database of USDA (2015). Fresh and ripe papaya has high vitamin-C content, as compared to orange or lemon. Papaya (scientific name; *Carica papaya*) is also an excellent source of Vitamin A and carotenes. According to Garewal (1993), consumption of natural fruits rich in carotenes are known to protect the body from lung and oral cavity cancers.

Banana or its scientific name *Musa acuminata*, is rich in potassium content, an essential mineral for maintaining normal blood pressure and heart function. Additionally, sterol content in bananas benefits the cardiovascular system in humans by blocking cholesterol absorption, helping to keep blood cholesterol levels in check (see Bazzano et al. (2002)).

Watermelon (scientific name: *Citrullus lanatus*) being mostly water has very low calories. The pulp which is usually red indicates its high content of

lycopene, an antioxidant lauded for its ability to minimize cancer risks (see Sharoni et al. (2012)). In addition, watermelon also offers important minerals like potassium and magnesium, which are electrolytes that are responsible to lower the pH levels, and influence the amount of water in one’s body (see Lakshmi and Kaul (2011)). The lack of potassium and magnesium can cause cramps or muscle spasms.

Starfruit is another fruit that contains high antioxidants, known as *proanthocyanidins*. It is also a nutritious source of vitamin C. Starfruit is scientifically known as *Averrhoa carambola*, which explains why starfruit tree is often referred to as carambola tree.

Pineapple or scientifically known as *Ananas comosus*, does not contain saturated fats or cholesterol. It contains a proteolytic enzyme bromelain that digests food by breaking down protein. Bromelain also has anti-inflammatory, anti-clotting and anti-cancer properties. It aids in digestion and provides a natural pain-reliever enzyme in UMMC (2015).

Another tropical fruit rich in vitamins, minerals and antioxidant compounds is mango (scientific name: *Mangifera indica*). Mangoes are rich in pre-biotic dietary fibers where fiber plays a role in gut health. Higher intakes of dietary fiber are linked to low cardiovascular disease (see Slavin (2013)).

## 2.4 Production Status of Selected Tropical Fruits in Malaysia

Three fruits, namely pineapple, banana and watermelon are highly produced in Malaysia. Each of them, respectively exceeds 200 metric tonnes (mt) per year (Figure 2).

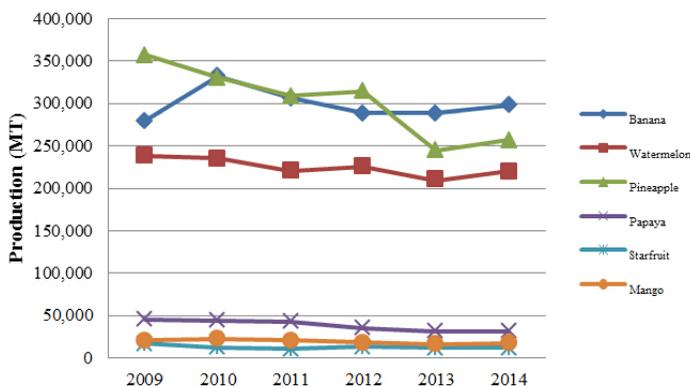


Figure 2: Production (mt) for Selected Malaysian Tropical Fruits, 2009-2014.  
 Source: Ministry of Agriculture, Malaysia (2015)

The map below offers an overview of the planting areas of the six fruits focused in this paper (Figure 3) and hence, the discussion that follows suit focuses on these fruit types. Johor is found to have the largest area of fruit cultivation with 15,263 ha (Table 1).

The second largest fruit cultivation state is Sarawak, with approximately 6,936 ha. Pahang follows suit with 4,700 ha. Three reasons attributable to high fruit cultivation in these states are:

- 1) availability of land
- 2) favorable soil condition
- 3) suitable environmental setting



Figure 3: Map of top three planted area (by state) for selected tropical fruits.  
 Source: Ministry of Agriculture, Malaysia (2015)

Table 1: Total selected fruit type cultivation in each state

State	Planted Area (Ha)
Johor	15,263
Negeri Sembilan	213
Selangor	121
Perlis	780
Pahang	4,700
Sabah	2,430
Sarawak	6,936
Kelantan	1,773
Terengganu	1,368
Grand Total	33,584

Source: Ministry of Agriculture, Malaysia (2015).

