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The Trade Competitiveness of Palm-Biodiesel in Renewable Energy Market

(Daya Saing Perdagangan Biodiesel Sawit di Pasaran Tenaga Boleh Diperbaharui)

Norashida Othman
Universiti Putra Malaysia

Zulkornain Yusop
Putra Business School
&
Universiti Putra Malaysia

Mohd Mansor Ismail
Institut Kajian Dasar Pertanian dan Makanan

Syamsul Herman Mohammad Afandi
Universiti Putra Malaysia

ABSTRACT

Following the decline of Malaysian biodiesel export revenue since 2009, the value has been fluctuating in recent years amid fierce global competition. Thus, it is important to assess the competitiveness of Malaysia-produced biodiesel. In comparison to other major biodiesel-producing countries including Indonesia, the United States of America, and Germany. Hence, this paper aimed to investigate the competitiveness of the Malaysian biodiesel industry based on the Relative Trade Advantage (RTA) indices with respect to the main competitors. Data from 2012 to 2016 were analyzed for selected biodiesel commodities. The RTA index indicated that Malaysia could potentially grow further despite being a minor producer. Hence, there is a need to strengthen the palm oil industry as it can be a definite source of higher export earnings.

Keywords: Competitiveness; palm oil; biodiesel; Relative Trade Advantage (RTA)

ABSTRAK

Hasil pendapatan eksport biodiesel dilihat semakin merosot dan menunjukkan trend yang tidak stabil sejak 2009. Oleh itu, adalah penting untuk menilai industri biodiesel di Malaysia masih mempunyai daya saing yang positif diperingkat antarabangsa atau sebaliknya. Artikel ini bertujuan untuk mengkaji daya saing Malaysia bagi produk biodiesel berdasarkan indeks kelebihan perdagangan relatif (RTA) berbanding dengan negara pegeluar utama produk biodiesel. Antara negara pengeluar biodiesel yang utama termasuk Indonesia, Amerika Syarikat dan Jerman. Data tahunan dari tahun 2012 hingga 2016 digunakan untuk tujuan analisis bagi komoditi biodiesel terpilih. Hasil kajian ini menunjukkan bahawa Indeks RTA bagi Malaysia mempunyai nilai positif. Ini bermaksud Malaysia mempunyai potensi untuk berkembang walaupun merupakan pengeluar kecil. Sehubungan itu, terdapat keperluan untuk mengukuhkan industri biodiesel di Malaysia, kerana ia dapat menjadi sumber pendapatan eksport yang lebih tinggi.

Kata Kunci: Daya saing; kelapa sawit; biodiesel; Kaedah Kelebihan Perdagangan Perbandingan

INTRODUCTION

The rise in fossil fuel prices caused by high demand has led the global oil industry to seek for alternative sources of fuel from renewable energy sources (e.g., biodiesel, bioethanol, biomethanol, and biohydrogen). Biodiesel is made in a chemical process called transesterification in which organically derived from combination of both vegetable oils or animal fats with an alcohol to form fatty esters with some chemical alteration, as for example polyethylene glycol esters trimethyl, propane esters and Methyl ester (Yusuf et al. 2011; Singh & Singh 2010).

Biodiesel is associated with the ability to reduce carbon monoxide emission and particulates, while degrading at a much faster rate than normal diesel fuel (Zhang et al. 2003; Demirbas 2007). The oils that most commonly used for its production include the following vegetable oils: soybean, palm, sunflower, rapeseed, cottonseed, peanut, and Jatropha (Singh & Singh 2010). International practices have lead to the use of a single nomenclature for the identification of biodiesel volume percentage in the diesel mixture. More specifically, B5, B10, and B100 are fuels with a concentration of 5%, 10%, and 100% of biodiesel, respectively (Yusuf et al. 2011).

Furthermore, palm oil is particularly known for its far better potential as the main feedstock for biodiesel production compared to other vegetable oils (Rahyla, Firdaus & Purwaningrum 2017). Such association is attributable to its production to be the most productive in terms of land use. Palm oil covers just 0.3% of agricultural land worldwide and yet has the highest yield compared to any other oilseed crops (MPOC 2019). For example, a global output of 65 million tons of palm oil in 2016 required the cultivation of merely 15 million hectares in comparison with a staggering 194 million hectares needed to produce 87 million tons of oil from soybean and rapeseed crops. Therefore, this renders oil palm plantations as having the highest oil yield per hectare compared to other vegetable oil crops. Figure 1 illustrates palm oil yield from palm plantations as ten times higher than that of soybean plantations and six times higher than rapeseed crops.

