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Revealed Comparative Advantage (RCA) of Asean 5 Countries Watermelon in the Global Market

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ABSTRACT

Watermelon is an important commercial fruit commodity in ASEAN. However, limited research was undergone regarding the comparative advantage of watermelon trade in ASEAN 5 countries. This study aims to determine the comparative advantage of ASEAN 5 countries' watermelons, namely Laos, Malaysia, Myanmar, Thailand and Vietnam. Data were collected from the United Nations Commodity Trade Statistics Database for the six years period (2014-2019) and analyzed by the method of the revealed comparative advantage (RCA) and revealed symmetric comparative advantage (RSCA). The results show that Laos and Myanmar had a comparative advantage of watermelon trade in the global market. This study suggests that the countries should focus on innovation (product, process, market and institutional) in order to maintain their comparative advantage of watermelon in the international market.

Keywords: ASEAN, RSCA, Revealed Comparative Advantage, Watermelon

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INTRODUCTION

Watermelon *Citrullus lanatus* (Thunb.) is an important commercial fruit in the world. Watermelon originally was found and cultivated in western Kalahari region of Namibia and Botswana, Africa. It was first used as a source of water during periods of drought (Grubben, 2004). There are many types of watermelon in international market due to their diversity in shape, size, rind color and pattern, flesh, maturity date, seeded and

seedless. Production and consumption of seedless are becoming higher as compare to seeded watermelon. Today, watermelon becomes an export fruit crop along with the everyday fruit like bananas, orange, papaya, apples and grape in Southeast Asian nations (Wijesinghe et al., 2020). Watermelon is consumed all over the world. Both watermelon rind and watermelon seed are not food waste. Watermelon seeds are a rich source of Vitamin B- complex.

On the other hand, watermelon rind is a great source of fatty acids, minerals, and phenolic compounds dietary fibers. These by-products are potential sources of functional compounds, and create novel/value added food products (Khan et al., 2021).

The Association of Southeast Asian Nations (ASEAN) was established on 8 August 1967 in Bangkok, Thailand. It is also known as a Southeast Asian regional cooperative organization. The objectives of ASEAN are as follow (ASEAN, 2020); (i) a highly integrated and cohesive economy, essentially facilitated in the free trade area; (ii) a competitive, innovation and dynamic region, with such elements effective competition, consumer protection and sustainability; (iii) enhanced connectivity and sectoral cooperation in transportation, information and communications technology, e-commerce, food, agriculture and forestry and energy; (iv) a resilient, inclusive, people-oriented and peoplecentered region on equitable economic development; and (v) integration the region into the global economy. Some of the major initiatives have been agreements on ASEAN free trade area (AFTA) and ASEAN investment area (AIA).

More than fifty years, global agricultural trade was advanced considering the comparative advantage

and net trade specialization in farm products. The idea of agricultural trade had been based on the comparative advantage, firstly introduced by Ricardo (1817). Ricardo argued that the concept of comparative advantage is not absolute but comparative advantages are responsible for international trade between nations. There are three basic disciplines in agreement on agriculture: (1) increase market access, (2) reduce domestic support measures and (3) reduce subsidized exports. Trade may take place in the world markets because of five reasons, namely differences in technology, differences in resource endowments, differences in demand, existence of economies of scale in production and, existence of government policies.

The previous research related to the analysis of comparative advantages of agricultural and food products using Revealed Comparative Advantage had been implemented in ASEAN countries. Mizik et al. (2020) stated that raw material and processed agri-food in ASEAN was more competitive than global trade for most of the countries from 2010 to 2018 supports by Balassa index. The recent literature argues that Agri-food production in Thailand, Indonesia, Vietnam and Malaysia had more comparative advantages compared to the other ASEAN member states. Mizik

(2021) reported that the patterns of the ASEAN Agri-food trade showed a tight connection between the theory and the practice. Although some studies had analyzed the Agri-food competitiveness patterns in ASEAN, the analysis of horticultural fruit crops is very limited. This study has a novelty from the previous research as it compared the comparative advantage of ASEAN 5 countries watermelon trade in the international market.

