

MOVEMENT, TRCEABILITY AND USES OF IMPORTED PALM OIL

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MINISTRY OF AGRICULTURE AND FARMERS' WELFARE,
GOVERNMENT OF INDIA

BY

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LIST OF ABBREVIATIONS

CAGR	Compound Annual Growth Rate
DGCI&S	Directorate General of Commercial Intelligence and Statistics
EU	European Union
FAS	Foreign Agricultural Service
FFB	Fresh Fruit Bunches
GoI	Government of India
ISOPOM	Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize
NFSM	National Food Security Mission
NMEO-OP	National Mission on Edible Oils-Oil Palm
NMOOP	National Mission on Oilseeds and Oil Palm
OPAE	Oil Palm Area Expansion
OPDP	Oil Palm Development Programme
PFAD	Palm Fatty Acid Distillate
PKFAD	Palm Kernel Fatty Acid Distillate
RBD	Refined Bleached Deodorized
US	United States
USDA	United States Department of Agriculture

EXECUTIVE SUMMARY

Palm oil plays a dominant role in the global edible oil market. It has the largest share in the global market in terms of production, consumption as well as trade. Of 212 million metric tons of vegetable oil produced in 2021-22, palm oil constitutes about 36 percent of the world's vegetable oil production. Palm oil is also the most widely consumed edible oil in the world and its demand is expected to increase markedly in the future due to its affordability and versatility. Further, palm oil dominates the international vegetable oil trade as it is the most exported and imported vegetable oil in the world.

A major share of the world's palm oil production comes from Indonesia and Malaysia. They are also the largest suppliers of palm oil to the world, fulfilling about 89 percent of the palm oil demand across the globe. Its demand has increased tremendously in the last decade. Asia is the largest consumer of palm oil responsible for more than 50 percent of the world's palm oil consumption. Efforts to promote biofuel in the European Union have also resulted in steady growth in demand for palm oil since 2008 (Voorra et al., 2019).

India is the leading importer of palm oil in the world. In 2021-22, India imported 7.75 million metric tons of palm oil, which is about 95 percent of the domestic consumption of palm oil. Dependency on imports has increased to meet consumption as domestic production has not been able to keep up with the rising demand for palm oil. Heavy reliance on imports of palm oil to meet huge domestic demand makes it susceptible to international price fluctuations. Despite huge potential, the area under oil palm cultivation remains minimal. Therefore, it is important to increase domestic production to reduce import dependency and counter food price inflation.

The low price and high utility of palm oil make it a popular vegetable oil for diverse end-use applications. Palm oil has a variety of end-use applications in the food and non-food industry.

Its food applications include cooking oil, bakery fats, shortening, margarine, confectionary fats and spreads, etc. It is also used widely in the manufacturing of personal care and cosmetic products, pharmaceutical products, oleochemicals, animal feed and biodiesel. Understanding the broad range of applications across various sectors is important to formulate policies on oil palm production to achieve self-sufficiency in palm oil.

The study discusses the trends in palm oil production and trade in India. It assesses the port-wise landing of imported crude palm oil and refined palm oil. It further examines the end uses of imported crude and refined palm oil in different sectors of utilization. The findings of the study reveal that palm oil is mostly imported in crude form in India. About 70 percent of the palm oil imports constitute crude palm oil, while 30 percent is imported in refined form. Among refined palm oil, RBD (refined, bleached and deodorized) palm olein constitutes a major share in the imports (about 93.5 percent in 2020-21). The share of RBD palm oil and RBD palm stearin in refined palm oil imports is meagre. The majority of the palm oil is imported from Indonesia and Malaysia which are the dominant producers and suppliers of palm oil. Together, they supply about 93 percent of India's palm oil requirements. They are the top suppliers of both crude and refined palm oil to India.

The shipment of imported palm oil arrives at Indian seaports from where it is transported to traders, refiners, manufacturers or retailers. Kandla sea in Gujarat, Kolkata sea in West Bengal, Krishnapatnam sea in Andhra Pradesh, Nhava Sheva sea in Maharashtra and New Mangalore sea in Karnataka are the top seaports of palm oil imports. Kandla sea is the largest port of palm oil imports where 30 percent of the total palm oil shipments arrive (amounting to Rs. 12.66 thousand crores in 2020-21). Kolkata sea and Krishnapatnam sea also received major shipments of crude palm oil.

