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BILL GATES, PALM OIL, AND THE TOP GLOBAL GREENHOUSE GAS EMITTERS

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RESUME

Bill Gates has accused palm oil of being a major cause of increasing global greenhouse gas (GHG) emissions and other environmental issues such as deforestation, biodiversity loss, and pollution. This statement can be seen as part of market conditioning for synthetic C16 products, which are substitutes for natural palm oil and are being developed by Gates' company. This accusation contradicts empirical evidence showing that fossil fuels are the primary source of GHG emissions. As a matter of fact, palm oil is relatively more sustainable compared to other vegetable oils due to its high productivity, which can reduce deforestation, produce lower emissions and pollution, and have a greater capacity in absorbing carbon (carbon sink/sequestration). Thus, palm oil presents a solution for global communities to mitigate global warming and climate change.

INTRODUCTION

Bill Gates has expressed his views, quoted by various media, on global climate change due to the increase in global greenhouse gas (GHG) emissions each year. Besides being the founder of Microsoft, Gates is also the primary investor of C16 Biosciences Inc. and he has blamed palm oil production for rising global GHG emissions.

Although the issue of linking global GHG emissions to palm oil production is not new, for someone like Bill Gates, who has extensive access to information, his statement is particularly tendentious, suggesting that palm oil production is a significant contributor to the increase in global GHG emissions. It can be understood that Gates made that statement in the context of market conditioning for synthetic C16 products, which are substitutes for natural palm oil and are being developed by the company he invests in.

Despite its contribution to global GHG emissions is relatively small, it seems that the advantages of palm oil have caught Bill Gates' attention, enough for him to disregard the primary emitter data of global GHGs. Even the United States, one of the world's top five GHG emitters and Gates' home country, escapes his scrutiny.

However, Gates' statement linking global GHG emissions to climate change is enlightening. The solution-oriented thinking generated by Bill Gates about the need for innovation to develop low-emission substitute products is expected to motivate global innovation.

This article will discuss the latest developments of the top global GHG emitters. This will then be followed by a discussion on how the palm oil industry has great potential as a solution for global communities to mitigate global climate change.

TOP-5 GLOBAL GHG EMITTERS

All human activities worldwide produce emissions and contribute to increasing global GHG emissions. Naturally, the number of emissions from each person and each activity varies depending on various factors. Generally, it holds true that the higher the economic growth and population, the higher the GHG emissions.

Recent studies on global GHG emissions (European Commission, 2023; IEA, 2023) reveal that global GHG emissions continue to increase year by year. Global GHG emissions in 2022 reached approximately 53.8 Gt CO_2 eq. This emission had an increase of 1.4 percent from 2021 or 2.3 percent compared to 2019 (before the COVID-19 pandemic).

The top-5 global GHG-emitting countries (Figure 1) have consistently been the top emitters since the 1970s (PASPI, 2023) and have not changed in the past century. These countries are China with emissions of 15.7 Gt CO_2 eq or 29.2 percent of global GHGs. It is followed by the United States with 6 Gt CO_2 eq (11.2 percent), India with 3.9 Gt CO_2 eq (7.3 percent), EU-27 with 3.6 Gt CO_2 eq (6.7 percent), and Russia with 2.6 Gt CO_2 eq (4.8 percent). These countries accounted for nearly 60 percent of global GHG emissions in 2022.

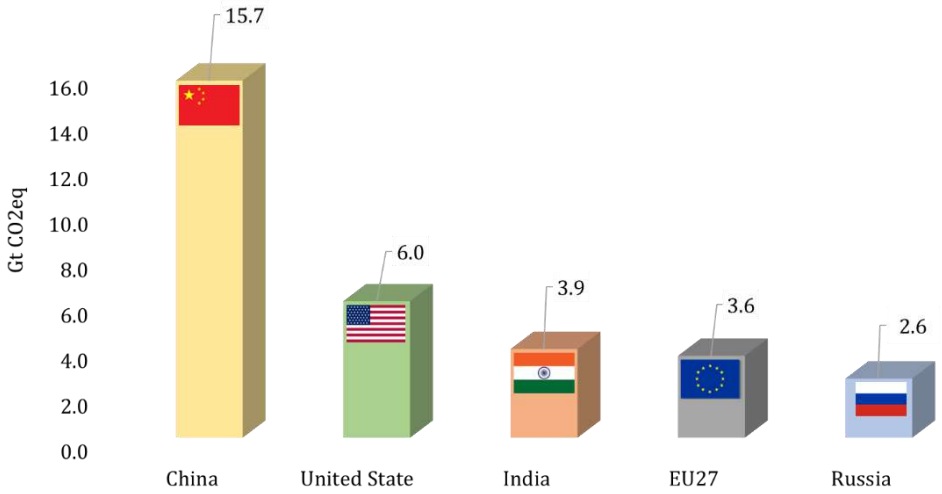

Figure 1. Top-5 Global GHG Emitters in 2022 (Source: European Commission, 2023)