Among the six fruit types, banana is highly cultivated followed by pineapple and watermelon (Table 2). Large area of lands in Johor, Pahang and Sarawak, are allocated for banana cultivation. Starfruit production is mainly concentrated in three states, i.e., Sarawak, Negeri Sembilan and Selangor. Meanwhile, papaya with its production value reaching almost RM70 thousand is mainly planted in Johor, Pahang and Sarawak (see MOA (2015)). Mangoes on the other hand are largely grown in Sabah and Sarawak, besides Perlis in the Peninsula. The Johor state is the main cultivation area for pineapple in Malaysia. Within Johor, pineapples are mainly grown in three

districts, Pontian, Kluang and Muar. Sabah and Sarawak also provide large areas for pineapple cultivation, with more than 1,000 hectares, respectively. Meanwhile, major states that cultivate watermelon are Johor, Kelantan and Terengganu.

Table 2: Top three planted area in the states of Malaysia for selected fruit types

Fruit Type	State	Planted Area(Ha)
Starfruit	Sarawak	139
	Negeri Sembilan	213
	Selangor	121
	Sub-total	473
Papaya	Johor	853
	Pahang	187
	Sarawak	182
	Sub-total	1,222
Mango	Perlis	780
	Sabah	1,115
	Sarawak	1,152
	Sub-total	3,047
Pineapple	Johor	5,099
	Sarawak	1,934
	Sabah	1,315
	Sub-total	8,348
Watermelon	Johor	2,985
	Kelantan	1,773
	Terengganu	1,368
	Sub-total	6,126
Banana	Johor	6,325
	Pahang	4,514
	Sarawak	3,529
	Sub-total	14,368
Grand Total		33,584

Source: Ministry of Agriculture, Malaysia (2015).

### 3. Methodology

#### 3.1 Analysis

This paper adopts the most commonly used RCA index: the Index of RCA as explained in the previous section (see Balassa (1965)). This paper examines the comparative advantage or disadvantage of Malaysia’s fruits in relation to its rivals during 2008-2014 focusing on: 1) General fresh tropical fruits, and 2) Selected fruit types. The selected fruits, as mentioned previously are banana, watermelon, papaya, pineapple, starfruit and mango.

The RCA index is measured by:

$$RCA = \ln(X_{iB}/X_B)/(X_{iA}/X_A) \quad (1)$$

where :

1.  $X_{iB}$ : Malaysia's exports of produce i to the world
2.  $X_B$  : Malaysia's total agricultural exports to the world
3.  $X_{iA}$  : Rival country's exports of produce i to the world
4.  $X_A$  : Rival's country total agricultural exports to the world

## 3.2 Data

Trade data covering the period between 2009 and 2014 was gathered from the United Nations Commodity Trade Statistics Database (UN COMTRADE) following the Harmonized Code System (HS) classification at the two digit level (edible fruits and nuts) and the four, six and nine digit levels (disaggregated levels) based on the 2012 Customs Duties Order:

- a) banana (08.03)
- b) watermelon (0807.11)
- c) papaya (0807.20)
- d) pineapple (0804.30)
- e) starfruit (0810.90 160)
- f) mango (0804.50 200)

The value of the RCA index ranges from zero to infinity ( $0 \leq RCA_{iB} \leq \infty$ ). A positive RCA value is an indication that Malaysia has a comparative advantage in exporting selected fruit type against its five rival countries. Conversely, a negative value may be interpreted otherwise. A higher positive value represents a higher competitiveness level while a higher negative value indicates a lower competitiveness level.

# 4. Findings and Discussion

## 4.1 RCA Results and Discussion

The RCA Balassa index values calculated for edible fruits and nuts, banana, watermelon, papaya, pineapple, starfruit and mango, respectively in the world market are shown in Table 3.