With regard to refined palm oil, Nhava Sheva sea, followed by Mundra port and Raxaul land is the major port of entry. Nhava Sheva sea received shipments worth Rs. 277 crores in 2020-21 which accounted for 37 percent of the total refined palm oil imports. Nhava Sheva sea is also the major port of entry for RBD palm olein which constitutes the major component of refined palm oil imports in India. For RBD palm oil, Kandla sea is the major port of import that accounted for 96 percent of the total RBD palm oil imports in 2020-21, whereas Mundra received the largest shipment for RBD palm stearin (97 percent of the total RBD palm stearin imports) in 2020-21.

Palm oil is a versatile edible vegetable oil that has diverse uses in the food as well as industrial sector. In India, palm oil is used enormously in the food sector with a share of 95.75 percent, whereas its industrial applications are minimal (only 4.25 percent). Imports of palm oil in India are concentrated among large manufacturing companies that are engaged in sourcing, refining and manufacturing of various products for use in various industries like food, bakery, personal care, pharmaceutical and chemical industry. The imports of the top 30 palm oil importing companies constitute about 90 percent of the total palm oil imports in the country. Emami Agrotech, Adani Wilmar, Ruchi Soya Industries, Gokul Agro Resources and South India Krishna Oils and Fats are the key players in palm oil processing and manufacturing, sourcing about 50 percent of the total crude palm oil imports in India.

Palm oil use in India is dominated by the food manufacturing sector as all major companies are involved in the production of cooking oil and fats for home and institutional use. The majority of these companies produce fats, shortening and margarine for applications in bakery and confectionary. Some companies also produce oleochemicals for use in different sectors like personal use, cosmetics, pharmaceuticals, and other industries. The market for livestock feed and biodiesel is extremely small with only a limited number of companies involved in its production.

India's heavy reliance on palm oil imports increases its vulnerability to international price fluctuations. Despite protectionist measures and trade barriers, India remains the largest importer of palm oil in the world. Due to high fluctuations in domestic prices as a result of international price volatility, farmers are not able to realize the remunerative price for their produce. This discourages farmers to undertake oil palm cultivation. Farmers, therefore, need to be hedged against international price volatility. Providing viability price to farmers can protect them from global price fluctuations.

Expansion of oil palm plantations is required to meet the growing domestic demand for palm oil. India has enormous potential for the development and expansion of oil palm plantations to achieve self-sufficiency in palm oil. Farmers need to be incentivized to undertake oil palm cultivation. Post-harvest practices also play a major role in providing remunerative prices to farmers for their produce. Hence, farmers should be provided with easy access to the mill to extract palm oil from harvested FFBS to minimize the time between harvest and arrival of bunches at the mill. Mills and refineries should be provided with access to technology and technical assistance to stimulate palm oil production.

Palm oil can be replaced with mustard oil or coconut oil which are domestically produced in India. Given that India's dependency on palm oil is mainly in the food sector, substitution with other vegetable oils (like soyabean oil, sunflower oil, coconut oil, etc.) can easily be achieved. The government can, therefore, initiate programmes to educate manufacturers and consumers regarding alternatives of palm oil.

1. INTRODUCTION

1.1. Background of the Study

Palm oil is an edible vegetable oil derived from the fruit of oil palm (*Elaeis Guineensis*), a tree-like monocot plant belonging to the Arecaceae family. The fruit of oil palm grows in dense bunches, called Fresh Fruit Bunches (FFBs). Oil palm trees begin to bear FFBs 3-5 years after they are grown and have an economic life span of 25-30 years producing fruits throughout the year (Barcelos et al., 2015). In a favourable environment, FFBs grow all round the year and therefore, are harvested at regular intervals (typically 7-10 days) throughout the productive life of oil palm. They deteriorate within 24 hours after harvesting, therefore, need to be transported from farm to mills quickly. Once FFBs reach the mill, crude palm oil is extracted from the fleshy outer pulp of the fruit called mesocarp, whereas, the kernel (seed) inside the hard shell of the fruit yields palm kernel oil. Crude palm oil is naturally red in colour because of its high beta carotene content along with vitamin E and antioxidants. Crude palm oil derived from mesocarp tissue makes up for about 89 percent of the total fruit oil while the remaining 11 percent is derived from the kernel (Murphy et al., 2021).

