The competitiveness of Indonesian cloves commodity in international market

A P Pratama¹,³ and D H Darwanto²

¹Agricultural Economics, Faculty of Agriculture, Universitas Gadjah Mada, Yogyakarta, Indonesia
²Faculty of Agriculture, Universitas Gadjah Mada, Yogyakarta, Indonesia

Email: adnanputrapratama07@gmail.com

Abstract. Clove is one of the plantation commodities that contributes to the Indonesian economy. Indonesia, with a large potential of land area, is expected to be able to increase domestic clove production to provide domestic and international demand, increasingly. The purpose of this study is to analyze the competitiveness of Indonesian clove commodities in the international market. Using the Revealed Comparative Advantage (RCA) indicator, the Trade Specialization Index and the Acceleration Ratio (AR). The results of the analysis show that Indonesian clove commodities have a comparative advantage, and play a role as net clove exporters and are able to compete and reduce the international market share.

1. Introduction
Clove (Syzygium aromaticum. L) is one of the strategic commodities whose plantations are managed by many people in Indonesia and contribute to the Indonesian economy. The clove plant itself comes from the Maluku region, which is one of the spice-producing regions and clove itself, which is one of the important commodities in the economy in Indonesia. However, the fact behind the superiority and the high selling price, this plantation commodity from Maluku is still unable to become part of Indonesia's main commodities. One of the causes of declining clove production is climate or weather. The development of clove plantations to date has not yet experienced a recovery like the conditions of its heyday. This can be seen from the area which only reached around 500,000 ha from the largest 700,000 ha in the early 1990s, with production still fluctuating around 60,000 to 100,000 tons each year [1].

The main products of cloves are clove flowers or cloves. Most cloves are used in Indonesia as a raw material for the clove cigarette industry. Historically, the clove cigarettes industry very much needed cloves which developed in Java from 1927. Clove cigarette factories were built in Kudus, Kediri, Blitar, Tulungagung and Mojokerto. Clove needs are increasing rapidly, so Indonesia sometimes has to import [2].

Clove plants (Syzygium aromaticum. L) are also one of the producers of essential oils. Clove oil as a commodity that has great potential in Indonesia. Clove plants can produce three types of essential oils, including clove oil, clove stalk oil and clove leaf oil. The oil content in clove flowers ranges from 17-18%, on the stalk or clove handle around 5%, while on the leaves around 2-3%. There are at least 70 types of essential oils which have been traded on the international market and 40 of them can be produced in Indonesia, but only a small proportion of essential oils have been cultivated in Indonesia. The oil is obtained by distillation [3].

---

1. Introduction
Clove (Syzygium aromaticum. L) is one of the strategic commodities whose plantations are managed by many people in Indonesia and contribute to the Indonesian economy. The clove plant itself comes from the Maluku region, which is one of the spice-producing regions and clove itself, which is one of the important commodities in the economy in Indonesia. However, the fact behind the superiority and the high selling price, this plantation commodity from Maluku is still unable to become part of Indonesia's main commodities. One of the causes of declining clove production is climate or weather. The development of clove plantations to date has not yet experienced a recovery like the conditions of its heyday. This can be seen from the area which only reached around 500,000 ha from the largest 700,000 ha in the early 1990s, with production still fluctuating around 60,000 to 100,000 tons each year [1].

The main products of cloves are clove flowers or cloves. Most cloves are used in Indonesia as a raw material for the clove cigarette industry. Historically, the clove cigarettes industry very much needed cloves which developed in Java from 1927. Clove cigarette factories were built in Kudus, Kediri, Blitar, Tulungagung and Mojokerto. Clove needs are increasing rapidly, so Indonesia sometimes has to import [2].

Clove plants (Syzygium aromaticum. L) are also one of the producers of essential oils. Clove oil as a commodity that has great potential in Indonesia. Clove plants can produce three types of essential oils, including clove oil, clove stalk oil and clove leaf oil. The oil content in clove flowers ranges from 17-18%, on the stalk or clove handle around 5%, while on the leaves around 2-3%. There are at least 70 types of essential oils which have been traded on the international market and 40 of them can be produced in Indonesia, but only a small proportion of essential oils have been cultivated in Indonesia. The oil is obtained by distillation [3].
Based on data from the Ministry of Agriculture, the trend of the development of production and the area of Indonesian clove land in recent years has tended to fluctuate. In 2011, the lowest of Indonesia clove domestic production was only 72,246 tons. Although fluctuating, production tends to increase every year, but in the period of 2015 to 2017 the increase in land area has not yet resulted in a significant increase in production, expected production to rise turns out to stagnate and even decline in 2017 [4].