Table 3: RCA Results, 2009-2014

	2009	2010	2011	2012	2013	2014
<b>Edible fruits and nuts</b>						
Malaysia vs China	-5.8	-6.0	-5.5	-3.8	-4.3	-2.9
Malaysia vs India	-3.5	-3.7	-3.7	-1.9	-2.5	-1.3
Malaysia vs Indonesia	n.a	-1.5	-0.3	1.4	1.0	n.a
Malaysia vs Philippines	-4.4	-4.5	-3.8	-2.5	-3.4	-2.2
Malaysia vs Thailand	-4.6	-4.8	-4.2	-2.6	-3.4	-2.2
<b>Banana</b>						
Malaysia vs China	0.7	0.9	0.8	1.0	0.9	1.6
Malaysia vs India	-1.5	-1.4	-0.8	-0.9	-0.5	-1.1
Malaysia vs Indonesia	n.a.	5.1	2.1	2.2	1.1	n.a.
Malaysia vs Philippines	-5.8	-5.6	-5.8	-6.3	-6.3	-6.3
Malaysia vs Thailand	-0.2	0.0	-1.6	-0.5	-0.3	-0.6
<b>Watermelon</b>						
Malaysia vs China	0.7	1.0	0.7	0.5	0.4	0.2
Malaysia vs India	1.6	1.4	1.5	1.7	1.6	1.8
Malaysia vs Indonesia	n.a.	6.5	4.8	4.4	3.8	n.a
Malaysia Philippines	3.4	2.5	3.4	2.8	5.0	4.8
Malaysia vs Thailand	4.8	5.2	5.4	5.2	5.5	5.8
<b>Papaya</b>						
Malaysia vs China	5.1	5.4	3.2	2.4	2.3	1.5
Malaysia vs India	0.6	0.7	0.5	0.7	1.0	1.0
Malaysia Indonesia	n.a.	4.6	2.9	5.8	5.9	n.a
Malaysia vs Philippines	-0.7	-0.2	-0.8	-0.9	-0.9	-0.6
Malaysia vs Thailand	3.0	2.5	1.7	2.3	2.9	2.6
<b>Pineapple</b>						
Malaysia vs China	2.1	2.1	1.6	1.8	1.8	2.4
Malaysia vs India	2.1	1.9	1.4	1.7	1.6	1.4
Malaysia vs Indonesia	n.a.	5.2	7.8	4.1	4.2	n.a.
Malaysia vs Philippines	-4.0	-3.6	-4.3	-4.6	-4.7	-4.3
Malaysia vs Thailand	7.1	5.3	4.9	4.9	4.5	4.7
Malaysia vs Vietnam	0.7	0.9	-0.7	2.8	4.2	n.a.
<b>Starfruit</b>						
Malaysia vs China	-0.7	-0.8	-1.4	-1.6	-1.5	-1.5
Malaysia vs India	-0.9	-0.4	-1.0	-1.0	-0.8	-1.0
Malaysia vs Indonesia	n.a.	2.0	2.2	1.9	1.8	n.a.
Malaysia vs Philippines	3.9	4.4	2.0	3.9	4.0	3.1
Malaysia vs Thailand	-2.0	-2.0	-2.7	-2.9	-2.7	-2.7

	2009	2010	2011	2012	2013	2014
<b>Mango</b>						
Malaysia vs China	1.1	0.8	0.6	0.7	1.2	1.4
Malaysia vs India	-4.4	-4.8	-4.2	-3.7	-2.6	-2.3
Malaysia vs Indonesia	n.a.	-1.4	-1.3	-1.8	0.4	n.a
Malaysia vs Philippines	-3.9	-4.7	-5.2	-4.9	-3.5	-3.6
Malaysia vs Thailand	-2.9	-3.4	-3.3	-3.6	-2.8	-2.5

*Note: Highlighted fields indicate Malaysia's comparative advantage over its rivals for the fruit type.*

#### 4.1.1 Edible fruits and nuts

Generally, Malaysia has lost its competitive edge to four out of five rivals for fruit and nut exports. Malaysia gained a slight advantage over Indonesia only in 2012 but that was not sustained in the following year. The findings of this study showed slight improvement over Malaysia's competitive position during the 2000-2008 period, in a study carried out by Suntharalingam et al. (2011). The findings of these two studies demonstrate that in general, Malaysia is not competitive in the edible fruits and nuts category.

