Environmental impact of ASEAN-China free trade agreement:  
A case of Indonesia palm oil industry 2005-2010

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Abstract. This research focused on the impact of the ASEAN-China Free Trade Agreement (ACFTA) on the environment of the Indonesian palm oil industry. The theory used in this research was trade liberalization impact with scale effect, composition effect, and technique effect as the variable to seek the environmental impact of trade liberalization. The method of this research used a qualitative approach and explanatory data analysis technique. This research indicates that ACFTA has a positive impact on the member states' economy. However, on the other hand, ACFTA has a negative impact on the environment because of deforestation and increased carbon emissions. Deforestation and increased carbon emission are caused by the expansion of palm land area, which is encouraged by the escalation in demand for palm oil products in the free trade area.

Keywords: ACFTA, environment, palm oil industry, trade liberalization impact, carbon emission

1. Introduction
The awareness of countries in the international world about fossil fuel energy is getting thinner and damaging nature by its process of income. That is why biodiesel energy is often sought to be a substitute for fossil energy. Biodiesel energy is derived from vegetable oil or plants, one of which is palm oil. Palm oil is an important commodity that is not only used as biodiesel energy but also in various products to meet human needs such as chocolate, soap, vegetable oil, etc.

This palm oil commodity has contributed as much as 11.14% of Indonesia's total exports. It makes it one of the largest contributors in Indonesian exports [1]. Therefore, palm oil is considered a crucial commodity that must be maintained in its production and export scale. Tremendous opportunities in the palm oil commodity in the world vegetable oil trade have encouraged the Indonesian government to spur the development of oil palm plantation areas [2].

From 2010 to 2017, palm oil exports continued to increase rapidly, but in 2018, there was a significant decline. This is due to the issue of palm oil being rife because of a negative campaign from the European Union to limit and even stop importing palm oil on the grounds of adverse impacts on the environment.
Various impacts on the environment have been mentioned by Green Palm organizations such as deforestation, global warming, threats to species resilience, and social issues [3].

Globalization is an era of technological development that expands, deepens, and accelerates engagement between countries in the world [4]. Globalization is driving the formation of more intensive economic integration. There is a lot of bilateral, regional, and multilateral economic, trade, and financial cooperation. The phenomenon of economic regionalism arises along with globalization.

The ASEAN-China Free Trade Agreement (ACFTA) is a trade agreement between ASEAN member countries and China to support the free trade flow without being limited by tariffs and non-tariff. This cooperation contains an agreement on three sectors, which are the goods, services, and investment sectors, and officially entered into force on January 1, 2010. Through this agreement, various impacts are felt by both parties in terms of economic, political, security, and more. According to the Observatory of Economic Complexity (OEC), China became the second-largest importer of palm oil from Indonesia after India in 2017 with a total export value of 2.08 billion US dollars. Therefore, China has a significant impact on the palm oil industry in Indonesia, not only in terms of economy and trade but also in terms of technology, investment, competitiveness, etc.

This paper focuses on the impact of the ACFTA on the environment in Indonesia’s palm oil industry from 2005 to 2010. As one of the sectors involved in ACFTA, the industrial sector plays a significant role in this free trade agreement. China is one of the important countries for Indonesia’s palm oil industry. It has a significant impact on palm oil commodities, such as its environment. Utilizing the descriptive analysis method describes and analyzes the impact of free trade between ASEAN and China on the palm oil industry sector in Indonesia by comparing them before and after the enactment of ACFTA [6]. This paper describes some actual or real events of specific problems, problem solving’s efforts, and interpretation of data on the impact felt by industry Indonesian palm oil, specifically air quality.

2. Theoretical framework

In general, ACFTA is a trade cooperation agreement between China and ASEAN. It carries the Free Trade Area concept, which is to create a tariff-free region to advance and improve the economy in the area. Chia Siow Yue explained that the rise of the Chinese economy was a factor in developing economic cooperation with surrounding countries, including ASEAN [7]. Along with the rapid increase in trade relations between the two since 1991, negotiations and cooperation were formed. This collaboration's impact is in the form of market expansion, increased investment, trade, and GDP so that this cooperation produces benefits for both parties or each member country. The impact of ACFTA has had a positive impact on trade overall between the member countries of the cooperation and outside this collaboration [8]. It can be concluded that the concept of the Free Trade Area used has been run properly.