Price uncertainty is a problem that is often faced by most farmers in Indonesia, including clove farmers, erratic selling prices lead to farmers' reluctance to maintain their crops so that crops are vulnerable to pests and diseases such as Clove Wood Bacteria (CPC), Clove Leaf Smallpox (CDC), Deciduous Clove Leaf (GDC) and clove stem borers. In 1995 national clove production reached 90,007 tons fell to 52,903 tons at the time of the small harvest in 1999 and only reached 79,009 tons at the time of the big harvest in 2002. Other problems faced were in terms of supporting infrastructure, almost all of the infrastructure in the clove production centers area was inadequate, therefore the farming costs become high and the selling price becomes less competitive. For example, the clove production center in Maluku islands and Toli-toli which only have one alternative transportation, namely water transportation. This condition resulted in supporting institutions tending to pressure farmers, such as marketing institutions that tended to be monopsony, financial institutions dominated by ijon systems which tended to harm farmers. Although there has been a Clove Farmers Association (APCI), farmers' access to information technology and markets has not gone well. On the other hand, the need for clove for industry rose to an average of 92,133 tons / year. The supply shortage is a challenge for farmers and entrepreneurs to be able to fulfill it. The balance of supply to demand can be done through intensification, rehabilitation and rejuvenation of plants, supported by a reasonable purchase price by the industry [5].

Along with the development of international market needs, clove demand from Indonesia continues to experience a significant increase. This is indicated by the average number of exports from various major world clove producing countries in the last ten years Indonesia ranks first, showing the highest difference from other competing countries such as Madagascar and Tanzania [6].

During 2002 to 2016 Indonesia has exported cloves continuously to 21 countries. The main markets country that dominate Indonesia's clove exports are Saudi Arabia, Vietnam, Malaysia, Pakistan, the United Arab Emirates, the Netherlands, Thailand, Germany, Egypt and Australia. During the fifteen years the volume of Indonesian clove exports in the market fluctuated; however, the average export grew [7]. Therefore, this research will try to describe to the reader the development of Indonesian clove commodity exports in the International Market and the competitiveness of Indonesian clove commodities in the international market.

2. Materials and methods

2.1. Types and data sources
This research on clove competitiveness provides the latest information regarding the strength of the competitiveness of Indonesian clove commodities in the international market since 1994 - 2017. The data used is in the form of quantitative secondary data which is translated into time series data. Sources of data were obtained from various related institutions including Directorate General of Plantation, Ministry of Agriculture, Food and Agriculture Organization (FAO), and United Nation of Commodity Trade Database (UNComtrade) using HS code 0907.

2.2. Data analysis
The data analysis method used in this study is adjusted to the research objectives by using indicators of mathematical approaches to measures of commodity competitiveness in the international market. The indicators used are Revealed Comparative Advantage (RCA), Trade Specialist Index (ISP) and Acceleration Ratio (AR).

2.2.1. Revealed Comparative Advantage (RCA). RCA is one method that can be used to see the market share of a commodity in a country by looking at the comparative advantage and competitiveness of these
commodities on the world market. In this analysis, the development of the RCA index of Indonesian clove commodities will be calculated from year to year. Mathematically RCA is formulated as follows:

\[ \text{RCA} = \frac{X_{ijt}}{W_{it}} \times \frac{X_{jt}}{W_{t}} \]

Information:
- \( X_{ijt} \): Value of export of commodity i by country j in year t
- \( X_{jt} \): Value of total exports of country j in year t
- \( W_{it} \): Value of world commodity exports i in year t
- \( W_{t} \): Value of total world exports in year t

The results of the RCA calculation indicate the occurrence of two possibilities or criteria to describe the competitiveness of a commodity, that is if the RCA value is more than one (RCA > 1) then the commodity in that country has a comparative advantage and high competitiveness in the world market and the higher RCA showing stronger competitiveness. If the RCA value is less than 1 (RCA < 1), the commodity in that country has a comparative advantage that is low or still below the world average and is considered weak competitiveness.