In particular, Malaysia is the second-largest supplier of palm oil in the global market after Indonesia and has supplied approximately 30% of the global export market, in contrast Indonesia's 60% dominance. However, the country is not among the top biodiesel producers, as seen in Figure 2. The United States is the world largest biodiesel producer; in 2016, it produced 5.5 billion liters. Meanwhile, Brazil produced 3.8 billion liters in that same year. Both countries utilize soybean as their biodiesel feedstock. In contrast, four European Union (EU) countries (i.e., Germany, France, Spain, and Belgium) produced more than 6 billion liters in 2016 and used rapeseed oil as their main feedstock. The neighbouring country of Indonesia ranked fourth in that same year by producing 3 billion liters of biodiesel and used palm oil as the major feedstock.

Figure 2 leads to the question whether Malaysia is competitive in biodiesel production. Despite the large production of palm oil (i.e. world's second-largest producer and exporter), why is the country not one of the top scorers in biodiesel production? Previously in 1982, Malaysia embarked on a comprehensive palm oil biofuel program through the aggressive stance of the Malaysian Palm Oil Board (MPOB). As a result, the government of Malaysia established the NBP (National Biofuel Policy) in 2006 to promote sustainable production and utilization of environmentally-friendly biofuel use of the five percent blend mandate (B5). The nomenclature indicates 5% biodiesel and 95% petrodiesel mixture, which serves as fuel for the transportation and industrial sectors. Apart from domestic consumption, local palm biodiesel has also been exported, which is mainly to the EU, Asia, and the USA. As of 2017, 16 biodiesel plants in Malaysia were operating with a total production capacity of 2.34 billion liters per year. However, domestic production of biodiesel recorded merely 0.907 billion liters, which were significantly below the full annual capacity.

Regardless, it remained to be seen that Malaysia's biodiesel exports increased from 95 thousand tonnes in 2014 to 180 thousand tonnes in 2015. The increment was partly due to the declining export supply from Indonesia due to their government-sanctioned increased local biodiesel consumption in 2015. Moreover, the devaluation of Malaysian currency relative to major trading currencies in 2015 was an additional factor resulting in biodiesel exports being cheaper in terms of the United States (US) dollar. As a result, the quantity of biodiesel exported by Malaysia increased. However, the export volume declined by about 50% to 80 thousand tonnes in 2016, whereby the export value was down by 48.8% to RM247.70 million in 2016 compared to RM483.57 million in 2015 (Figure 3). The decline in biodiesel exports in 2016 was mainly due to lower demands from the EU as a result of higher domestic soybean oil (SBO) usage as feedstock. That year, it

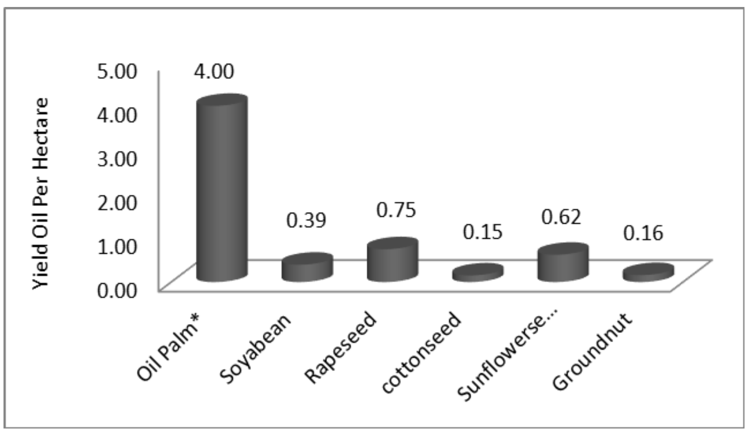

FIGURE 1. Major Oilseeds Yield Per Hectare, 2016
Source: Malaysia Palm Oil Board (MPOB), 2017

increased by 20.8% to 0.58 million tonnes compared to 0.48 million tonnes in 2015 (MPOB 2017). Regardless, the EU has remained a major export destination of biodiesel for Malaysia; in total, 83.5%, or 69,766 tonnes of the total biodiesel exports were destined to the locality in 2016.

In general, renewable energy from biodiesel is well-known as one of the most reliable substitutes for petroleum-derived diesel (Mekhilef, Siga & Saidur 2011; Lee, Johnson & Hammond 1995). Therefore, having an abundance of feedstock for biodiesel such as palm oil provides an opportunity for Malaysia to increase its trade competitiveness in the global market. Throughout this study, we endeavor to answer the following questions: (1) What is the level of trade competitiveness for Malaysia's biodiesel products in the global market relative to other major producers? and (2) How have the trade competitiveness patterns changed over the analyzed period? The remainder of the paper is organized as follows: the literature review section delineates a brief review on previous literature conducted on the studies of competitiveness related to palm oil industry. Following this, the methodologies applied in assessing the trade competitiveness and the results and discussion are presented accordingly, while a summary and conclusions made on the topic are included in the last section.

