

## PALM OIL IS THE MOST "OILY" VEGETABLE OIL IN THE WORLD

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### RESUME

*There are four main vegetable oil plants that produce around 90 percent of the global vegetable oils, namely oil palm, soybeans, rapeseed, and sunflower. Areal and production of them also increasing significantly in last 20 years.*

*Among this vegetable oil plants, oil palm has comparative advantages compared than other vegetable oils. Oil palm plantation's area is the smallest compared to other vegetable oil plants, however the oil production is the largest. This shows the advantage of oil palm plants are more land-saving and the more "oily" because higher productivity than other vegetable oils.*

*The higher productivity and plant morphology of oil palm is classified tree and annual plant with a planting cycle of up to 25-30 years has implications for its ability and capacity has a larger and more sustainable "ecosystem lungs" in long term. Meanwhile, this function from other vegetable oil plants has not been obtained, however if we follow the proportion of productivity and plant morphology it's estimated lower than oil palm plants.*

*Another advantages compared to other vegetable oil plant is to producing one tonnes of palm oil is more efficient in the use of production inputs (nitrogen fertilizers, phosphate fertilizers, pesticides/herbicides, and energy) and more eco-friendly because the pollution/residual water/soil and GHG emissions into the air are lower.*

## INTRODUCTION

The global community should be grateful because they have a biodiversity of various plants that are able to produce vegetable oil and used by them in throughout the year. The process of cultivating vegetable oil plants has been carried out from generation to other generation, it's means this process also helps to preserve their biodiversity, so that can exist until today.

Among the vegetable oil plants in the world, there are top-four that produce around 90 percent of the global vegetable oils, namely oil palm, soybeans, rapeseed, and sunflower (USDA, 2021).

Rapeseed and sunflower are vegetable oil plants that are widely grown in sub-tropical areas such as Europe, Russia, North America, and China. Meanwhile, oil palm is a vegetable oil plant that thrives on tropical areas such as Indonesia, Malaysia, and Central Africa. Meanwhile, soybeans are vegetable oil plant that is generally grown in sub-tropical areas such as the USA, Brazil, Argentina, and China. These plants are also grown in tropical areas but their productivity is less than optimal. This article will discuss the comparison among the top-four main vegetable oils in the world.

## OIL PALM PLANT IS LAND-SAVING

The top-four main vegetable oil plants have a unique history because they had rapid development rather than their origin. For example, soybeans were originally from mainland China which later entered the United States and expanded into South America. Rapeseed plant was first cultivated in England and later expanded to North America and Europe. Meanwhile, sunflower plants were also originally developed in North America, then expanded to Europe and Russia. Similar to the history of other vegetable oils, oil palm plant is also originally from Southwest Africa and has grown rapidly in Indonesia and Malaysia. This shows that since the beginning of the development of the top-four main vegetable oils, they have globalized and belong to the global community.

In the last 20 years, the area of top-four main vegetable oils has grown rapidly (Figure 1). Based on USDA data (2021), the total area of them reach 213.6 million hectares in 2020, consisting of soybean (127 million hectares), rapeseed (35.5 million hectares), sunflower (27.6 million hectares), and oil palm (24 million hectares).

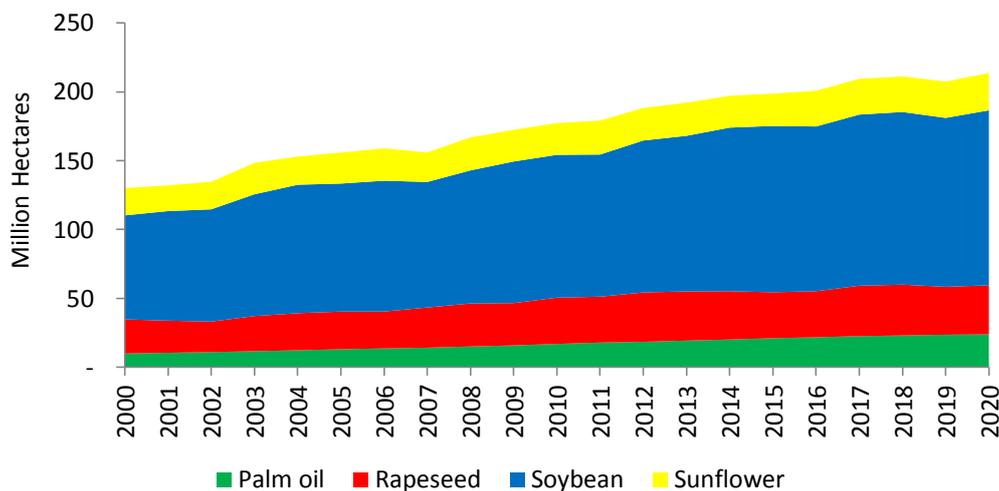


Figure 1. The Area of the Top-Four Main Vegetable Oil Plants in the 2000-2020 (Source: USDA, 2021)

When compared with the area of oil palm, the area of the soybean is 5 times larger than the area of oil palm. Meanwhile, the rapeseed area is almost 1.5 times and the sunflower area is also around 1.2 times than oil palm area.