2.2.2. Trade Specialization Index (ISP). ISP is used to identify the position or stage of development of a product or commodity so that it can be known the tendency of a country to act as an exporter or importer. Mathematically the ISP can be formulated as follows:

\[ \text{ISP} = \frac{X_{i} - M_{i}}{X_{i} + M_{i}} \]

Information:
- \( X_{i} \): Value of Export of Commodities i
- \( M_{i} \): Import Value of Commodities i

The ISP will identify the growth rate of a product in trading into the following five stages based on figure 1 below [8]:
1. Introduction phase, if the ISP value is between -1 and -0.50 (Net Importer)
2. Import substitution stage, if the ISP value is between -0.50 to 0.00 (Importer)
3. Growth stage, if the ISP value is between 0.01 and 0.80 (Export Expansion)
4. Maturity stage, if the ISP value is between 0.81 to 1.00 (Net Exporter)
5. The stage of re-importing, if the ISP value returns decreases from 1.00 to 0.00

![Figure 1. ISP curve according to product cycle theory](image)

2.2.3. Acceleration Ratio (AR). The Acceleration Ratio (AR) method is used to see a comparison between the acceleration of a country's export growth towards the acceleration of world import growth. Mathematically formulated as follows:

\[ \text{AR} = \frac{\text{Trend } X_{ij}+100}{\text{Trend } M_{i}+100} \]

Information
- \( X_{ij} \): Value of commodity exports i in country j
AR calculation results can be stated if AR approaches or more than one (AR > 1) then the commodity from that country can capture the market, whereas if AR is less than zero (AR < 0) or close to -1 means that there is a market share of the supplier earlier could not capture market share.

3. Result and discussion

3.1. Development of land area, production and productivity of Indonesian clove commodities and competitor countries

The pattern of clove plantations in Indonesia is still dominated by the pattern of People's Plantation (PR) whose percentage reaches 98% of the total, the remaining 1% each comes from the Large Private Plantation (PBS) and the State Large Plantation (PBN). Indonesian Clove Plantations are spread in several main areas including Central Sulawesi, South Sulawesi, North Sulawesi, Southeast Sulawesi, Maluku, Central Java, East Java, West Java and other Provinces [9]. Indonesia has a much wider clove plantation area compared to other countries which are the main countries producing world cloves such as Madagascar and Tanzania. The potential of this high land area should be a great opportunity for Indonesia to optimize national clove production, which at present Indonesia is a producer country, as well as the largest clove consumer in the world.

![Figure 2. Developments of the clove areas in Indonesia, Madagascar and Tanzania in 1994-2017.](image_url)

Based on figure 2, it can be seen that the increase in the area of Indonesian clove plantations from year to year tends to increase where in 1994 the area was only 392,000 ha and by 2017 it had reached 548,091 ha. There was a significant decrease in the area in the period 2000 and 2006, this occurred because farmers abandoned their clove plants and even cut them down, resulting in a drastic decrease in the area of clove. Madagascar itself has also experienced a decline in clove plantation areas from 2005 to 2010, while Tanzania itself tends to experience a decline in the area of clove plantations from the period 2008 to the present.

This neglect was caused by a drop in world clove prices, causing farmers to abandon their clove plants and even cut them down and replace them with more profitable crops, even though the government had established a CPC (Marketing and Clove Marketing Agency) to regulate national clove prices but this has not yet had a positive impact on improving domestic clove prices. The increase in the area of clove plantations is expected to be a factor driving the increase in national clove production.
Based on figure 3, the development of Indonesian clove production in the period 1994-2017 based on the data source from Food and Agricultural Organization from 1994 – 2017 was generally fluctuating and tended to increase, where in 1994 the production of cloves was only 78,379 tons then until 2017 it had reached 123,773 tons. While from competing countries so far, the highest production produced by Madagascar amounted to 22,000 tons in 2016 while Tanzania itself experienced instability in production, this can be seen from the decline in production in the last 3 years where production only reached 8000-9000 tons per year. Clove production in Indonesia is currently estimated at around 120,000-130,000 tons per year, resulting from around 330,000 ha of produce. Thus the productivity of clove plants ranges from 400-450kg / ha. Judging from its potential, clove plants can produce up to 1,000 kg / ha so that the national productivity achieved today has not reached 50% of its potential [10].