#### 4.1.2 Banana

Over the six year period, Malaysia has a slight comparative advantage over China and greater comparative advantage over Indonesia. However, India, The Philippines and Thailand demonstrated greater comparative advantage over Malaysia in the global banana trade. The findings of this study somewhat follow closely with the findings from the previous study by Suntharalingam et al. (2011), in which among the five countries, Malaysia was found to lose significantly to its close rival, Philippines from 2000-2008. Both studies, i.e., previous and current demonstrated that Malaysia showed a higher comparative advantage over Indonesia and a slight better advantage over China during the past 15 years (2000-2014). In addition, Suntharalingam et al. (2011) showed that beginning 2008, Malaysia began losing its competitive advantage to Thailand and India, respectively. The current study undertaken demonstrated that Malaysia continues to lose its comparative advantage to these two nations between 2009 and 2014. This clearly shows that while Malaysia is at a disadvantage in exporting banana to the world as compared to The Philippines, India and Thailand, it has advantage over China and Indonesia.

#### 4.1.3 Watermelon

Over the last six years, Malaysia has a high comparative advantage in the global watermelon market. It has a significant advantage in exporting watermelon as compared to The Philippines, Thailand and Indonesia, a moderate advantage over India and a relatively smaller comparative advantage over China. It was found that the comparative advantage Malaysia has over Thailand, India, Indonesia and Philippines in this study period is similar with the period under study by Suntharalingam et al. (2011). This indicates that Malaysia has a relatively stable comparative advantage over Thailand, India, Indonesia and The Philippines over the last 15 years. However, as previously cautioned by Suntharalingam et al. (2011), Malaysia needs to be watchful of China. The competitive gap between Malaysia and China has narrowed

drastically over the last 15 years, demonstrating that China is slowly encroaching into Malaysia's watermelon competitive space.

#### 4.1.4 Papaya

Malaysia has comparative advantage over all its rivals except The Philippines in the global papaya market. Prior to 2006, Malaysia was the leader in papaya exports among the five major Asian players in Suntharalingam et al. (2011). Unfortunately, for the last eight years, Malaysia is no longer competitive in the global papaya market. While it has a greater comparative advantage as compared to Indonesia and Thailand in exporting papaya to the world, it is also slowing and losing its competitiveness to China and India. China seems to be seen as a power to be reckoned with.

#### 4.1.5 Pineapple

Malaysia has demonstrated that it has comparative advantage over four out of its five rivals in the global pineapple market. The Philippines continues to be the leader over the last six years. Suntharalingam et al. (2011) found the same during the 2000-2008 period. The comparative advantage Malaysia has over China, India and Indonesia is somewhat stable over the last 15 years. However, Malaysia has shown significant advantage over Thailand in exporting its pineapple worldwide. The reasons for this significant positive progress calls for an in depth study.

#### 4.1.6 Starfruit

Between 2009 and 2014, Malaysia has a comparative advantage over Indonesia and Philippines in the global starfruit market. Unfortunately, we have lost our competitive position to China, India and Thailand.

#### 4.1.7 Mango

Four out of five countries, i.e., India, Indonesia, Philippines and Thailand have comparative advantage over Malaysia in marketing its mangoes worldwide. Only with China, Malaysia has a comparative advantage.

## 5. Summary and Recommendation

The findings of this study demonstrate that Malaysia has a competitive edge in selected fruit types over some countries. Generally, the RCA analysis showed that Malaysia has a comparative advantage over all its five rivals in the global watermelon market. However, China has narrowed the competitive gap with Malaysia in this fruit market. For the global banana market, Malaysia was found to have a comparative advantage over China and Indonesia. It was also found to be the second most competitive nation in exporting papaya and pineapple, after Philippines. However, Malaysia needs to pay extra attention on competitive positioning of China and India in the papaya market as they seem to be gaining momentum. Malaysia also has an advantage over Indonesia and Philippines in the global starfruit market. Meanwhile in the world mango market, Malaysia has a comparative advantage only over China.