The Oil Palm tree is native to West Africa but its commercial expansion has occurred in the tropical regions of Southeast Asia as well as Latin America. Climatic conditions constitute an important factor determining land suitability for oil palm (Pacheco et al., 2017). It grows well in humid tropical climates 5 degrees north and south of the equator. Ideal conditions require temperature ranging from 24 to 32 degrees centigrade and tropical rainforest with 1780 to 2280 mm rainfall throughout the year (Sheil et al., 2009).

Palm oil is one of the most widely used edible vegetable oil in the world due to its efficiency in production and versatility in application. Oil palm is the most efficient crop because of its high productivity and low production cost in comparison to other crops like soyabean,

sunflower, mustard or rapeseed. Oil palm has the highest yield per unit area, producing 3.3 tonnes of oil per hectare, whereas, coconut, sunflower and soyabean seeds/crop produce less than 0.7 tonnes of oil per hectare. The versatility of palm oil enables it to use in a wide variety of food and non-food applications. The uses of palm oil in the food industry are cooking oil, bakery fats and shortenings, margarine, confectionary fats and spreads, among others. Non-food applications of palm oil include the production of soaps and detergents, personal care and cosmetics, pharmaceuticals, oleochemicals, animal feed and biofuel.

Palm oil plays a dominant role in the global vegetable oil market. It forms the largest share in terms of production, consumption as well as trade. Of 213 million metric tons of vegetable oil produced in 2021-22, palm oil accounts for 35 percent of the world's vegetable oil production. Palm oil is also the most consumed edible oil in the world due to its easy availability and affordability. Its demand is expected to increase markedly in the future due to its great versatility in producing daily goods (Shigetomi et al., 2020). The Asia-Pacific region accounts for 58 percent of the global vegetable oil production, the majority of which comes from Indonesia and Malaysia (OECD/FAO, 2021). Both Indonesia and Malaysia have witnessed large-scale commercial plantations of oil palm and thus, dominate the global market in palm oil production. They are also the leaders in palm oil exports, serving about 89 percent of the world's traded palm oil. A significant proportion of the global palm oil production is consumed by India, China and the European Union (EU) which rely mainly on imports to meet the domestic demand. They are the largest importers and among the largest consumers of palm oil in the world.

India imports the majority of its edible oil needs and its dependence on imports have increased over years. India is the largest importer of vegetable oils and is projected to maintain its high import growth of 3.4 percent per annum due to rising domestic demand and limited production growth opportunities (OECD/FAO, 2021). Among the vegetable oils, palm oil has emerged as

the most consumed edible oil in India due to its availability, affordability and versatility. India is the largest importer and consumer of palm oil in the world. India's dependence on imports of edible oils has increased substantially over the years due to trade liberalization, rising population, changing consumption patterns as well as low domestic productivity.

1.2.Rationale of the Study

India relies heavily on the imports of palm oil to meet its huge domestic demand making it susceptible to international price fluctuations. It is important to increase domestic production to reduce import dependency and counter food price inflation. Palm oil has a variety of end-use applications. A major part of the palm oil is directly used in cooking or blended with other edible oils like soyabean, groundnut, rapeseed, sesame, sunflower and safflower oil. Palm oil is also used in other sectors like cosmetics and personal care, pharmaceutical and industrial use, animal feed, biofuel, etc. Understanding the broad range of applications across various sectors is important to formulate policies on oil palm production to achieve self-sufficiency in palm oil.

1.3.Objectives of the Study

The study aims to fulfill the following objectives:

- a. To analyse trends in palm oil trade and production in India and the world.
- b. To analyse the port-wise landing of imported crude palm oil and refined palm oil.
- c. To study the end uses of imported crude and refined palm oil in different sectors.

1.4.Data and Methods

The study is conducted at the all-India level. It employs both primary and secondary data. Secondary data on global trends in palm oil production, consumption and trade are collected from Foreign Agricultural Services (FAS), United States Department of Agriculture (USDA). Data on India's palm oil imports are obtained from Export-Import Data Bank, Ministry of Commerce and Industry. Data pertaining to the imports of palm oil arriving at different ports are collected from the Directorate General of Commercial Intelligence and Statistics (DGCI&S), Ministry of Commerce and Industry. DGCI&S provides detailed monthly and yearly information on exports and imports of commodities by country, region and port. This data is utilized to analyse the port-wise imports of crude palm oil and refined palm oil arriving from different countries.