LITERATURE REVIEW

In terms of international trade, the concept of competitiveness is equivalent with the theory of national competitive advantage which are pioneer by Adam Smith in the year 1776 and David Ricardo in 1817 (Bojnec & Fertő 2009). In general, the absolute advantage theory

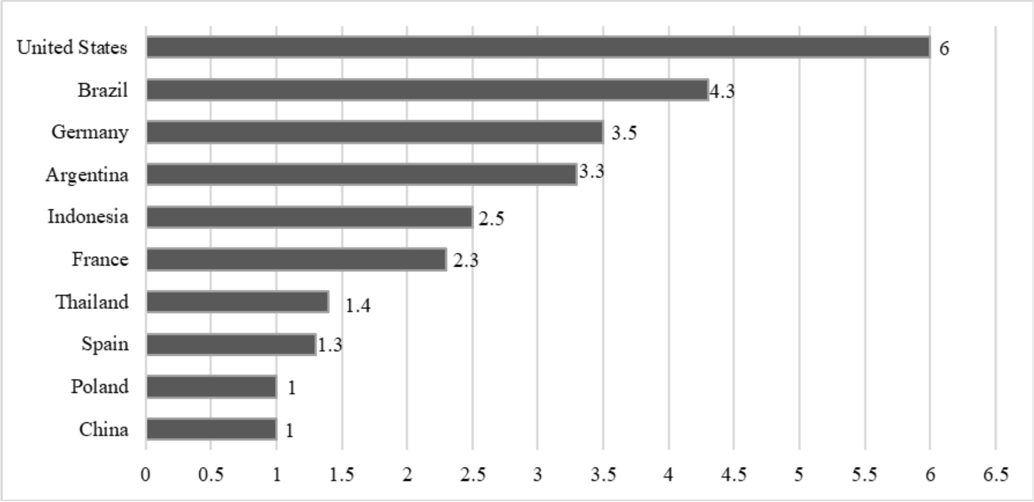

FIGURE 2. Top biodiesel producers worldwide in 2017 (billion liters)
Source: Renewables 2018 Global Status Report

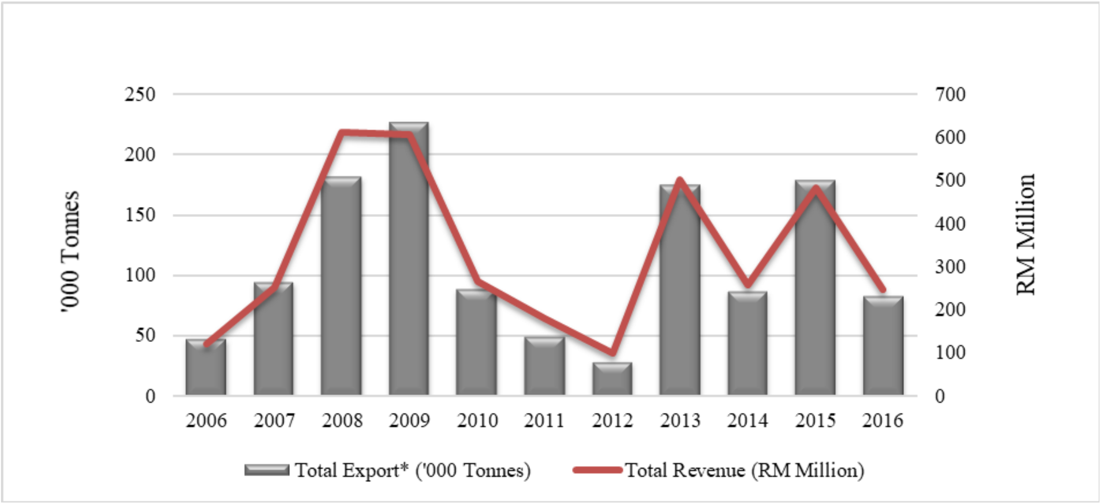

FIGURE 3. Total Exports and Total Revenue of Malaysia's Biodiesel (2006-2016)
Source: MPOB 2017

proposed by Smith (1776) states that a competitive nation holds at least one absolute advantage in one productive sector. However, the theory does not explain trade between countries with no absolute advantage in any of the production sectors. Due to the palpable vacuum in the absolute advantage theory, one is incapable of explaining the trades in countries that do not possess an absolute advantage in any sector, thus rendering the theory of comparative advantage in international trade to gain more importance. Accordingly, the concept of comparative advantage within the international trade theory was initially developed by Ricardo (1817). It revolves around the fact that it is not necessary for a country to possess an absolute advantage in a sector for higher exports. As per Smith (1776), if a country has the ability to produce one goods at a lower opportunity cost relative to another country, then that country can export such product as it has a comparative advantage for that particular goods. Hence, countries that specialize in certain goods generally have a lower opportunity cost of production compared to other countries. Even if it is not an efficient producer of the goods, it can still benefit from the trade activity as long as it specializes and exports the goods for which it possesses either relatively lower opportunity cost of production or higher comparative advantage (Davis & Weinstein 2003).