The reason why this study analyzed the specific comparative advantage of watermelon exports is that the global watermelon exports increased by more than 20% from 2014 to 2019. In the same period, the total value of ASEAN watermelon exports increased by more than 84%. The market share of ASEAN watermelon exports increased from 6.21% to 9.52% of the global market (Table1). Also, previous research related to watermelon trade analysis had not been widely found in the international literature.

In 2019, the world largest watermelon market share countries were led by Spain (24.75%), Mexico (18.41%), the United States of America (6.19%) and Italy (5.71%). These countries accounted for more than 50% of the global market. Five ASEAN nations occupied more than 9% of the global market share in the recent year. Between 2014 and 2019, the market share of Laos' watermelon exports increased from 0.06% to 1.17% of the global market. Vietnam has the fluctuation trend of watermelon exports share in the global market. Market share of Myanmar and Malaysia has the stability trends, more than 4% and 1% of total world exports, respectively (Table 2).

Other researchers have carried out various studies on the comparative advantages of agricultural food products in ASEAN (Mizik et al., 2020). However, there are very limited research discussing the competitiveness of watermelon trade in the international market. Competiveness is the ability

Table 1. Share of the ASEAN and ASEAN 5 largest watermelon exporters' exports in the global market (%)

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	Year	ASEAN	Myanmar	Vietnam	Malaysia	Lao	Thailand
	2014	6.21	4.69	0.09	1.32	0.06	0.005
	2015	7.44	4.61	1.08	1.35	0.36	0.007
	2016	12.53	4.43	6.43	1.25	0.39	0.009
	2017	11.54	4.34	5.47	1.15	0.54	0.014
	2018	10.26	4.27	4.31	1.06	0.60	0.023
	2019	9.52	4.20	3.09	1.01	1.17	0.047

Source: UNCOMTRADE, 2020 (processed)

Table 2. Share of the world 20 largest watermelon exporters' exports in the global market (%)

Watermelon Exporters	2014	2015	2016	2017	2018	2019
Spain	19.90	23.49	22.17	21.48	26.30	24.75
Mexico	19.13	23.03	19.24	14.87	13.61	18.41
USA	8.04	8.90	7.47	7.16	6.46	6.19
Italy	4.51	4.96	5.13	4.81	6.59	5.71
Morocco	1.45	2.27	2.08	4.71	6.62	5.26
Netherlands	5.92	4.31	3.53	4.80	5.17	4.96
Myanmar	4.69	4.61	4.43	4.34	4.27	4.20
Greece	3.36	3.45	2.97	3.02	3.35	3.34
Vietnam	0.09	1.08	6.43	5.47	4.31	3.09
Brazil	1.07	1.92	1.91	2.13	1.67	2.35
China, mainland	3.09	1.76	1.57	1.84	2.07	2.17
Iran	12.80	2.73	7.55	8.78	2.18	2.02
Costa Rica	1.08	0.94	1.18	1.39	1.27	1.56
France	0.60	0.94	0.77	1.01	1.42	1.38
Guatemala	1.45	1.60	1.51	1.55	1.58	1.30
Honduras	0.25	0.28	0.35	0.60	0.49	1.23
Laos	0.06	0.36	0.39	0.54	0.60	1.17
Malaysia	1.32	1.35	1.25	1.15	1.06	1.01
Panama	1.31	1.18	1.00	0.79	0.68	0.81
Senegal	0.60	0.46	0.41	0.50	0.30	0.71

Source: UNCOMTRADE, 2020 (processed)

Note(s): USA: United States of America, Laos: Lao Peoples Democratic Republic

to produce goods and services and maintain market share in domestic/or international market (Krugman, 1994). Therefore, this study aims to focus on the issue of the 5 ASEAN countries' watermelon trade in the global market. The objective of the study is to determine the comparative advantage of ASEAN 5 countries watermelon in the global market. This research also aims to answer the following research question; which 5 ASEAN countries has the most competitiveness in the watermelon trade?

METHODS

Data collection

Based on the secondary data, there are five top watermelon exporters in ASEAN, namely Laos, Myanmar, Malaysia, Thailand and Vietnam (UNCOMTRADE, 2020). Therefore, this study selected 5 ASEAN nations to understand the comparative advantages of watermelon exports in the international market. This research was intended to identify the export performance of watermelon in ASEAN 5 nations. The reason why this study chose 5 nations is that the selected

nations' watermelon exports increased by more than 85% from 2014 to 2019.