In order to sustain its competitive position in the watermelon market, Malaysia should venture into downstream processing so as to add value, instead of focusing solely on marketing a whole fruit. Additionally, the size of the watermelon fruit must be reviewed to reflect consumer preference. Generally, size of fruits is slowly decreasing as a typical consumer prefers to consume fresh fruits at one-go, instead of storing them in the refrigerator for several days. These days, consumers are leaning towards harnessing the nutritional benefits of fresh produce as soon as they make a purchase. They tend to minimize the storage period as they realize fruits that are freshly harvested offer higher nutritional benefits as compared to fruits that are stored.

Additionally, exporting tropical fruits that are minimally processed may raise their export value. Research and development activities will need to be intensified to improve on existing fruit processing methods and to develop new fruit-based products for consumption. Further, Suntharalingam et al. (2015) reported that post-harvest issues must be tackled so to ensure that fruit freshness and quality are not compromised upon reaching destination markets.

The increased awareness of the general population towards cultivating healthy eating habits should be seen as an opportunity towards increasing demand of tropical fruits. It has been established in Section 2.3, that tropical fruits offer many health benefits as they are high in nutritional content. Some tropical fruits have also been found to serve as natural sweet ingredient that could replace an otherwise high sugar content product. Promoting the benefits that tropical fruits offer could serve as a marketing strategy towards increasing the sale of tropical fruits.

As such, in order to be better able to compete globally in tropical fruits trade, Malaysia must first seek to understand the market demand and cater to the needs of respective markets. By understanding the market, Malaysia can then adopt a marketing effort to promote the fruit type that is highly demanded in the respective markets. Additionally, it is time for Malaysia adopt a strategic approach in order to remain relevant and competitive in the global fruit exports. Malaysia must be focused on the type of fruits that it plans to market. Should we focus on being competitive in all fruit types, or be selective in certain fruits in which we have comparative advantage over our rivals, i.e., watermelon?

Efforts in adopting innovative technologies to customize fruit varieties that adhere to specific market requirement (Suntharalingam et al. (2011)) must be intensely pursued. The growing population and improvement in economic well being of developing economies could translate into higher demand for fresh and processed fruits, ready-to-serve canned fruit products and fruit juices. Collaboration initiatives between the agriculture and tourism sectors can assist in introducing Malaysian fruits to international visitors, which may boost demand and increase comparative advantage of our local fruits. With the growing confidence of global consumers towards hypermarkets and supermarkets, these modern marketing outlets have shown to be among the preferred channels for promotion and distribution of agricultural produce, including local fruits. As such, fruit supply chain management must be strengthened to avoid post harvest losses and wastage. This will require adopting an inclusive approach, in which emphasizes the perspectives of various stakeholders involved in the fruit chain. Policies, programs and strategies pertaining to marketing of fruits require collective effort and commitment from public and private sectors, alike.

Malaysia must also pay attention to the signing of various trade agreements. While the main aim of trade agreements is to liberalize flow of goods and services between nations, precautions must be practiced. Tariff and non-tariff barriers are rarely discussed in depth within national context before trade negotiations at a higher platform takes place, and this could hamper the benefits Malaysia plans to attain from free trade. Predictions of trade benefits must not be overrated so as to impinge into the nation's best interest of ensuring the sustainability of our tropical fruit industry.

## Acknowledgement

The authors gratefully acknowledge the financial support from the Malaysian Agricultural Research and Development Institute (MARDI). The authors would also like to thank Mr. Mohd Zaffrie Mat Amin and Ms. Noorlidawati Ab Halim who assisted during the interpretation of the analysis for this study.