Compared to the top-5 emitters above, Indonesia's emissions, which Bill Gates has cited as a significant contributor to global GHG emissions, are only around 1.2 Gt CO2 eq, or about 20 percent of the United States' emissions (European Commission, 2023).

The increase in GHG emissions is primarily due to human activities on Earth and the emergence of man-made gases such as chlorofluorocarbons (CFCs) and halogens (human-enhanced greenhouse effect). Various empirical studies (IEA, 2016; Olivier *et al.*, 2022) revealed that the energy sector (fossil fuels) is the main contributor to global GHG emissions.

Similar findings were reported by the European Commission (2023) and IEA (2023). Of the 53.8 Gt CO_2 eq global GHG emissions in 2022, about 76 percent (41.2 Gt CO_2 eq) came from fossil fuel sources. GHG emissions from fossil fuels have increased almost 1.5 times from about 28.1 Gt CO_2 eq in 2000.

During the 2000-2022 period (Figure 2), emissions from coal consumption nearly doubled from just 8.9 Gt CO_2 eq to 15.5 Gt CO_2 eq. The contribution of emissions from oil also increased from 9.7 Gt CO_2 eq to 11.2 Gt CO_2 eq. Similarly, natural gas emissions rose from 4.6 Gt CO_2 eq to 7.3 Gt CO_2 eq. These three fossil fuel sources have contributed to about 82 percent of GHG emissions from fossil fuels.

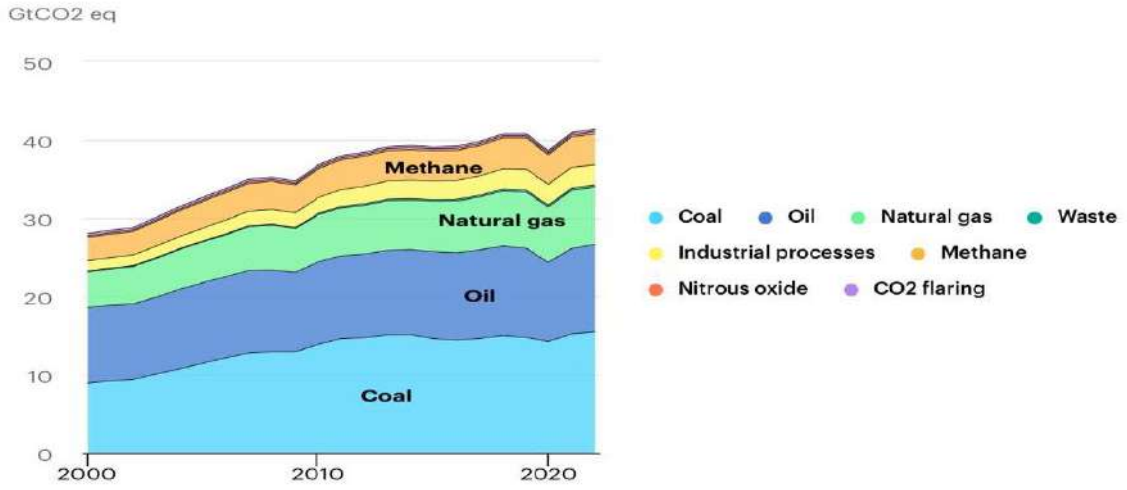

Figure 2. Contribution of Fossil Fuels to Global GHG Emissions from 2000 to 2022 (Source: IEA, 2023)

The development and composition of global GHG emission sources and emissions from fossil fuels have revealed that total global GHG emissions are still on an upward trend (PASPI Monitor, 2023[d]). The main sources of global GHG emissions remain fossil fuels. The three global fossil fuel sources—coal, fossil oil, and natural gas—continue to be the primary contributors to global GHG emissions. In fact, coal emissions have tended to increase significantly over the past 20 years. Similarly, the top-5 global GHG emitters have not changed.