The assessment of end uses of palm oil is undertaken through online questionnaires and structured telephonic interviews administered on palm oil importers. The information available in the public domain is also collected and reviewed. The importers of palm oil are identified and surveyed to examine different utilization of crude palm oil or refined palm oil and their movement to its end-uses in various sectors like food, personal care and cosmetics, pharmaceutical, chemical, animal feed and biofuel is traced. The data from FAS, USDA is utilized to analyse the end uses (food and industrial use) of palm oil in India and the world. Analysis of the data is based on descriptive statistics.

1.5.Organization of the Study

The rest of the study is organized as follows. Section 2 analyses the global trends in palm oil production, consumption and trade. It compares palm oil production, consumption and trade with other major vegetable oils, including soyabean oil, sunflower oil, rapeseed oil, coconut

oil, among others. Major producers, consumers and traders of palm oil across the world are also analysed. Section 3 undertakes a detailed review of the trends in imports and production of palm oil and its fractions in India. It discusses India's dependency on palm oil imports owing to low domestic production of oil palm. Section 4 assesses the landing of imported palm oil and its fractions at various seaports. Section 5 studies the structure of the palm oil supply chain and its end uses in India. Section 6 provides policy suggestions for reducing the dependency on imported palm oil.

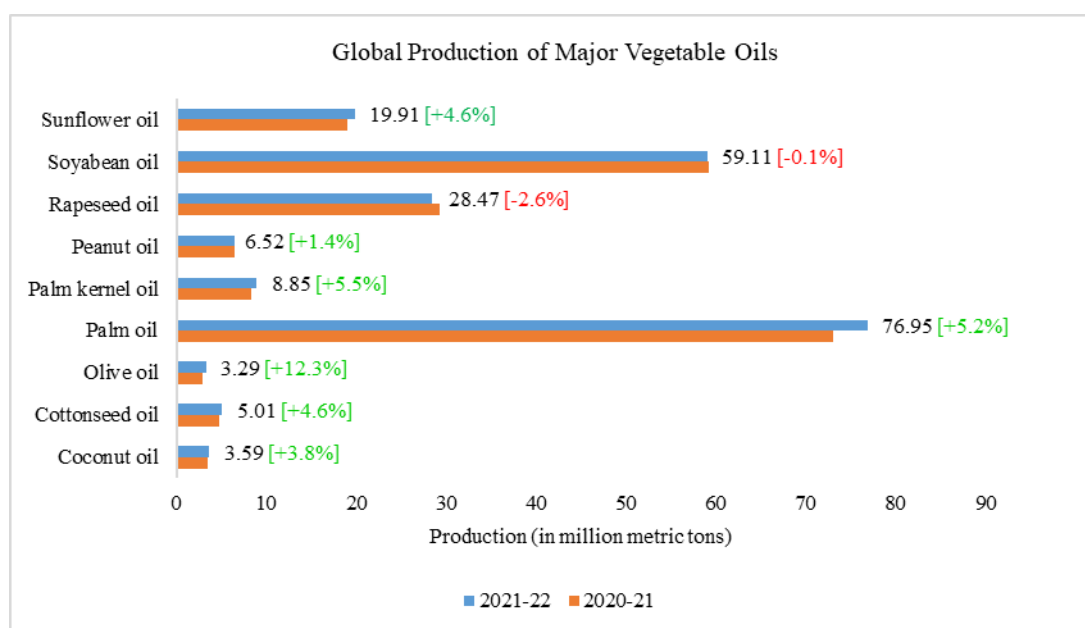
2. TRENDS IN GLOBAL PRODUCTION, CONSUMPTION AND TRADE OF PALM OIL

2.1. Production, Consumption and Trade of Palm Oil vis-à-vis other Vegetable Oils

Palm oil is one of the most produced and consumed vegetable oil in the world owing to its land-use efficiency, affordability and versatility. The global production of palm oil was 73.13 million metric tons in 2020-21 and 76.95 million metric tons in 2021-22, increasing by 5.2 percent during this period (refer figure 2.1). Its production accounts for around 36 percent of the total vegetable oil production worldwide. Soyabean oil and rapeseed oil are other most produced vegetable oils with the production of 59.11 million metric tons (28 percent of total vegetable oil production) and 28.5 million metric tons (13.5 percent of total vegetable oil production), respectively in 2021-22. The global consumption of palm oil has increased by 1.4 percent from 73.52 million metric tons in 2020-21 to 74.57 million metric tons in 2021-22 (refer figure 2.2). This accounts for 36 percent of the global vegetable oil consumption, making it the most consumed vegetable oil in the world followed by soyabean oil and rapeseed oil with a consumption share of 28.6 percent and 14.1 percent, respectively.