The highest production so far was achieved in 2015 with a production of 139,641 tons. Therefore, more intensive handling is needed to maximize the production potential that should be achieved. The industrial needs which are increasing every year and become one of the cornerstones of the country's revenue sources require consistency from the increase in clove production itself so that it remains available on an ongoing basis [11].

Based on figure 4, it can be seen that in terms of productivity based of the data source from Food and Agricultural Organization from 1994 – 2017, Indonesia still lags behind the two competing countries. Tanzania looks far superior to Indonesia and Madagascar in terms of productivity despite the area and production of cloves Tanzania is not as big as Indonesia but they are superior in terms of productivity where the average annual yield is 1-1.2 tons / ha / year while Indonesia can only produce an average of 0.2-0.3 tons / ha / year. The low productivity of Indonesian cloves is partly due to the low intensity of care carried out by farmers and the lack of rejuvenation measures to replace damaged or dead plants.
Until now, efforts to increase clove production and productivity are still being encouraged in an effort to meet the increasing needs, especially in the industrial sector. Most of Indonesia's clove production is used to meet the raw material needs of clove cigarette manufacturers and when viewed from its contribution to the country's revenues is quite large, this commodity occupies a quite important position in the national economy.

3.2. Development of clove import exports in Indonesia

Indonesia plays a very strategic role in international trade. This can be seen from the consistency of Indonesia as a producer which in addition to fulfilling the demand of the domestic industry as well as the world's largest clove exporter in order to meet the international market demand. The fluctuations in clove prices, especially in the export market, affect farmers' motivation in maintaining and fertilizing crops [12]. The chart below shows the development of Indonesia's clove import exports in the period 2000-2017 based of the data source from International Trade Statistic Database (Processed).

Based on figure 5, the development of the value of Indonesian clove exports in the period of 2000-2017 was fluctuated but tended to increase. During this period the export value of Indonesia's highest occurred in 2015 reaching US $ 46,483,663 while from the Indonesian import side it had not imported cloves from outside at all in 2008 and 2014 but even worse things have happened in Indonesia where very high imports of clove occurred in 2011 to reach US $ 345,150,592, this was due at that time the high demand for domestic industries which at the same time decreased the production of clove in the country due to climate and weather anomalies at that time.

3.3. Revealed Comparative Advantage (RCA) analysis

The chart below shows the development trend of Indonesia's clove RCA index during the period 1994-2017 based of the data source from International Trade Statistic Database (Processed). Based on figure 6, it can be seen that the development of the RCA index of Indonesian clove commodities fluctuated and tended to rise even though the drastic decline had occurred during the 1998-1999 period, 2003-2004, 2007-2009, and 2015-2017, but the average clove RCA index Indonesia is 9.53 which means that Indonesian clove commodities have competitiveness from comparative advantage [13]. This figure can still be improved considering the potential of the Indonesian state in terms of land area and efforts to increase efficiency in the cultivation process. This position made Indonesia one of the determinants of the price of clove commodity exports because Indonesia was one of the largest clove producers and exporters on the international market. In addition, the world market began to realize about the multipurpose function of cloves, so that clove consumption continued to increase. Importing countries also tend to choose to buy high quality organic cloves, where Indonesian cloves are cloves which are recognized as having the best quality standards in the international market [7].
3.4. Trade Specialization Index (ISP)
Based on figure 7, the analysis of the Trade Specialization Index of Indonesian Clove Commodities based on the data source from International Trade Statistic Database (Processed) shows that Indonesia's position in world clove trade is likely to be an exporting country. This is indicated by the ISP value in the period 1994-1998 which was positively ranging from 0.84 - 0.99 the period 2002-2010 and 2013-2015 ranged from 0.77 - 1 [13]. However, Indonesia also imported several times from other countries, this can be seen from the ISP values that were negatively marked in the period 1999-2001, 2011-2012 and 2016-2017. The fluctuations in ISP values were caused by fluctuations in domestic clove production, which led to the rise and fall of the value of Indonesian clove exports and imports, but overall Indonesian clove commodities had enormous potential to capture world market share.