Data were obtained from the United Nations Commodity Trade Statistics Database (UNCOMTRADE, 2020) for the period 2014-2019. According to the Laos and Myanmar dataset, the initial year was in starts from 2014, while 2019 was the latest available year at this moment with data for all the analyzed countries. The watermelon export share of agricultural products is attached in the Appendix.

Data analysis

Balassa index had been widely used to determine a country's comparative advantage. The index or Revealed Comparative Advantages (RCA) index had been widely applied in the agriculture sector: Rice (Khai et al., 2016), Corn (Hoang et al., 2017), Vegetable Products (Laosutsan et al., 2017), Broiler Meat Products (Benalywa, 2019), Coconut Oil (Yulhar & Darwanto, 2019), Rice (Kea et al., 2020), and Agri-food (Mizik et al., 2020). However, there are several limitations associated to the Balassa index. The RCA index is limited for making it asymmetric, because it takes a value between zero and infinity (Rossato, 2018). Therefore, for solving asymmetric problem, Dalum et al. (1998) Revealed Symmetric Comparative Advantage index was employed to measure the comparative advantage.

The original index of the revealed comparative advantage (RCA) and revealed symmetric comparative advantage (RSCA) were determined by using the following equations (Balassa, 1965; Dalum et al., 1998):

$$B_{ij} = RCA_{ij} = \frac{\frac{X_{ij}}{\sum_{i} X_{ij}}}{\frac{\sum_{j} X_{ij}}{\sum_{i} \sum_{j} X_{ij}}}$$
(1)

$$RSCA = (RCA - 1) / (RCA + 1)$$
 (2)

Where, X_{ij} and $\Sigma_i X_{ij}$ represent the value of watermelon exports and the total value of agricultural exports from country j at the specific period. $\Sigma_i X_{ii}$ and $\Sigma_i \Sigma_j X_{ij}$ represent the total value of world watermelon exports and the total value of world agricultural products exports at the specific period in the international market. The numerator represents the percentage share of a given product in national exports— X_{ii} are exports of product i from country j. The denominator represents the percentage share of a given product in the world exports. According to Hinloopen and Marrewijk (2001), both RCA and RSCA can be divided into four classes.

Jing (2018) suggested that the method of Dalum et al (1998) can analyze the stability of comparative advantages of the fruit products. Therefore, this study applied the method of Dalum et al. (1998) to test the stability of the comparative advantage. The stability

Class a: $0 < RCA \le 1$ or $-1 < RSCA \le 0$; no comparative advantage Class b: $1 < RCA \le 2$ $0 < RSCA \le 0.33$; weak comparative advantage Class c: 2 < RCA≤ 4 $0.33 < RSCA \le 0.6$; medium comparative advantage Class d: 4 < RCAor 0.6 < RSCA; strong comparative advantage

of comparative advantage is analyzed by using linear regression with the following contributions:

$$RSCA_{ij}^{t2} = \alpha_i + \beta_i RSCA_{ij}^{t1} + \varepsilon_{ij}$$
 (3)

Where α and β are standard linear regression parameters, and ε is the residual disturbance. The superscripts t_1 and t_2 refer to the initial year and the final year, respectively. The dependent variable refers to the value of the RSCA in the final year t_2 for watermelon. The independent variable is the value of the RSCA in the initial year t_1 . When $\beta = R$ indicates that the comparative advantage unchanged. R is the regression correlation coefficient. If $\beta > R$, it indicates that the comparative advantage is strengthened and more specialized in watermelon. Whereas, if $\beta < R$, it suggests that the comparative advantage of watermelon is weakened. In addition, it can be interpreted using the ratio value of $\frac{\beta}{B}$, if the value is greater than 1, it means that the comparative advantage has been strengthened in the whole period. Oppositely, when the value is less than 1, it means that the comparative advantage has been weakened (Dalum et al., 1998).