Palm oil also dominates the international vegetable oil trade as it is the most exported and imported oil among the vegetable oils. The palm oil trade constitutes more than half of the vegetable oil trade in the world. 48.19 million metric tons of palm were exported in 2020-21 and 46.88 million metric tons in 2021-22 (refer figure 2.3), which is about 57 percent of the total vegetable oil exports. Similarly, palm oil imports were 47.5 million metric tons in 2020-21 and 45.5 million metric tons in 2021-22, accounting for around 58 percent of total vegetable oil imports (refer figure 2.4).

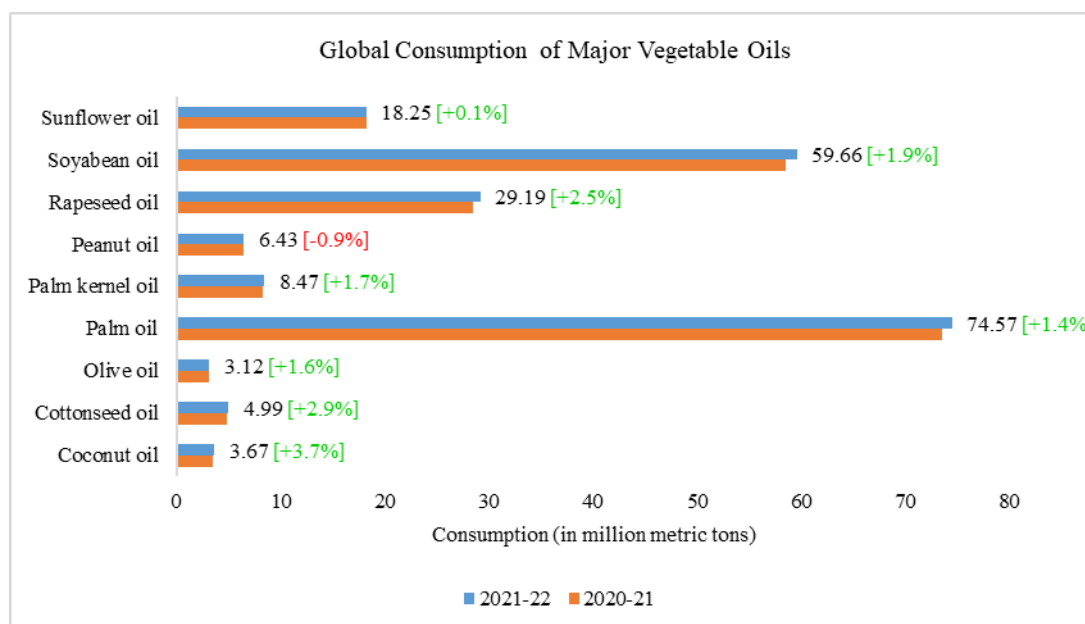
Figure 2.1: Global production of major vegetable oils



Figures in parentheses [] indicate percentage change over the last period, i.e., from 2020-21 to 2021-22.

Source: Foreign Agricultural Service (FAS), United States Department of Agriculture (USDA)