The lower land requirements of oil palm among the top-four main vegetable oils is also confirmed by FAO's study (2013) stated that the land required to produce one ton of palm oil is only 0.23 hectares. Meanwhile,

land requirement of rapeseed oil and soybean oil to produce the same amount of oil are 1.45 hectares and 2.22 hectares, respectively.

A different point of view can be seen in terms of vegetable oil production produced by them. The production of top-four vegetable oils in the last 20 years has also shown an increase significantly, from around 76 million tons to 191.4 million tons (Figure 2).

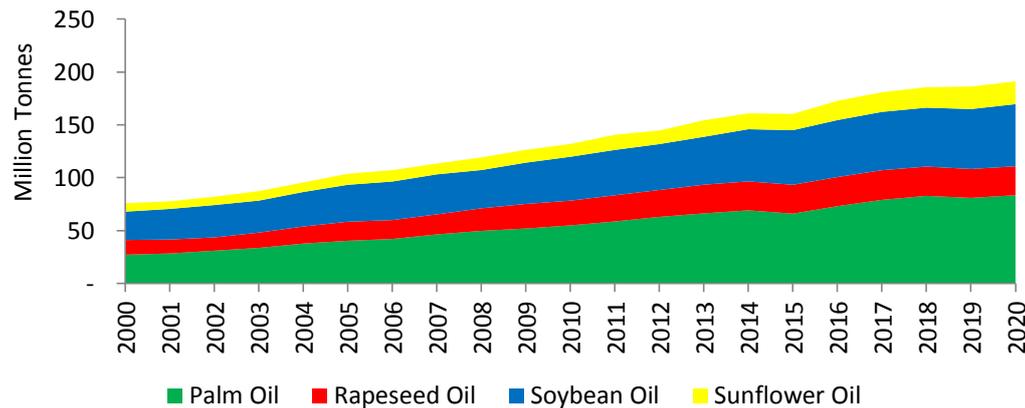


Figure 2. Top-Four Main Vegetable Oil Production in 2000-2020 (Source: USDA, 2021)

From the production volume of the top-four main vegetable oils in 2020 reached 191.4 million tons are consist of 84.2 million tons of palm oil. Meanwhile, the volume production of soybean oil was 60.3 million tons, rapeseed oil was 27.6 million tons, and sunflower seed oil was 19.3 million tons in the same period.

These data shows that although total area of oil palm plantation is only about 11 percent of the total area of the top-four main vegetable oil plants, they have producing 44 percent of the top-four main vegetable oil production. On the other hand, soybeans plantation have 60 percent of the total area, they are only able to produce about 30 percent of the total top-four main vegetable oil production. These facts above show that oil palm is the most efficient in terms of land use, otherwise soybean including vegetable oil crops are wasteful of land use.

### PALM OIL IS MORE "OILY"

Oil palm is not only the most efficient in land use but also the highest in oil productivity or the most "oily". Among of the top-four main vegetable oil crops, only oil palm is a tree and classified as an annual plant with a planting cycle of up to 25-30 years. Oil palm trees are also gifted by God with oil production capabilities that greatly exceed the capabilities of other vegetable oil plants.

This is confirmed by Oil World (2008), the average productivity of palm oil (CPO+CPKO) reaches 4.3 tons per hectare (Figure 3). Meanwhile, the productivity of rapeseed, sunflower, and soybean in producing oil was only 0.7 tons per hectare, 0.52 tons per hectare, and 0.45 tons per hectare, respectively. Palm oil productivity is almost 10 times the productivity of soybean or 8 times the productivity of sunflower and 6 times the productivity of rapeseed.

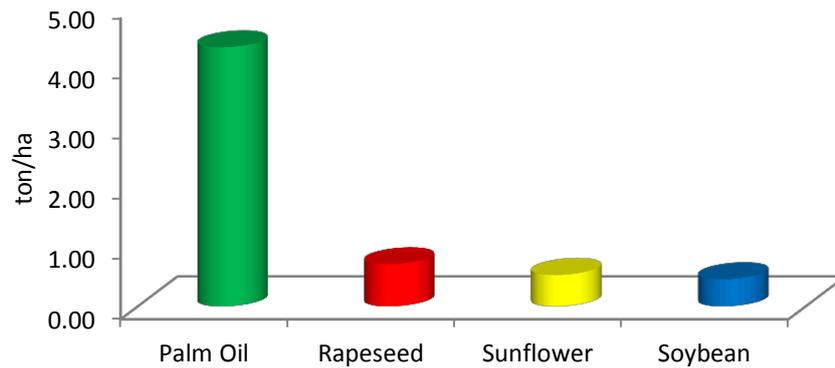


Figure 3. Comparison of Productivity of the Top-Four Main Vegetable Oils (Source: Oil World, 2008)

The much higher productivity of palm oil than other main vegetable oils does not only show that they more “oily”, this fact also has far-reaching implications related to the strategy for supply of global vegetable oil as well as solutions to environmental issues.