RESULTS AND DISCUSSION Comparative Advantages of ASEAN 5 Nations Watermelon Trade

The results indicated that Laos and Thailand had increasing trends in the value of RCA and RSCA. Laos watermelon became an alternative economic opportunities fruit or agrientrepreneur fruit due to a greater demand for food in the border of Chinese market. Wanwimolruk et al. (2015) stated that it was safe to consume and export watermelon from Thailand as the residues of pesticides detected in some watermelons were low. These levels were lower than the recommended regulation of maximum residue limits of pesticide residues in watermelon. It may be one way to improve the competitiveness of watermelon export considering food safety impacts and consumers satisfaction on watermelon fruit "No consumers, No Competitiveness" in the international market.

The values of RCA and RSCA of Laos watermelon were 12.27 and 0.85, respectively. The values of RCA and RSCA were also greater than 4 and 0.6, respectively. It indicates that Laos had a strong comparative advantage of

watermelon in the international market. At the same year, the values of RCA and RSCA of Thailand watermelon were 0.02 and -0.96 indicating that this country had no comparative advantage of watermelon in the international market.

On the other hand, Malaysia and Myanmar showed a stabile trend. Vietnam had an unstable trend between 2014 and 2019 (Table 3). Pedroso et al. (2017) suggested that the net benefits of fruits and vegetables production were 9 times higher than of the rice production in Vietnam. However, one challenge for watermelon production is the high labor demands. In Vietnam, the values of RCA and RSCA were 2.40 and 0.41, respectively in 2019. The value of RCA was between 2 and 4. It reveals that Vietnam had medium comparative advantage of watermelon in the global market.

The results of descriptive statistics indicate the significant differences levels of comparative advantages in

watermelon in the 5 countries (Table 4). The average RCA and RSCA values of Myanmar were 17.05 and 0.89, respectively. The values of average RCA and RSCA were greater than 4 and 0.6, respectively. It indicates that Myanmar had a strong comparative advantage of watermelon. Myanmar had been significantly good at production and border trade of watermelon. Muse-Ruili (bordering China) was one of the most important border trade points for the watermelon producers and trader in Myanmar.

Laos had the average RCA and RSCA values of 6.34 and 0.67, respectively. It means that Laos also gained a comparative advantage of watermelon in the global market. Mizik et al. (2020) suggested that Laos and Myanmar had the highest competitiveness relatively exports in agri-food products in the world market since the productivity-based comparative advantages theory was

Table 3. RCA and RSCA of ASEAN 5 countries in the global market

		RC	Α			RSCA				
Year	MYA	VIE	LAO	MYS	THA	MYA	VIE	LAO	MYS	THA
2014	25.14	0.08	2.02	0.70	0.002	0.92	-0.85	0.34	-0.18	-1.00
2015	15.41	0.84	5.97	0.77	0.003	0.88	-0.09	0.71	-0.13	-0.99
2016	14.93	4.79	4.80	0.72	0.004	0.87	0.65	0.66	-0.16	-0.99
2017	15.64	3.95	6.11	0.68	0.006	0.88	0.60	0.72	-0.19	-0.99
2018	15.01	3.28	6.89	0.69	0.010	0.88	0.53	0.75	-0.19	-0.98
2019	16.15	2.40	12.27	0.67	0.020	0.88	0.41	0.85	-0.20	-0.96

Source: UNCOMTRADE, 2020 (processed)

Note(s): MYA: Myanmar, VIE: Vietnam, LAO: Lao Peoples Democratic Republic, MYS: Malaysia, THA: Thailand

partly valid to ASEAN countries. These countries had the highest agricultural potential and productivity excelling in the regional market. Between 2014 and 2019, Vietnam revealed the average RCA and RSCA values of 2.56 and 0.21, respectively. It shows that Vietnam had a medium comparative advantage.