The top-5 global GHG emitters and the main sources of global GHG emissions should have drawn Bill Gates' attention. If he wants to contribute to reducing global GHG emissions (a cause of climate change), Gates should have focused more on developing low-emission and renewable energy sources as substitutes for fossil fuels. As the largest contributor to global GHG emissions, reducing fossil fuel consumption will have a significant impact on reducing global GHG emissions.

As a global influencer, Bill Gates is also expected to use his influence on "pressure" the top-5 global GHG emitters (including the United States) to reduce their emissions, as these countries contribute nearly 60 percent of global GHG emissions. If the top-5 emitters reduce their emissions by just 10 percent, the reduction in global GHG emissions would be significant.

Although not a top-5 global GHG emitter, Indonesia has taken steps to reduce emissions through its Nationally Determined Contribution (NDC) and Net Zero Emission (NZE) program by 2050 (PASPI Monitor, 2021[b]; 2023[e]). This includes policies to substitute fossil fuels with low-emission and renewable energy.

PALM OIL: A GLOBAL SOLUTION

Regarding the global production of vegetable oils (including palm oil), several issues highlighted by Bill Gates include deforestation, biodiversity loss, emissions, carbon sink/sequestration, and pollution. According to Gates, these issues are important arguments for developing synthetic C16.

Globally, there are about 17 types of vegetable oils produced and consumed for both food and energy. However, among these 17 types, only four are the world's primary vegetable oils, namely palm oil, soybean oil, rapeseed oil, and sunflower oil. These four types of vegetable oils account for about 90 percent of the world's vegetable oil production and consumption (PASPI, 2023).

These four main vegetable oils have different oil productivity (PASPI, 2023). Palm oil productivity per hectare is about 8-10 times higher than other vegetable oils (soybean oil, rapeseed oil, and sunflower oil). Palm oil is not only the most efficient in land use but also has the highest oil productivity (PASPI Monitor, 2021[a]).

The average productivity of palm oil (CPO+CPKO) is 3.36 tons per hectare. In contrast, the productivity of sunflower, rapeseed, and soybean plants is only 0.78 tons per hectare, 0.74 tons per hectare, and 0.47 tons per hectare, respectively. Given such productivity, the global community can rationally choose relatively more sustainable vegetable oils.

Based on global deforestation studies (Matthew, 1983; Walker, 1993; Horughton, 1996; Egli, 2001; Bhattarai *et al*., 2001; FAO, 2012; European Commission, 2013; USDA, 2014; Keenan *et al*., 2015; Kaplan *et al*., 2017; Sabatini *et al*., 2018; Barredo *et al.,* 2021; European Commission, 2023), almost all land on Earth's surface has been related to past deforestation, and deforestation still continues in various countries, though not as intensively as before. Not only global vegetable oils, but all products, if traced, are directly or indirectly related to deforestation. The difference lies in the timing of deforestation in each country.

The production process of each type of vegetable oils in various producing countries, as noted by Bill Gates, is indeed linked to deforestation and emissions. If one seeks a vegetable oil free from deforestation and emissions, it will never be found in reality (it is unrealistic). Thus, the issue is not whether it is linked to deforestation or emissions, but which type of vegetable oils is relatively more efficient in terms of deforestation and emissions.

Relatively speaking, palm oil has several sustainable advantages that can be a solution for the global community (PASPI Monitor, 2023[a], 2023[b], 2023[c], 2023[d], 2024). ***First***, oil palm is the most productive and land-efficient crop. To produce one ton of vegetable oil, oil palm requires about 0.2 hectares of land. In contrast, other vegetable oils need 8-10 times more land to produce the same amount of oil. If the land used for vegetable oil production comes from deforestation, then palm oil is far more efficient in terms of deforestation compared to other vegetable oils. This also means that the presence of palm oil can prevent wider deforestation for global vegetable oil production (PASPI, 2023).

Second, biodiversity loss. If it is assumed that all land comes from past deforestation, then all vegetable oil expansion causes biodiversity loss. Beyer *et al*. (2020) and Beyer & Rademacher (2021) examined the global biodiversity loss comparisons among vegetable oils by comparing land cover biodiversity before and after being converted to vegetable oil crops. By measuring the footprint indicator, namely Species Richness Loss (SRL) per liter of oil produced (as a measure of biodiversity loss), it shows that the biodiversity loss of palm oil is much smaller compared to other vegetable oils (PASPI, 2023). This means that with the presence of palm oil, the global community avoids greater biodiversity loss.