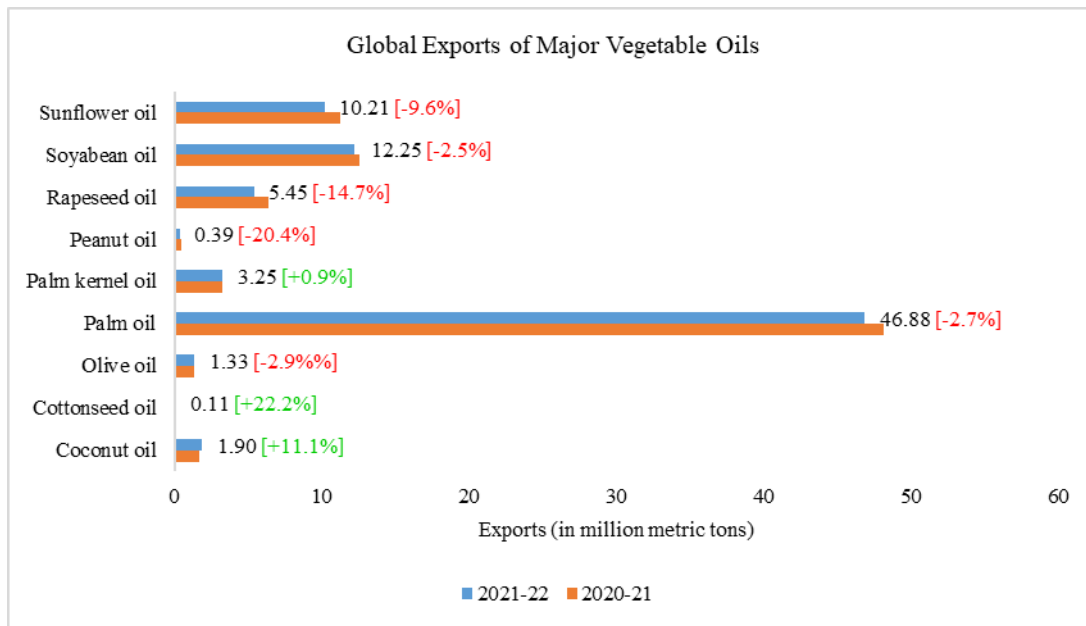
Figure 2.2: Global consumption of major vegetable oils



Figures in parentheses [] indicate percentage change over the last period, i.e., from 2020-21 to 2021-22.

Source: FAS, USDA

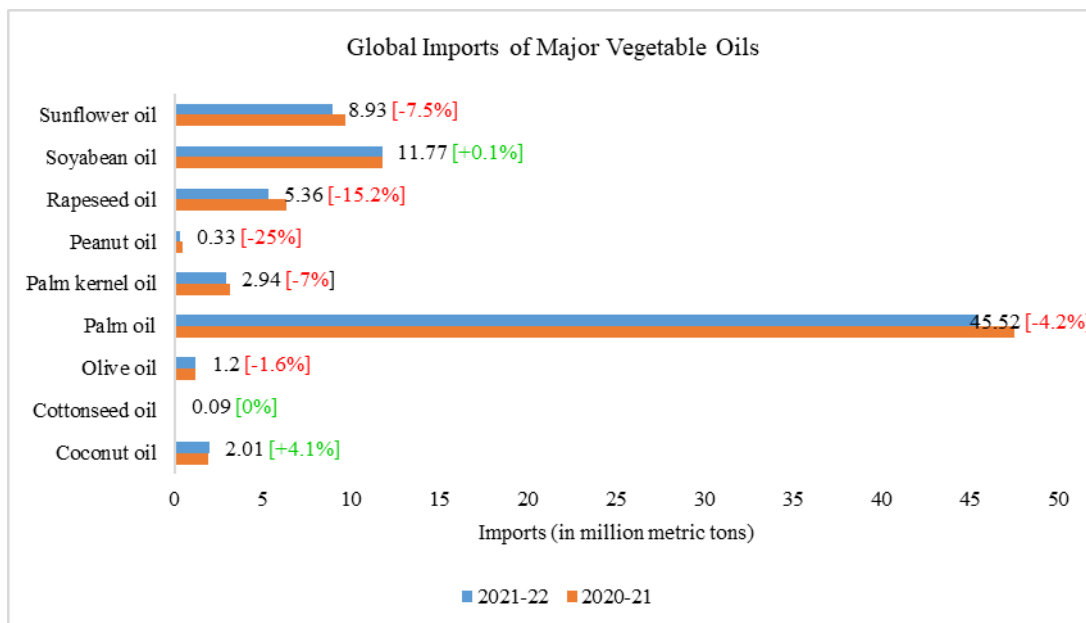
Figure 2.3: Global exports of major vegetable oils



Figures in parentheses [] indicate percentage change over the last period, i.e., from 2020-21 to 2021-22.