Heckscher and Ohlin (H-O) have further developed the Ricardian model in the early 20th century. In their model, the assumption of only one-factor input is replaced by the two factors of production comprising of land and labor. It is also assumed that the two goods being produced are either land-intensive or labor-intensive in nature. Following this, the comparative advantage of the country is determined by its relative factor endowments. In other words, a country specializes in the production of products requiring the factor endowments that are naturally more abundant in its locality (Husted & Melvin 1998). Therefore, a land-abundant country will specialize in land-intensive products, whereas a labor-abundant country will specialize in labor-intensive products. Thus, the H-O model explains international trade based on production and long-term natural advantages.

Some empirical studies based on classical international trade theory proposed to measure country specialization and trade competitive advantage with the consideration of an export commodity relatively. In other word, measuring the comparative advantage based on the "revealed" data is the best option since there is always lack of availability for the data for cost and productivity for every specific commodity and sector. The index of revealed comparative advantage (RCA) proposed by Balassa (1965) is based on the classical international trade theory (Ismail & Abdullah 2013). The index utilises revealed export data to calculate the ratio of a country's export share for one specific commodity in the international market to the country's export share of all other commodities.

However, the Balassa index has limitations such as 'double-counting' issue (i.e., country and sector considered are not exclude in the aggregates benchmarks) and not considering the importance of import simultaneously in the measurement. To eliminates any double-counting problem, Vollrath (1991) as cited by Bojnec and Fertő (2009) has suggested for the relative trade advantage (RTA) to be calculated as the difference between the relative export advantage index (RXA) and its counterpart, relative import specialization advantage index (RMA).

Most empirical studies for palm oil-related products have implemented traditional international trade performance as the key measure for international competitiveness. These works include those undertaken by Hassanpour and Ismail (2010); Rifin (2010); Arip et al. (2013); and Salleh et al. (2016). First, Hassanpour and Ismail (2010) have examined the Malaysian competitiveness of palm oil exports relative to other industrial plantation products in selected Association of Southeast Asian Nations (ASEAN) countries and China by using the RCA and Revealed Symmetric Comparative Advantage (RSCA) indices. The results obtained are indicative of Malaysia having a competitive advantage in palm oil and palm kernel oil production. In particular, Indonesia has ranked first in palm oil commodities while Malaysia ranks second in the competitiveness of palm oil products. While this study has considerable importance, the product categories taken into account in the study have not considered higher value-added products, such as biodiesel in the palm oil industries. In contrast, Rifin (2010) has utilized the constant market share (CMS) to analyze the export competitiveness for Indonesian and Malaysian palm oil exports across three regions, namely Asia, Europe, and Africa. The results have shown that Indonesia gains an increasing market share compared to Malaysia in Asian and African regions, whereas Malaysia's share is higher in the European market. This particular study has also limited the products chosen to the upstream sector of the palm oil industry made up of crude palm oil (CPO) and processed palm oil (PPO).

Besides these studies, the empirical analysis by Arip et al. (2013) has assessed the comparative advantage for the palm oil related products in Malaysia and Indonesia by using RCA. Their findings have shown that Malaysia is more competitive comparing with Indonesia in the most of their downstream palm oil products. However, this study has merely investigated 20 related palm oil products in which biodiesel products are not included. Moreover, Salleh et al. (2016) have claimed that there are limited empirical studies on the relative competitiveness of palm oil export products in the downstream sectors. Therefore, the work has opted to analyze the comparative advantage of CPO and PPO exports between the Malaysian and Indonesian palm oil sectors to five major markets, namely India, China, Pakistan, the USA and the European Union (EU). The study has employed the RCA index spanning from year 1999 to year 2014, with the results shows that Indonesia has a higher comparative advantage compared with Malaysia for the market in India, the EU, and China. Contrastly, Malaysia has a significant comparative advantage as compared with Indonesia for the market in USA and Pakistan. In this particular study, a noteworthy limitation is that the products related to the downstream sector are only restricted to PPO.