## References

- Ana Shohibul, M. A. (2013). Revealed comparative advantage measure: Asean-china trade flows. *Journal of Economics and Sustainable Development*, 7:136–145.
- Balassa, B. (1965). Trade liberalization and revealed comparative advantage. *The Manchester School of Economic and Social Studies*, 33:99–123.
- Bazzano, L. A., He, J., and Ogden, L. G. (2002). Fruit and vegetable intake and risk of cardiovascular disease in us adults: the first national health and nutrition examination survey epidemiologic follow-up study. *The American Journal of Clinical Nutrition*, 76:93–99.
- Civan, A. and Serin, V. (2008). Revealed comparative advantage and competitiveness: A case study for turkey towards the eu. *Journal of Economics and Social Research*, 10:25–41.
- Devine, C. M., Connors, M., Bisogni, C. A., and Sobal, J. (1998). Life-course influences on fruit and vegetable trajectories: Qualitative analysis of food choices. *Journal of Nutrition and Education*, 30:361–370.
- Ferto, I. and Hubbard, L. J. (2002). Revealed competitive advantage and competitiveness in hungarian agri-food sectors technology foresight in hungary. *Institute of Economics Hungarian Academy of Sciences Discussion Papers, Budapest*.
- Garewal, H. S. (1993). Beta-carotene and vitamin e in oral cancer prevention. *Journal of Cellular Biochemistry Supplement*, 17F. Review. PubMed PMID: 8412203.
- Lakshmi, A. and Kaul, P. (2011). Nutritional potential, bioaccessibility of minerals and functionality of watermelon (*citrullus vulgaris*) seeds. *Food Science and Technology*, 44:1821–1826.
- MATRADE (2015). Malaysia external trade development corporation. Accessed: 21 August 2015 at <http://www.matrade.gov.my/en/malaysian-exporters/going-global/understanding-free-trade-agreements>.
- MITI (2015). Ministry of international trade and industry. Accessed: 21 August 2015 at <http://fta.miti.gov.my/?mid=49>.

- MOA (2015). *Agrofood Statistics*. Ministry of Agriculture and Agro-based Industry, Putrajaya, Malaysia.
- Nik Rozana, N. M., Tengku Ariff, T. A., and Abu Kasim, A. (2013). Current status and future perspectives of agricultural trade: The case of Malaysia. Paper presented during the International Seminar on the Threats and Opportunities of the Free Trade Agreements in the Asian Region on 29 September - 3 October 2013 at Seoul, Korea.
- Nur Fazliana, M. N., Nor Azlina, S., and Rashilah, M. (2015). Daya saing industri rumpai laut di Filipina melalui kajian kumpulan fokus. *Economic and Technology Management Review*, 10a:65–73.
- Sharoni, Y., Linnewiel-Hermoni, K., Zango, G., Khanin, M., Salman, H., Veprik, A., Danilenko, M., and Levy, J. (2012). The role of lycopene and its derivatives in the regulation of transcription systems: Implications for cancer prevention. *American Journal of Clinical Nutrition*, 96:1173–1178.
- Slavin, J. (2013). Fiber and prebiotics: Mechanisms and health benefits. *Journal of Nutrients*, 5:1417–1435.
- Suntharalingam, C., Kanapathy, K., Othman, A. S., Dardak, R. A., Shah, M. D. M., Harun, A., and Ahmad, M. F. (2015). Marketing Malaysian fruits to British consumers: Exploring influential factors. *Economic and Technology Management Review*, 10b:121–133.
- Suntharalingam, C., Tengku Ariff, T. A., Abu Kasim, A., Rawaida, R., and Noorlidawati, A. H. (2011). Competitiveness of Malaysia's fruits in the global agricultural and selected export markets: Analyses of revealed comparative advantage and comparative export performance. *Economic and Technology Management Review*, 6:1–17.
- Thornton, P. (2014). *The Great Economists: Ten Economists Whose Thinking Changed the Way We Live*. FT Publishing, United Kingdom.
- UMMC (2015). Complementary and alternative medicine guide: Bromelain. Accessed: 13 August 2015 at <http://umm.edu/health/medical/altmed/supplement/bromelain>.