Source: FAS, USDA

Figure 2.4: Global imports of major vegetable oils

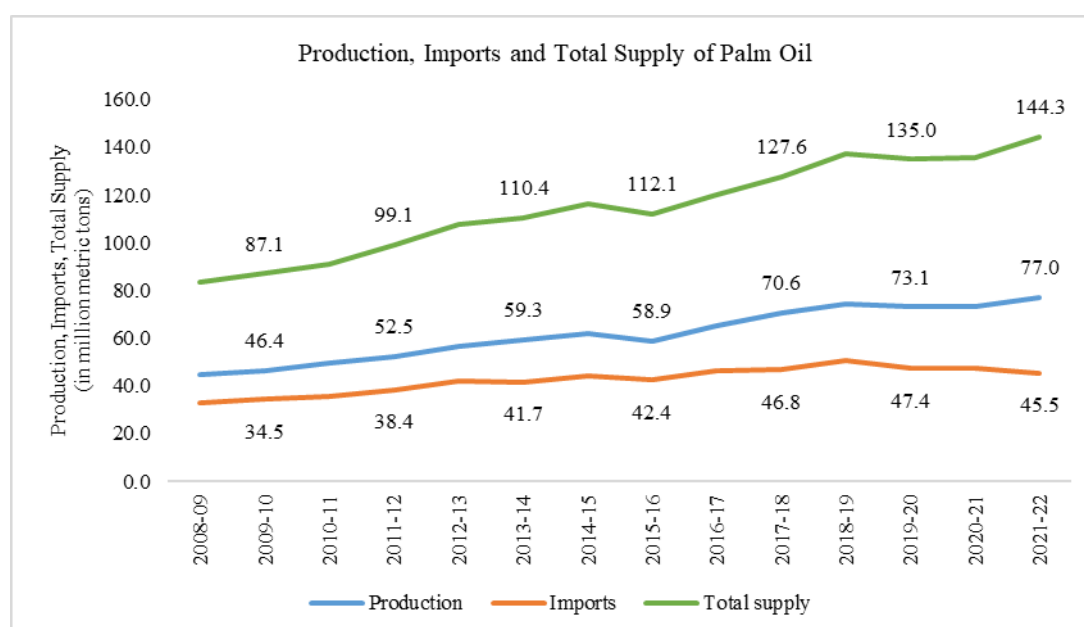


Figures in parentheses [] indicate percentage change over the last period, i.e., from 2020-21 to 2021-22.

Source: FAS, USDA

The global production, imports and total supply of palm oil have undergone rapid growth over the last decade (refer figure 2.5). The production of palm oil has increased from 44.5 million metric tons in 2008-09 to 77 million metric tons in 2021-22, thereby registering a growth of around 73 percent during this period. Imports of palm oil have also registered a marked increase of about 38 percent rising from 32.9 million metric tons in 2008-09 to 45.5 million metric tons in 2021-22. The increasing supply of palm oil is attributed to the growing appetite for palm oil across the countries due to its affordability and versatility.

Figure 2.5: Production, imports and total supply of palm oil



Source: FAS, USDA

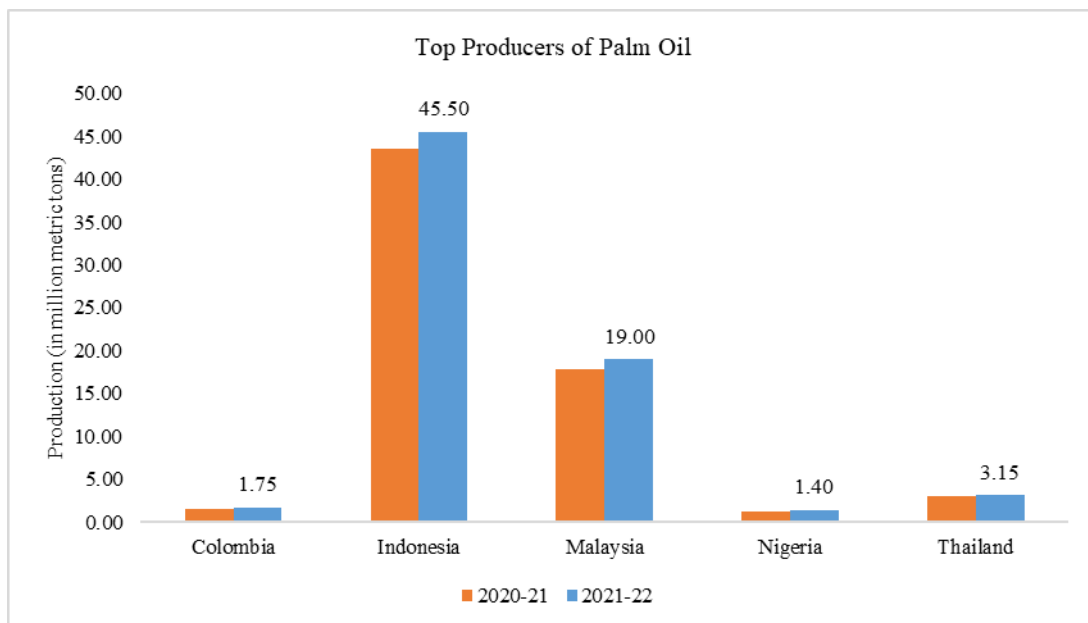
2.2. Major Producers, Consumers and Traders of Palm Oil