Meanwhile, the impact of ACFTA cooperation that not only affected trade flows but also influenced policies from member countries that adapt to existing markets and demand levels. Like the Malaysian government, who made a policy to produce high-quality palm oil. From the Indonesian side, ACFTA affects increasing exports, which affects national income and growth percentage. In the palm oil sector itself, ACFTA shows a positive dynamic effect on the flow of palm oil trade [9].

The impact of free trade cooperation on the environment is closely related. In trade cooperation, there are positive and negative impacts in conditions of CO2 pollution [10]. The analysis of the effects of free trade cooperation on CO2 pollution implies that low-income countries have greater pollution effects even after the application of FTAs due to weak environmental standards. At the same time, high-income countries benefit because free trade cooperation is beneficial to reduce pollution. Besides, the impact of ACFTA on the environment has also been investigated by several parties because it cannot be denied that trade cooperation is inseparable from environmental factors.
In 2009, CDRI Working Paper Series no. 41 analyzed the environmental impact of ACFTA on the Mekong sub-region of Cambodia by calculating the intensity of pollution [11]. Analysis conducted using the theory of the impact of trade liberalization by Grossman and Krueger. They stated that the level of air pollution increased with the increasing trade flow between Cambodia and China. Besides, the high demand for wood products has triggered deforestation in Cambodia. The same thing was mentioned earlier in the journal by Hing Vutha and Hossein Jalilian published in 2008 entitled Environmental Impacts of the ASEAN-China Free Trade Agreement on the Greater Mekong Sub-Region [12]. Greater demand for natural resource products can lead to overexploitation and other unsustainable resource extraction practices in Cambodia.

The government of Indonesia has launched a set of new policies on Indonesian Sustainable Palm Oil (ISPO) as part of sustainable action on the palm oil industry and other commodities as responsibility for environmental problems or issues that occur [13]. After previous actions on the handling of environmental effects that have been taken by several private bodies, the Indonesian government took action to establish standards and certifications on palm oil products. However, lack of government capacity in the form of a lack of authority from the ISPO committee, and a lack of coordination from government agencies and other ministries allow conflict with policies and regulations [13].

This paper applies the theory of the impact of trade liberalization adopted from Grossman and Krueger [14][15] explaining the impact of ACFTA on environmental quality through Indonesia's palm oil trade. Grossman and Krueger explained that the impact of trade liberalization, in the form of changes in trade and foreign investment policies on pollution levels and the depletion of scarce environmental resources, can be categorized into three interrelated mechanisms, namely scale effect, composition effect, and technical effect [14][15].

The scale effect arises from increased economic activity due to trade and investment liberalization. The total pollution generated will be in line with the graph of economic growth. That way, increased economic activity such as the process of allocation or movement of goods and resources results in increased pollution. Thus, the scale effect gives a negative result for trade liberalization, which reduces environmental quality, in this case, air quality.

The composition effect is the result of changes in sector specialization and trade policy in trade liberalization. Looking at a competitive advantage, the country will focus on production with relatively abundant resources and relatively scarce imported products. The effect of composition on the environment sees the country's comparative advantage in pollution-intensive or less polluting sectors. A positive composition effect occurs if the export sector's specialization is on average lower in pollution than the competing import sector. In contrast, a negative composition effect occurs if the specialization of the export sector on average is more polluting than the competing sectors of the import.

The technique effect occurs when increased liberalization of trade and foreign investment refers to a more restrictive policy so that the entry of more environmentally friendly renewable or modern technology with lower emissions intensity and pollution reduction per unit. Then the increase in national income has an impact on the government's demand for a cleaner environment by creating more stringent pollution standards and environmental laws.
Table 1. Variable and Indicator

| Variable          | Indicator                                      |
|-------------------|------------------------------------------------|
| Scale Effect      | - Energy consumption                           |
|                   | - Total transportation across country           |
| Composition Effect| - Environmental policy                          |
|                   | - Competitive advantage                        |
| Technique Effect  | - Technology investment                        |
|                   | - Pollution standard                           |

2.1. Palm oil in the context of ACFTA
China's entry into the WTO in November 2001 marked a new stage of economic reform and opening to the outside world. It is expected to make China more efficient and competitive because it integrates its economy into the international trade system [16]. There is hope that the Chinese economy's dynamism and a large market with 1.3 billion consumers will become a new regional growth engine for ASEAN.