As such, the current work highlights several empirical gaps noted from previous studies. First, a limited amount of studies on palm oil competitiveness with a focus on biodiesel products has been underlined. Second, most of the previous studies have measured trade competitiveness by utilizing the RCA index (Bojnec & I. Fertő, 2006; Arip, Yee & Fang, 2013; Ismail & Abdullah 2013) in which the technique has been criticized by most scholars due to asymmetric values and double-counting issue. Third, comparative studies done to estimate palm oil competitiveness have been limited to Malaysia and Indonesia only, except for Hassanpour and Ismail's (2010) work, which includes ASEAN and China. Therefore, this study is attempting to fill the gaps by taking into account the biodiesel product at the harmonized system code (HS code) 6-digit code using RTA proposed by Volrath (1991). It further includes other major producers of biodiesel, such as Indonesia, the USA, Brazil, Germany, France, Thailand, and Spain. In summary, the current work aims to assess the relative trade competitive advantage/disadvantage of Malaysia's biodiesel products in the global market in comparison with other major biodiesel-producing countries.

METHODOLOGY

The competitive advantage is demonstrated by the individual commodity trade performance, in the sense that trade patterns will stimulate relative market costs (Bojnec & Fertő 2009). Therefore, it is important to determine the extent to which this sector is successful in selling its products from time to time in the world market compared to its competitors. To measure the competitiveness level under real-world conditions where its trade regime varies, the RTA is considered a suitable technique.

The indices offered by Vollrath (1991) is associated with three specifications, namely: (1) the revealed comparative export advantage index (RXA); (2) the relative import specialization index (RMA); and (3) the relative trade advantage index (RTA). The RXA calculation is as follows:

$$RXA_{ij} = \frac{\left(X_{ij} / \sum_{t,t\neq j} X_{it}\right)}{\left(\sum_{n,n\neq i} X_{nj} / \sum_{n,n\neq i}\sum_{t,t\neq j} X_{nt}\right)} \quad (1)$$

Where X indicates exports, *i* is the selected country, *j* is the biodiesel product, *t* is the total number of commodities, and *n* is all countries in the world. X_{ij} describes country exports for a specific product *j* (i.e., biodiesel) in world market, while X_{it} denotes the country exports without a given biodiesel product *j*. X_{nj} is all countries' total exports excluding country *i* to the whole world. To eliminates any double-counting issues, the biodiesel product, *j* is excluded from X_{nt} and X_{it}, while the country *i* is also excluded from X_{nt} and X_{nj}. Finally, X_{nt} is the total commodities exports by all countries excluding country *i* and the biodiesel product *j* (Vollrath 1991, as adapted by Bojnec & Fertő 2009).

Meanwhile, the RMA calculation is as follows:

$$RMA_{ij} = \frac{\left(M_{ij} / \sum_{t,t\neq j} M_{it}\right)}{\left(\sum_{n,n\neq i} M_{nj} / \sum_{n,n\neq i}\sum_{t,t\neq j} M_{nt}\right)} \quad (2)$$

Where M indicates imports, *i* is the selected country, *j* is the biodiesel product, *t* is the total number of commodities, and *n* is all countries in the world. M_{ij} describes country imports for a particular product *j* (i.e., biodiesel) to the world, while M_{it} denotes the country imports without a given biodiesel product *j*. M_{nj} is all countries total imports excluding country *i* to the whole world. To overcome double-counting problem, the biodiesel product *j* is also excluded from M_{it} and M_{nt}, while the country *i* is excluded from M_{nj} and M_{nt}. Finally, M_{nt} indicates the total merchandise imports by all countries excluding the biodiesel product *j* and the country *i* (Vollrath, 1991, as adapted by Bojnec & Fertő 2009).

Next, the RTA index introduced by Vollrath (1991) simultaneously accounts for exports and imports. It is calculated by the difference between the RXA and RMA:

$$RTA_{ij} = RXA_{ij} - RMA_{ij} \quad (3)$$

The RTA is classified into three groups: (1) RTA < 0, which indicates the products with an absence of a relative trade advantage; (2) RTA = 0, which indicates the product groups at a break-even point, with neither a relative trade advantage nor a relative trade disadvantage; and (3) RTA > 0, which indicates the product groups with a relative trade advantage. The annual biodiesel export and import data by country were retrieved from the United Nations (UN) Comtrade database. In particular, there are two subgroups of biodiesel products, namely: (1) HS382600 (i.e., biodiesel when the petroleum base is less than 70%), and (2) HS271020 (i.e., biodiesel when the petroleum base is more than 70%).

It is also worth highlighting the reason for the cut-off point of 70% for biodiesel. According to Rosi (2009) as cited in the European Commission report, Ecofys (2019) has stated that biogas from organic waste digesters usually contain from 60% to 70% of methane, 30% to 40% carbon dioxide, and less than 1% nitrogen. To enable comparisons between international competitors, the RTA of biodiesel for Indonesia, the USA, Brazil, Germany, France, Thailand, and Spain were also calculated. The most recent trade data available provided the value of imports and exports spanning from 2012 to 2016.