3.5. Acceleration Ratio (AR)
Analysis using Acceleration Ratio (AR) describes the ability of a country to capture market share. If the AR value is smaller than 1 (<1) then this indicates the acceleration of the growth of total exports of a commodity in a country is lower than the total imports of these commodities in the world, so it can be said that a country is difficult to compete and capture world market share.

| Country   | Acceleration Ratio (AR) |
|-----------|------------------------|
| Indonesia | 1.0011                 |
| Madagascar| 1.0002                 |
| Tanzania  | 1.0036                 |

Figure 6. Developments of the Indonesian Clove RCA Index on International Markets in 1994-2017.

Figure 7. Developments of Indonesian Clove Trade Specialization Index (ISP) on International Markets in 1994-2017.
Based on table 1, the analysis of AR values from Indonesia, Madagascar and Tanzania based on the data source from International Trade Statistic Database (Processed) shows a positive value of more than 1 (> 1). Indonesia as the highest producer showed positive AR results of 1.0011 (> 1), which means that Indonesia was able to capture the foreign clove market followed by its two competing countries, Madagascar and Tanzania [13]. This is because the growth of clove exports from the three main producing countries is greater than the growth of world clove imports so that these three countries have a very large role in the availability of cloves in the world.

4. Conclusion
Clove is Indonesian native plant that was originally an export commodity has now turned into a commodity that must be imported because of the rapid development of the industry, the problems faced by producers, in this case farmers as the main producers need full attention from the government as policy makers to protect farmers from various risks. Given the enormous potential of the clove plantation area which is still not able to be optimally optimized by it, strategic steps are needed to anticipate it. Things that can be done in the form of an intensified, rehabilitation and rejuvenation program of clove plants. Development of clove agribusiness systems in an effort to increase profits and competitiveness through strengthening small and medium enterprises (SME) as downstream industries. With the opportunity to develop downstream industries for food, pharmaceuticals and vegetable pesticides, including exports, the private sector is expected to be able to invest in clove agribusiness that includes upstream agribusiness, for example in seed breeding, on-farm large plantation establishment (PBS) and rejuvenation replanting as well as downstream agribusiness in the oil refining industry, food and pharmaceutical industry and processing of clove vegetable pesticides. Equally important is institutional strengthening at the farm level and access to capital and financial institutions and pricing policies.

Acknowledgments
Thank you, the authors convey to the Education Fund Management Institute (LPDP) for their assistance, both financially and non-financially so that the authors can publish the results of research related to the competitiveness of Indonesian cloves commodity in international market.

References
[1] Ndiba T A, Wullur M and Tumade P 2016 Evaluation of supply chain performance of clove commodities (study in lalumpe village, minahasa regency). J. EMBA, 4(1), 153–164.
[2] Semangun H 2014. History of cloves in clove books: history, cultivation and industry. indesso and master of biology. Universitas Kristen Satya Wacana. Salatiga
[3] Azhari A 2009. Prototype of steam distillation tower for distilling clove leaf essential oil. Poli Teknik Negeri Srimajaya.
[4] Agricultural Statistics. 2018. Agricultural Statistics. Data Center and Agricultural Information System. Ministry of Agriculture of the Republic of Indonesia
[5] Agricultural Research and Development Agency. 2007. Propek and Direction of Clove Agribusiness Development Second Edition. Ministry of Agriculture, Jakarta. http://www.deptan.go.id
[6] Food and Agriculture Organization of United Nation (FAO). 2019. http://faostat.fao.org
[7] Nurhayati E, Hartoyo S and Mulatsih S 2018. Analysis of Indonesian clove export development. J. Econ. Develop. Pol., 7(1), 21–42.
[8] Department of Trade. 2008. Trade Specialization Index (ISP). http://www.kemendag.go.id
[9] Data Center and Agricultural Information System. 2014. Outlook for Clove Commodities. Ministry of Agriculture. http://www.pusdatin.setjen.pertanian.go.id/
[10] Directorate General of Plantation. 2017. Indonesian Plantation Statistics. Ministry of Agriculture. Jakarta. http://ditjenbun.pertanian.go.id
[11] Wahyudi A 2016. Stabilization strategy of national clove market performance. J. Perspektif 15(1), 73–86 DOI: http://dx.doi.org/10.21082/psp.v15n1.2016.73-85
[12] Kingu J 2014. Cloves Export response to trade liberalization in tanzania: a cointegration analysis. 
    *J. Econom. Sustain. Develop.* **5**(1): 99–120.

[13] UNComtrade. 2019. *International Trade Statistic Database*. https://comtrade.un.org/