The purposes of the ACFTA cooperation that carries the concept of Free Trade Area are none other than to strengthen and enhance economic, trade and investment cooperation between member countries; liberalize progressively and increase trade in goods and services and create a transparent system and to facilitate investment; explore new fields of cooperation and develop appropriate policies in the framework of economic cooperation between member countries; facilitating more effective economic integration of new ASEAN members (Cambodia, Laos, Myanmar, and Vietnam - CLMV) and bridging economic development gaps between member countries [5]. There are three stages in reducing the tariff of goods trading, namely the Early Harvest Program (EHP), Normal Track, and Sensitive Track.

The products included in the EHP are agricultural and livestock products such as live animals, fish, dairy products, plants, vegetables, and fruits. The National Regulation governing the Stipulation of Import Duty Tariffs on Imported Goods within the framework of EHP ACFTA is Minister of Finance Decree No. 355 / KMK.01 / 2004 dated July 21, 2004. Besides, there is a Bilateral agreement between Indonesia and China for specific products such as coffee, palm oil / CPO, Chocolate, Rubber goods, and furniture. The bilateral agreement is regulated in the Decree of the Minister of Finance No. 356 / KMK.01 / 2004 dated July 21, 2004, concerning the Stipulation of Import Duty Tariffs on the Import of Goods in the Indonesia-China Bilateral EHP Framework. Tariff reduction at this stage began on January 1, 2004, and will gradually become 0% or free of import duty on January 1, 2006.

Palm oil is one of the important commodities that attracts the attention of many parties, such as international organizations and multinational companies. This commodity is considered important because its role in international trade is quite large. The percentage of world vegetable oil consumption in types of vegetable oils, such as soybean oil, sunflower seed oil, palm oil, palm kernel oil, peanut oil, cottonseed oil, coconut oil, olive oil, and rapeseed oil, shows that of the total world vegetable oil consumption of 197.33 million metric tons, palm oil consumption reached 69.57 million metric tons or 35.3% [17].

From the side of the countries that are members of ACFTA, palm oil is a calculated commodity. Compared with other vegetable oils, palm oil is superior in its consumption level in ACFTA based on data obtained from the Commodity.com website. The vegetable oil industry, such as palm oil, occupies the fourth position of the five highest import commodities in China. The number of imports in the vegetable oil commodity reached 38.3 billion US dollars in 2019. So that China was named the largest crude oil importer in the world with an average of 116 billion US dollars per year and represented 17 percent of the total world crude oil imports [18].

In addition, in ASEAN itself, two countries produce the largest palm oil in the world held by Indonesia and Malaysia. Indonesia and Malaysia dominate palm oil production as much as 85 percent to 90 percent of
total world palm oil production [19]. China, Malaysia, and Indonesia are the main actors in the palm oil industry. The three countries are members of the ACFTA collaboration. So, it cannot be denied the importance of the palm oil industry in ACFTA because the pace of trade has become the economic driver of ACFTA member countries.

3. Analysis

3.1. The impact of ACFTA on Indonesian palm oil

The Industrial Sector is very influential in the world economy because of its contribution to meeting human needs. The industrial sector has developed rapidly since the industrial revolution in the 16th century, which impacted international trade. According to the Minister of Industry, Airlangga Hartarto, this sector has become the largest contributor to Indonesia's national economy with a percentage of more than 20 percent. So that Indonesia can be regarded as an industrial country. One of Indonesia's leading industries in exporting its commodities is palm oil. Based on data from Bank Indonesia, palm oil accounted for 29.5% of total Indonesian exports in the industrial sector in 2016 [20].

The palm oil industry has become an industry with superior commodities. Its role has become one of Indonesia's national interests. Therefore, palm oil has been included in the priority of Indonesia's diplomatic agenda [21]. Contribution to Indonesia's total exports is one of the important factors in the palm oil industry for Indonesia. Based on the Indonesian palm oil data below, there can be an increase in production figures, total exports, and total exports to China. Palm oil production continues to increase each year from 2005-2010 with a fairly stable, which indicates the amount of demand has also increased.