RESULTS AND DISCUSSION

Table 1 displays the RXA index value, which reflects the relative export advantage of biodiesel for Malaysia and other major biodiesel-producing countries. The RXA value index more than one indicates an export advantage for the country, whereas values less than one indicate a comparative export disadvantage (Bojnec & Ferto 2009). For the period under investigation, the results revealed that Germany had a relatively high comparative export advantage for both biodiesel products of HS271020 and HS382600, followed by Spain. In contrast, Malaysian biodiesel products for both subgroups yielded positive RXA indices over the five years of data, but less than one.

In comparing Malaysia with Indonesia as the world's major palm oil producer, the result indicated that Indonesia surpassed Malaysia for both biodiesel exports between 2012 to 2016. Therefore, Malaysia is technically lagging behind Indonesia in terms of competitive export advantage in biodiesel despite being the second-largest palm oil producer globally.

The RMA index value in Table 2 indicates the relative import specialization advantage of biodiesel for Malaysia and other major biodiesel-producing countries. The RMA index value more than one indicates an import specialization disadvantage for the country, whereas RMA index value less than one indicates an import specialization advantage (Bojnec & Ferto 2009). Accordingly, Germany and France both displayed a positive value and RMA indices more than one for both products. In contrast, Spain only had a positive value and its RMA indices were more than one for one product, specifically HS 382600, over the five years of data.

Next, the RTA results are reported in Table 3. The results revealed Malaysia's positive relative trade advantage in biodiesel for HS 382600 and a slight disadvantage in the export market for HS 271020. In particular, the latter recorded a negative RTA value in 2015. Meanwhile, Germany recorded the best performance over the five years for both products, whereas Indonesia, Brazil, Thailand, and Spain had a positive RTA for HS382600 for all five consecutive years.

Figure 4 and Figure 5 shows the comparison of biodiesel trade competitiveness position among major producing countries. A line graph is drawn based on the RTA indices for each product (HSC 271020 and HSC 382600) to compare the competitiveness trend among these countries. It is vital for the country to have a stable competitive position of these commodities to set the seal on the future competitiveness level in the global market is sustained. A downward trend for the non-competitive product reflects that the country will have higher levels of competitiveness in the future biodiesel products, whereas an upward trend for a non-competitive product

TABLE 1. Relative Export Advantage (RXA) for Biodiesel Product, 2012-2016

Country	HSC	2012	2013	2014	2015	2016
Malaysia	271020	0.0000	0.0008	0.0045	0.0000	0.0044
	382600	0.0000	0.3099	0.5965	0.5498	0.3054
Indonesia	271020	0.1149	0.9131	0.0063	0.0000	0.0211
	382600	6.4634	6.5085	4.7304	0.9316	0.9466
U.S.	271020	0.0065	0.0434	0.0096	0.0124	0.0284
	382600	1.1298	1.2184	0.4515	0.5104	0.3308
Brazil	271020	0.0001	0.0003	0.0002	0.0004	0.0012
	382600	0.0000	0.4194	0.3483	0.1069	0.0001
Germany	271020	7.1601	9.6957	12.4180	9.0283	10.8152
	382600	10.6714	12.4843	9.8946	7.4399	4.7724
France	271020	0.3842	0.3197	0.3311	0.4684	0.5923
	382600	0.4600	0.5748	0.7813	1.2089	1.3162
Thailand	271020	0.2175	1.1881	0.5324	0.0450	2.0881
	382600	0.1223	0.1157	0.1605	0.2996	0.2855
Spain	271020	1.3262	1.5502	2.4111	1.6745	1.2814
	382600	9.0201	10.1398	6.7780	8.7010	10.5884

reflects that the country will have lower competitiveness levels for biodiesel in the future.

Accordingly, Germany displayed the highest RTA values; however, these values were declining. Besides, the trend for Indonesia was similar to Germany. On the other hand, Spain showed an improving competitiveness level where the RTA values were positive and even surpassed Germany's values in 2015. Meanwhile, the USA yielded a negative RTA value in 2015 and 2016 both. For Malaysia, its RTA value showed a stagnant trend over the years; despite this, it generated a positive RTA value regardless over the year of 2012 through 2015. Additionally, France did not seem to be competitive since it produced negative RTA values across all five consecutive years for both products.