Third, carbon emissions. The linkage of vegetable oil production, including palm oil, to carbon emissions is also a global environmental issue. Studies by Beyer *et al*. (2020) and Beyer & Rademacher (2021) found that at the global ecosystem level, oil palm plantations are the lowest emitters among vegetable oil sources. This means that palm oil production is the most emission-efficient (PASPI, 2023). With the presence of palm oil, the global community avoids a larger increase in GHG emissions in the production and consumption of vegetable oils.

Fourth, carbon sink or carbon sequestration. To help reduce GHG emissions from the Earth's atmosphere, it is necessary to reabsorb these emissions and store them in the soil for as long as possible. The productivity differences among vegetable oils also reflect differences in their ability to absorb carbon (GHG emissions) from the atmosphere and store it as biomass and soil carbon. The carbon sink/sequestration capacity of oil palm varies depending on factors such as plant age, productivity, and plant population. Generally, the older the palm plant, the higher the carbon stock (Singh *et al*., 2018; Lamade and Bouillet, 2015; PASPI, 2023).

A study by Chan (2002) revealed that the carbon stock of oil palm plantations ranges from 16.12-45.28 tons C/hectare. A study by Kusumawati *et al.* (2021) found that the carbon stock of oil palm plantations ranges from 43.50-74.7 tons C/hectare. A study by Khasanah *et al.* (2019) also indicated an average oil palm plantation carbon stock of 40 tons C/hectare. A study by Setiadi *et al.* (2020) found that oil palm plantation carbon stock ranges from 34.16-69.32 tons C/hectare. This carbon stock is higher than the average carbon stock per hectare of forests in France (CIRAD, 2015).

The carbon stock sequestered in oil palm plantation sites can last 25-30 years. Even the carbon stock that has turned into soil organic carbon can remain in the soil for over 100 years. This means that the presence of palm oil enables the global community to reabsorb atmospheric carbon and store it as soil organic carbon directly and indirectly.

Fifth, soil/water pollution in producing global vegetable oils. The use of fertilizers and pesticides in the cultivation of vegetable oil crops indeed produces fertilizer and pesticide residues in both soil and water.

According to FAO data (2013), for each ton of vegetable oil produced, oil palm generates 5 kilograms of nitrogen pollutants, 2 kilograms of phosphorus (P_2O_5), and 0.4 kilograms of pesticides. In contrast, rapeseed oil production generates 10 kilograms of nitrogen pollutants, 13 kilograms of phosphorus (P_2O_5), and 9 kilograms of pesticides per ton. The vegetable oil source that generates the most pollutants is soybean oil, with each ton producing 32 kilograms of nitrogen, 23 kilograms of phosphorus (P_2O_5), and 23 kilograms of pesticides. This shows that palm oil production results in relatively fewer pollutants compared to rapeseed and soybean oil (PASPI, 2023).

Thus, it is quite clear that the various issues highlighted by Bill Gates—deforestation, biodiversity loss, emissions, carbon sinks, and pollutants related to the production process of global vegetable oils—are valid. Empirical evidence shows that palm oil is relatively the most sustainable compared to other vegetable oils, being relatively minimal in terms of deforestation, biodiversity loss, emissions, and pollutants, while being higher in carbon sink/sequestration.

The development of C16 as a substitute for palm oil cannot completely avoid environmental issues, as claimed by Bill Gates. Using a footprint or Life Cycle Analysis approach, the entire production chain of C16 also generates GHG emissions and other environmental issues. Naturally, developing microbe based C16 is necessary for the future to meet global needs, including as a potential substitute for fossil energy.

CONCLUSION

Various environmental issues related to the global vegetable oil production process highlighted by Bill Gates, such as deforestation, biodiversity loss, emissions, carbon sink/sequestration, and pollution, are not only associated with global vegetable oils but with almost all activities on Earth.

The top five global GHG emitters are China, the United States, India, the European Union, and Russia. All human activities produce emissions. However, the main global GHG sources are fossil fuels (oil, coal, natural gas). Emissions from the global vegetable oil production process, including palm oil, are relatively small.

Empirical evidence shows that deforestation has occurred in almost every country in the past and present, so almost all land and activities on it, including the global vegetable oil production process, are directly or indirectly linked to deforestation. However, among the world's major vegetable oils, palm oil is relatively more sustainable with high productivity, relatively low deforestation, lower emissions, lower pollution, and higher carbon sink/sequestration. The presence of palm oil in the global market prevents the world from engaging in more extensive deforestation, causing greater biodiversity loss, and producing higher emissions and pollution. Additionally, palm oil helps reabsorb global GHG emissions from the Earth's atmosphere and store them in the form of biomass and soil organic carbon.

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