The increase in palm oil production was quite rapid during the decade. In 2005, Indonesia's palm oil production only reached 19.2 million tons, while in 2015, the production figure had reached 32.5 million tons. Similarly, total palm oil exports have risen in line with increased production. However, in 2010 and 2011, there was a decrease in total exports, which coincided with a decrease in the number of Indonesia's palm oil exports to China. As the second-largest importer of Indonesian palm oil, China has a major influence in determining the ups and downs of Indonesia's total palm oil exports (Figure 1).

![Palm Oil Graphic](source: Took from several articles such as Directorate General of Plantations (2016) and Indonesia Investment (2017))
In more detail, Figure 2 shows the ups and downs of Indonesia's exports to China so that ACFTA cooperation, which is expected to continue to increase the value of exports, does not run properly. Especially after the decline reached 0 percent in the EHP, which includes palm oil products, the graph shows a decline in the value of exports in the year after that. However, starting in 2008, palm oil exports to China experienced a significant increase despite fluctuations. China also holds the title of the first or second-largest Indonesian palm oil importer in turn with India. Even though in 2011 and 2013, there was a decline in palm oil imports.

On the other hand, Indonesia's palm oil exports to China have increased every year, regardless of the quota amount. Compared to before the entry into force of the ACFTA, there was a sharp increase in the total value of Indonesia's palm oil exports to China. This can be seen in the data summarized by the authors taken from the OEC website in graphical form below.

![Figure 2. The Graphic of Indonesian Palm Oil Exports to China](source: Badan Pusat Statistik (2017))

![Figure 3. Graphic of Indonesia’s Palm Oil Export Value to China](source: The Observatory of Economic Complexity (2017))
In the years 2000 to 2003, where ACFTA was still not in force and the design process, it was seen that the value of palm oil exports experienced a slight increase. However, after the entry into force of the ACFTA with the Early Harvest Program, the value of Indonesia's palm oil exports rose rapidly. If calculated, the percentage increase in the value of exports from 2004 to 2006, where the EHP was in full effect, amounted to 42.2 percent or 211 million US dollars. Then it can be concluded that the price of palm oil continues to increase every year following the market demand, which also increased.

3.2. Environmental impact

Indonesia is the highest palm oil-producing country in the world. Indonesia's palm oil production reaches 36 million metric tons compared to Malaysia, with 21 million metric tons [19]. A large amount of production affects the land use increases so that the conversion of forest land to plantation land is needed. The European Parliament's Environmental, Public Health, and Food Safety Committee, in its report on Palm Oil and Rainforest Deforestation, launches environmental problems such as forest fires, dried up rivers, land erosion, and declining biodiversity.

Various accusations were made by international bodies or organizations such as the European Union, which use a lot of palm oil and environmental organizations such as Greenpeace, the World Health Organization (WHO), and the World Wildlife Fund (WWF). Allegations of the European Union related to social conflicts such as social labor that are charged with manual harvesting tools, and violations of human rights such as employing women and minors, fines for leaving a crop, and minimal salary. In addition, there are allegations of Greenpeace that in 2015-2017 about 30 large companies in Papua encroached 4000 hectares of forest to be planted with oil palm. The figure is almost as much as half the city of Paris. Deforestation was 8% from 1990-2008 due to palm oil production.

High demand for palm oil products has brought Indonesia to convert forest land quickly. From 2000 to 2015, Indonesia has lost 498 thousand hectares of forest land each year, making it the second-highest deforestation country after Brazil [22]. The issue of deforestation has also become a major issue for the palm oil industry, which continues to have negative effects on the environment. With the ASEAN-China free trade, the number of requests continues to increase, which can be seen from the increasing number of exports and the impact on increasing the amount of production. In the production process, producers need to increase their production resources such as land area or production area.