In this current condition facing scarcity and limited land resources, the global community will prefer a “land-saving” plant with higher oil yield productivity. This choice is suitable to be “dropped” on palm oil.

The choice of palm oil to land-saving without reducing oil production is also more relevant to global efforts for contribute to reducing deforestation and land-use change. If the global community wants to reduce deforestation, then the solution is not to hate palm oil because the losses will be greater. Because every reduction in production of one million tons of palm oil must be paid for by global deforestation (land-use change) for soybean expansion of 2.2 million hectares, or expansion of rapeseed area of 1.7 million hectares, or expansion of sunflower area of around 2 million hectares.

The facts also confirmed by IUCN’s study (2018) stated that palm oil production is the most efficient in terms of land use compared with other vegetable oils, which need nine times more land to produce the same amount of oil. Their argues shows that replacing palm oil with other vegetable oils would lead to much greater exploitation of land and causing more of a threat to biodiversity.

The higher productivity in palm oil and plant morphology (classified tree-form) are

also related to the provision of environmental services such as the ability to absorb carbon dioxide (carbon sink) and produce oxygen. The difference in productivity and morphology between top-four vegetable oil plants also reflects the difference in the functioning capacity of the ecosystem “lungs” or absorption of carbon dioxide and oxygen production.

Henson (1999) and Fairhurst (2004) revealed that the net absorption (assimilation-respiration) of carbon dioxide from oil palm plants reaches 64.5 tons CO<sub>2</sub>/ha/year, while the oxygen production reached 18.7 tons O<sub>2</sub>/ha/year. Meanwhile, the amount of carbon dioxide absorption and oxygen production or the “lungs” function from other vegetable oil plants such as rapeseed, soybean, and sunflower has not been obtained. However, if we follow the proportion of productivity and plant morphology (Figure 3), the absorption of carbon dioxide and oxygen production of the three vegetable oil plants is estimated lower than oil palm plants.

The FAO study (2013) also states to producing one ton of palm oil has other advantages such as being efficient in the use of production inputs (nitrogen fertilizers, phosphate fertilizers, pesticides/herbicides, and energy) compared to inputs for producing one ton of soybean oil and rapeseed oil. The implication is that pollution/residual water/soil and GHG emissions into the air produced to produce palm oil are also lower than soybean oil and rapeseed oil (Table 1).

Table 1. Comparison of Input, Output, Energy, and Land among Top-3 Main Vegetable Oils

Comparison Indicators	One ton of Oil		
	Palm oil (PO)	Soybean oil (SBO)	Rapeseed soil (RSO)
<b>Inputs</b>			
Nitrogen (kg N)	47.0	315.0	99.0
Phosphate (kg P2O5)	8.0	77.0	42.0
Pesticides/herbicides (kg)	2.0	29.0	11.0
Energy (Gj)	0.5	2.9	0.7
<b>Output</b>			
Pollution/residue to water/soil:			
Nitrogen (kg)	5.0	32.0	10.0
Phosphate (kg P2O5)	2.0	23.0	13.0
Pesticides/herbicides (kg)	0.4	23.0	9.0
GHG emissions to the air:			
Nox	0.5	4.0	0.8
SO2	0.2	2.0	0.3
CO2	0.1	6.0	2.0
Energy Input (Gj/ha)	19	20	12
Energy Output (Gj/ha)	182	50	70
Energy Netto (Gj/ha)	163	30	58
Land needs (ha/ton)	0.23	2.22	1.45

Source: FAO (2013)

In other words, palm oil as one of the global main vegetable oil has the advantage of being land-save, efficient in the use of production inputs, more "oily", having a larger "lung" capacity for ecosystems, and eco-friendly in cultivation due to lower pollutant/emission compared to other vegetable oil plants.

### CONCLUSION

The top-four vegetable oil are main contributor to fulfilling the global demand. Although oil palm has a relatively small area compared to other vegetable oil plants (soybean, rapeseed, and sunflower) area, however it's capable of producing the largest volume of palm oil in the vegetable oil production structures. This shows the advantage of oil palm plants are more land-saving and the more "oily" because higher productivity than other vegetable oils.

Besides these two advantages, morphology of oil palm is classified as tree-form and annual plant with a long cycle of up to 25-30 years, also has implications for its ability and capability has a larger and more sustainable "ecosystem lungs" in long term than other vegetable oil plants. Another advantage in the production of palm oil is

efficient in the use of production inputs and more eco-friendly because the pollution/residual water/soil and GHG emissions into the air are lower.

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