The aforementioned results thus suggest that Germany policies would be a good benchmark for the Malaysian especially the government and agency like Malaysia Palm Oil Board (MPOB) in drafting strategies for the local palm oil biofuel industry development, especially widespread biofuel mandates. In Germany, legislation to stipulate reductions of life-cycle carbon intensity via transportation fuels has stimulated its biofuels industry development support market growth

TABLE 2. Relative Import Advantage (RMA) for Biodiesel Product, 2012-2016

Country	HSC	2012	2013	2014	2015	2016
Malaysia	271020	0.0000	0.0001	0.0001	0.2435	0.0000
	382600	0.0000	0.0296	0.0165	0.0015	0.0040
Indonesia	271020	0.0001	0.0002	0.0001	0.0000	0.0002
	382600	0.0343	0.1570	0.0001	0.0001	0.0001
US	271020	0.0957	0.1934	0.2656	0.1987	0.2432
	382600	0.1016	1.1710	0.5676	1.2665	2.3636
Brazil	271020	0.0004	0.0008	0.0024	0.0013	0.0029
	382600	0.0000	0.0000	0.0000	0.0000	0.0000
Germany	271020	1.3169	1.4203	2.2489	2.1090	1.8779
	382600	2.0778	1.3943	1.5020	1.3057	1.3103
France	271020	4.6761	3.0392	3.5068	3.2861	1.9432
	382600	1.5785	1.7965	2.1812	2.0147	2.5063
Thailand	271020	0.0100	0.1403	0.5467	0.0052	0.1330
	382600	0.0824	0.0229	0.0194	0.0203	0.0192
Spain	271020	2.0565	0.7810	0.5504	0.1918	0.5624
	382600	8.5971	3.5240	1.7141	1.8334	2.1044

TABLE 3. Relative Trade Advantage (RTA) for Biodiesel product, 2012-2016

Country	HSC	2012	2013	2014	2015	2016
Malaysia	271020	0.0000	0.0006	0.0044	-0.2435	0.0043
	382600	0.0000	0.2803	0.5800	0.5484	0.3014
Indonesia	271020	0.1148	0.9129	0.0062	0.0000	0.0210
	382600	6.4291	6.3515	4.7303	0.9315	0.9466
United States	271020	-0.0892	-0.1500	-0.2560	-0.1864	-0.2148
	382600	1.0282	0.0474	-0.1161	-0.7560	-2.0328
Brazil	271020	-0.0003	-0.0004	-0.0022	-0.0009	-0.0017
	382600	0.0000	0.4194	0.3483	0.1069	0.0001
Germany	271020	5.8433	8.2754	10.1690	6.9193	8.9373
	382600	8.5936	11.0900	8.3926	6.1342	3.4621
France	271020	-4.2919	-2.7196	-3.1758	-2.8177	-1.3509
	382600	-1.1185	-1.2217	-1.3999	-0.8057	-1.1901
Thailand	271020	0.2076	1.0479	-0.0142	0.0399	1.9551
	382600	0.0399	0.0928	0.1411	0.2793	0.2663
Spain	271020	-0.7303	0.7692	1.8607	1.4827	0.7191
	382600	0.4230	6.6158	5.0638	6.8676	8.4840

even though the implementation of the B10 biodiesel mandate merely came into effect in February 2019. Therefore, the Malaysian government should be more aggressive in implementing the B10 program, which would attract more investments into this industry. Moreover, in Malaysia, many players, especially the small-scale producers are not able to maintain their operations due to high production costs in the biodiesel industry. Thus, support from the government encompassing tax incentives and subsidies is important to facilitate the industrial activities. It can also be viewed based on agricultural structures in the production of raw commodities (or feedstock), costs of labor, improvements in supply marketing chains, and more.

CONCLUSION

This paper successfully provided empirical evidence on the biodiesel trade competitiveness of Malaysia versus other major biodiesel-producing countries, such as Indonesia, the USA, Brazil, Germany, France, Thailand, and Spain. Data spanning from year 2012 to year 2016 were analyzed for the following commodities accordingly: HSC271020 (i.e., biodiesel with petroleum base less than 70%) and HSC382600 (i.e., biodiesel with petroleum base more than 70%). Current trends in exports indicated that Malaysian biodiesel fluctuated over the year. One of the reasons behind this weak export performance is the lack of production, whereby high