In accordance with Figure 4, the expansion of oil palm land in Indonesia with three types of land ownership can be seen as increasing numbers each year. The figure also proves that private companies and farmers own most of the land. The high land area controlled by private companies does not mean that many companies manage the land. Based on the non-governmental organization Transformasi untuk Keadilan Indonesia (Tuk Indonesia), oil palm land is only controlled by 25 companies with a total of 12.3 million hectares in 2019. Behind it, there is a role of banks (mostly foreign banks) and foreign investors who provide capital to 25 companies these [23].
Based on data from the Directorate General of Plantations, the most extensive oil palm land is in Sumatra. It is subsequently in a row in Kalimantan, Sulawesi, Maluku and Papua, and Java. In areas with the highest area of palm oil, there is an alarming rate of deforestation. In 2016, the palm oil area in the North Sumatra was 24 percent of forest land or 266,237 hectares. Then in the area of East Kalimantan, control of forest land by palm oil reached 13 percent or 1,152,392 hectares.

Oil palm plantations contributed 54 percent of deforestation in Indonesia from 1989-2013 [24]. Figure 4 shows the expansion of Indonesian palm oil lands shows that land expansion with an average of 582 thousand hectares per year in the period 2005-2010. This figure exceeds the rate of deforestation every year. As it is known, deforestation has implications for increased levels of carbon emissions due to reduced forests that can neutralize pollution. According to research by Thomas Guillaume et al., a researcher at EPFL's Ecological Systems Laboratory (ECOS) and the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) in 2018 [25], one hectare of converted forest land causes 174 tons of carbon emissions released into the air. Moreover, looking at the picture below, the rate of loss of tree cover in Indonesia is continuing and is increasingly worrying every year. Although there has been a decrease in the loss rate in 2010, it cannot be denied that the area of land that has lost tree cover is extensive.

Based on data reviewed by the World Bank Group, carbon emissions in Indonesia have increased rapidly since 2006. According to data obtained from the CIAT Indonesia Climate Data Explorer website (2010), agriculture and plantations are the main contributors to carbon emissions [26]. A total of 19 provinces with vast agricultural and plantation areas are the biggest emitters. The site also shows carbon emissions data for each province in Indonesia, with the largest contributor to emissions is the provinces of North Sumatra, Riau, Central Kalimantan, Lampung, Papua, West Kalimantan, and South Sumatra. These areas are rich in plantations and agriculture. Most of the oil palm land is in the area. The following is attached the data of emission levels in these provinces as of 2010.

Table 2. Emissions Level in Indonesia Provinces

| Province           | Emission Intensity (tCO2e) | Emissions Per Capita (tCO2e) |
|--------------------|---------------------------|-------------------------------|
| North Sumatera     | 945.3                     | 20.03                        |
| Riau               | 222.91                    | 4.01                         |
| Central Kalimantan | 2137.38                   | 41.13                        |
Lampung 835.79 11.91
Papua 766.39 23.73
West Kalimantan 1037.25 14.29
South Sumatera 395.36 8.37

Source: Indonesia Climate Data Explorer-PINDAI (2010)

Compared to the value of Indonesia's palm oil exports to China with total pollution in the oil palm plantation area, it can be seen the harmony in the impact of pollution or carbon emissions contributed by the palm oil sector. The analysis is carried out using data on the total value of Indonesia's palm oil exports to China instead of Indonesia's GDP to obtain specific results on these commodities. Based on graphic data from The International Council on Clear Transportation above, it can be seen a sharp increase in carbon emission levels produced by the palm oil industry in Indonesia and Malaysia. From 2005 to 2010, there were fluctuations in the levels of emissions produced, which are also in line with the ups and downs of the number of Indonesia's palm oil exports to China in thousand tons.

If it focuses on pollution in Indonesia's forestry sector, deforestation has an impact on increasing pollution that is spread in the air. Based on the figure below, emissions from the forestry sector continued to increase from 2005 to 2009 but declined in 2010.
On the other hand, emissions data from energy activities such as transportation, fuel gas, showed fluctuations from 2005 to 2010. Similar to the number of exports in thousand tons of Indonesia to China, emissions produced by energy activities fluctuate but continue to experience increase until 2010.