Table 4. Descriptive Statistics of RCA and RSCA of ASEAN 5 countries

	RCA	RSCA
Laos		
Mean	6.34	0.67
Standard Deviation	3.37	0.17
Minimum	2.02	0.34
Maximum	12.27	0.85
Malaysia		
Mean	0.71	-0.17
Standard Deviation	0.04	0.03
Minimum	0.67	-0.20
Maximum	0.77	-0.13
Myanmar		
Mean	17.05	0.89
Standard Deviation	3.99	0.02
Minimum	14.93	0.87
Maximum	25.14	0.92
Thailand		
Mean	0.01	-0.98
Standard Deviation	0.01	0.01
Minimum	0.00	-1.00
Maximum	0.02	-0.96
Vietnam		
Mean	2.56	0.21
Standard Deviation	1.82	0.58
Minimum	0.08	-0.85
Maximum	4.79	0.65

Source: Own elaboration, 2021

In Malaysia and Thailand, the average RCA and RSCA values had lower

than the minimum value (below 1). It suggested that Malaysia and Thailand had no comparative advantages. In contrast, Rozana et al. (2017) found that Malaysia had a strong comparative advantage in the global watermelon market as compare with China, India, Indonesia, Philippines and Thailand between 2009 and 2014. The nation should continue to promote and produce products, reinforce new technology and enhance the cost competitiveness in order to increase a competition at international market share (Benalywa, 2019). Multiple cropping systems in Thailand might deal with the limitations of physical condition, social and economic factors, and farmer skills (Promkhambut & Rambo, 2017). To improve the competitiveness of watermelon, all stakeholders should be aware of the limitation's factors in their watermelon value chain.

Watermelon export destinations can be seen in Table 5. Laos, Myanmar and Vietnam concentrated in the Chinese market more than 98% of their total watermelon exports. Singapore market was the largest export destination for Malaysia which accounted for 64% of its total exported watermelon. Thailand exported its watermelon to Myanmar (29%), Laos (24%) and Singapore (16%). China and Singapore were the main watermelon export destinations for the countries. It could be concluded

Table 5. Watermelon Export Destinations of ASEAN 5 Countries

Thailand	% M	lalaysia	%	Vietnam	%	Myanmar	%	Laos	%
Myanmar	29 Sin	igapore	64	China	98	China	99	China	99
Laos	24 Ho	ng Kong	24	UAE*	0.6	Thailand	0.5	Vietnam	0.07
Singapore	16 UA	Æ*	6	Australia	0.3	India	0.1		

Source: Own elaboration using data from (UNCOMTRADE, 2020)

Note(s): UAE*: United Arab Emirates

Table 6. The Results of Stability Test

2014-2019								
Country	α		R	/R				
ASEAN 5 countries	-0.03***	0.81	0.79	1.02				

Source: Own elaboration

that China was the main watermelon market for Laos, Myanmar and Vietnam.

The stability test was exerted to evaluate the trade specialization pattern of watermelon for ASEAN 5 countries as whole. The results show that the value of coefficient β was less than 1, which means it is significant. The value of $\frac{\beta}{R}$ was greater than 1, indicating that the comparative advantage of the 5 ASEAN countries' watermelon had been strengthened within six years period. The results of the stability test confirmed that the comparative advantage of the 5 ASEAN countries' watermelon was increasing in the global market.

CONCLUSION AND SUGGESSTION

This study analyzed the comparative advantage of the ASEAN 5 countries watermelon in the global market between 2014 and 2019. The results show that Laos and Myanmar

had a strong comparative advantage of watermelon. The stability test confirmed that watermelon trade comparative advantage had been strengthened in all countries. Watermelon actors in all nations should focus on product innovation, process innovation, market innovation and institutional innovation in order to maintain the competitiveness of watermelon exports in the global market. Future research should focus on the analysis of the influencing factors on competitiveness of watermelon trade in ASEAN.

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 Competitiveness of Indonesian

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Appendix

Table 1. Share of Watermelon in the Agricultural Products exports from 2014 to 2019 (%)

Year	Laos	Malaysia	Myanmar	Thailand	Vietnam	World
2014	0.22	0.08	2.73	2.5E-04	0.01	0.11
2015	0.66	0.09	1.71	3.6E-04	0.09	0.11
2016	0.62	0.09	1.92	5.3E-04	0.61	0.13
2017	0.74	0.08	1.89	7.2E-04	0.48	0.12
2018	0.90	0.09	1.97	1.3E-03	0.43	0.13
2019	1.58	0.09	2.08	2.6E-03	0.31	0.13