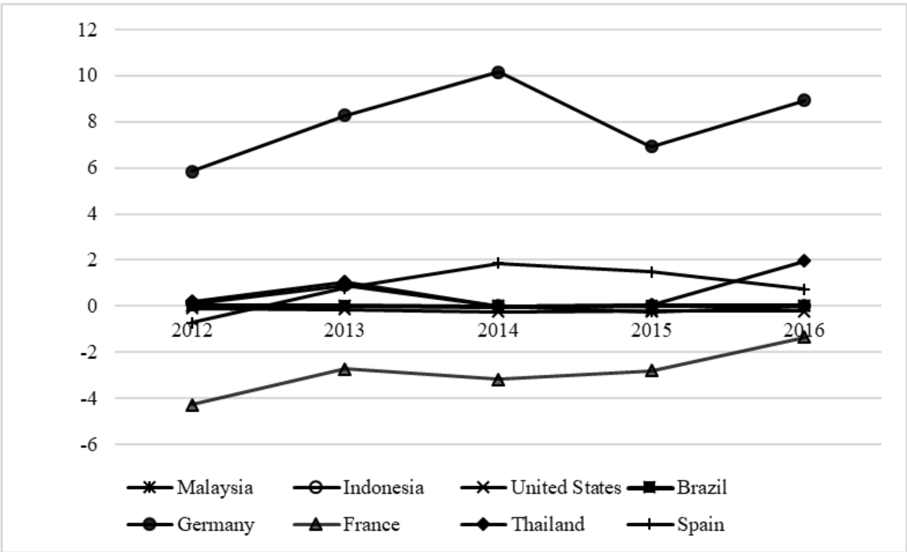

FIGURE 4. Relative Trade Advantage (RTA) for Biodiesel Product HS271020, (2012-2016)

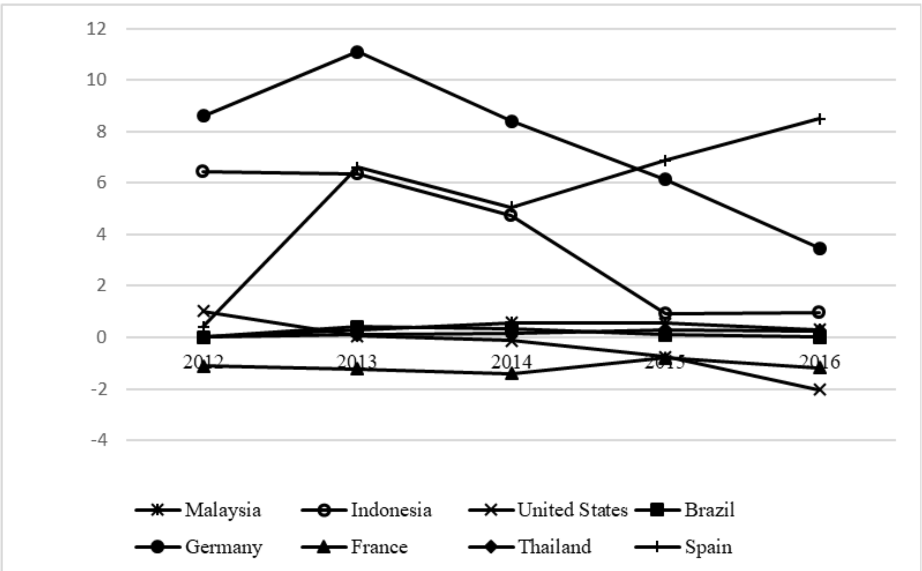

FIGURE 5. Relative Trade Advantage (RTA) for Biodiesel Product HSC 382600, (2012-2016)

production costs in the Malaysian biodiesel industry cause many players, especially small-scale producers, to be incapable of maintaining their operations. In view of its current domestic production, it is expected that Malaysia's biodiesel export in the future will further decline. However, the findings obtained suggest that although Malaysia is not a top biodiesel-producing country, its RTA index value is indicative of the potential for growth. As the second-largest producer of palm oil, which is one of the most cost-effective feedstocks for biodiesel, it is not impossible for Malaysia to become a highly prominent producer of quality biodiesel in the global market. Hence, the support from the government of Malaysia is crucial to enhance and promote biodiesel competitiveness in order for the nation to increase, recover, and sustain its strong global position against other key players.

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Norashida Othman*
Economics Department
Faculty of Economics and Management,
Universiti Putra Malaysia,
43400 Serdang Selangor,
MALAYSIA
E-mail: shida_hr87@yahoo.com

Zulkornain Yusop
Putra Business School
Serdang, Malaysia
&
Faculty of Economics and Management,
Universiti Putra Malaysia,
43400 Serdang Selangor,
MALAYSIA
E-mail: zulkornain@upm.edu.my

Mohd Mansor Ismail
Institute of Agricultural and Food Policy Studies
Universiti Putra Malaysia,
43400 Serdang Selangor,
MALAYSIA
E-mail: mkk@upm.edu.my

Syamsul Herman Mohammad Afandi
Faculty of Economics and Management,
Universiti Putra Malaysia,
43400 Serdang Selangor,
MALAYSIA
&
Institute of Agricultural and Food Policy Studies
Universiti Putra Malaysia,
43400 Serdang Selangor,
MALAYSIA
E-mail: syamsulhma@upm.edu.my

*Corresponding author