**Table 3. Emission Data from Indonesian Energy Activities**

| Year | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|------|------|------|------|------|------|------|------|------|------|------|------|
| Emission (MTon CO2e) | 298  | 328  | 340  | 350  | 369  | 373  | 391  | 387  | 410  | 399  | 453  |

Source: Ministry of Environment and Forestry (2017)

The authors see Indonesia's policy on land expansion and pollution standards as less strong from the composition effect. It was said that from 2005 to 2010, there were no regulations regarding oil palm expansion restrictions or delaying land expansion permits. The Indonesian government has just adapted the Roundtable on Sustainable Palm Oil (RSPO) policy to an Indonesian policy called ISPO in 2011. Sustainable policies to minimize negative impacts on the environment impose regulations, one of which is tightening and delaying land expansion permits. However, due to the study's limitations, the authors did not analyze the year the ISPO policy emerged, but rather the authors looked at the impact of the RSPO policy on pollution in Indonesia.

The RSPO policy itself must be applied by palm oil producers if they want their products to be sold to foreign markets. The use of palm oil cannot be eliminated because of the effectiveness and ease of production; the solution obtained is to oversee the production process. Forests are burned to make available land to plant oil palm is one of the ways that is often used because it is faster and easier but has a harmful impact on ecosystems and climate. A Roundtable on Sustainable Palm Oil (RSPO) was formed in 2003 to oversee palm oil production and set strict regulations on the process.

Even so, palm oil trade continues to increase. This is because it does not support domestic regulations and policies related to this matter. Amid the increasing trade in palm oil, Indonesia has not yet implemented a clear policy on the environment. When compared with Indonesia, China has a competitive advantage in...
its environmental regulations and policies. In the article "Environmental Challenges and Current Practices in China: A Thorough Analysis" explained that China has an awareness of high levels of carbon emissions so that through Quantified Emission Limitation and Reduction Objectives (QELROs) declared a target of reducing energy intensity by 20% in 2010 [24].

So, it can be said that economic growth and economic activity in China's superior sector has had a positive composition effect due to the government's awareness of the adverse environmental impacts that created regulations and policies to reduce these adverse impacts. However, Indonesia has not yet implemented this. Hence, it is not surprising that trade in Indonesia's flagship product, palm oil, continues to increase due to regulations that deal with the environmental impact of commodity production, which is still weak. It benefits producers and consumers who can minimize the cost of production factors.

In the annual meeting of the Association of Biology and Tropical Conservation in 2016, it was mentioned that deforestation in Kalimantan is included in the fast conversion category [27]. Moreover, the amount of oil palm land originating from forest land affected by fire continues to be debated. One case of forest and oil palm fires is the case of PT. Triomas Forestry Development Indonesia (TFDI) caused a fire on its 400-hectare land concession in Riau in 2014 [28]. Then there were also forest and land fires that occurred in Riau in 2013, which produced a thick smog that disrupted community activities and adversely affected health. These fires occur in forested land, oil palms, industrial crops, and timber. Although the two cases above concern oil palm land, it is difficult to ascertain and conclude that the fire occurred to expand oil palm land.

![Figure 7. Total Emission in Indonesia](source: Ministry of Environment and Forestry (2017))

The increasing trade in palm oil through ACFTA has a negative scale and composition effect on the environment due to increased carbon emission levels. Figure 7 shows an increase in energy use, and transportation has an impact on increasing carbon emissions in the sector. This is also evidenced by the high level of carbon emissions in provinces with large areas of oil palm such as Sumatra and Kalimantan. From the data shown above, it can be seen the harmony in the indicators in this study.
4. Conclusion

Based on the results of an analysis of the impact of trade liberalization on the environment in Indonesia in the case of the palm oil industry, this study concludes that the ACFTA has contributed to the increasing environmental damage on both ASEAN and Indonesia. The results obtained from the analysis of the variable scale effects, composition effects, and technical effects with the indicators. Free trade that increases trade flows has given a scale effect in the form of an increase in energy demand due to increased production to increase emissions levels. Land expansion that causes deforestation also has implications for increasing the number of carbon emissions in the air so that forests that should be able to neutralize and absorb carbon emissions levels are reduced.

In addition, Indonesia's policies and regulations regarding the phenomenon of increasing emission levels have not been able to respond to this because Indonesia has not ratified the RSPO policy that was in force in 2003 into domestic policies, so that palm oil production actors are not paying attention to the environmental impacts that occur. However, the limitation of this study was that it had not analyzed any technical effects arising from the palm oil industry. It is due to limited data on investments in palm oil production technology and palm oil-related pollution standards that can reduce environmental impacts.

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