A major share (about 59%) of the world's palm oil production comes from Indonesia amounting to 45.5 million metric tons in 2021-22 (refer figure 2.6), making it the largest producer of palm oil in the world. Malaysia, the second-largest producer, produced 19 million metric tons of palm oil in 2021-22 that accounts for about 25 percent of the world's palm oil production. Indonesia and Malaysia, thus, dominate palm oil production in the global market. Thailand has also witnessed large commercial plantations of oil palm, making it the third-

largest producer of palm oil in the world. Apart from Southeast Asia, Africa and Latin America also provide conducive climatic conditions for oil palm to grow. Colombia and Nigeria have thus, emerged among the top palm oil-producing countries due to their suitable tropical climate. India’s production of palm oil is, however, almost negligible. In 2019-20, India produced 0.28 million metric tons of palm oil which is only 0.38 percent of the global palm oil production.

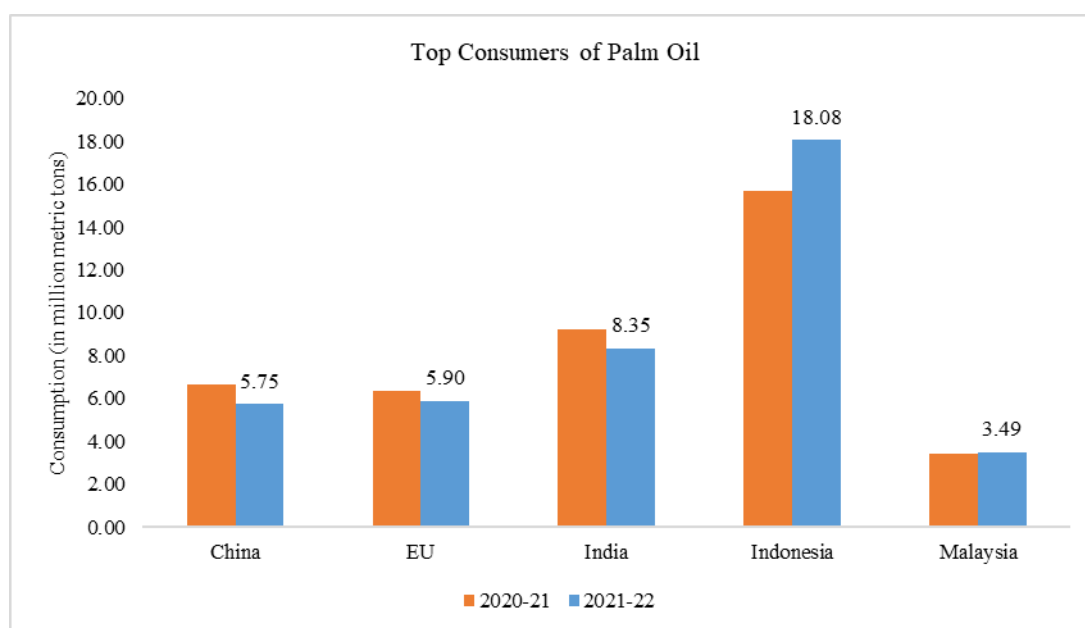
A significant proportion of the world’s palm oil production is consumed by Asia. Its consumption accounts for more than 50 percent of global palm oil consumption. Specifically, Indonesia has the largest share in the world’s palm oil consumption (24%), followed by India (11%) and China (8%) (refer figure 2.7). European Union (EU) is also a significant consumer of palm oil, contributing 8 percent to the world’s vegetable oil consumption in 2021-22.

Figure 2.6: Top producers of palm oil



Source: FAS, USDA

Figure 2.7: Top consumers of palm oil

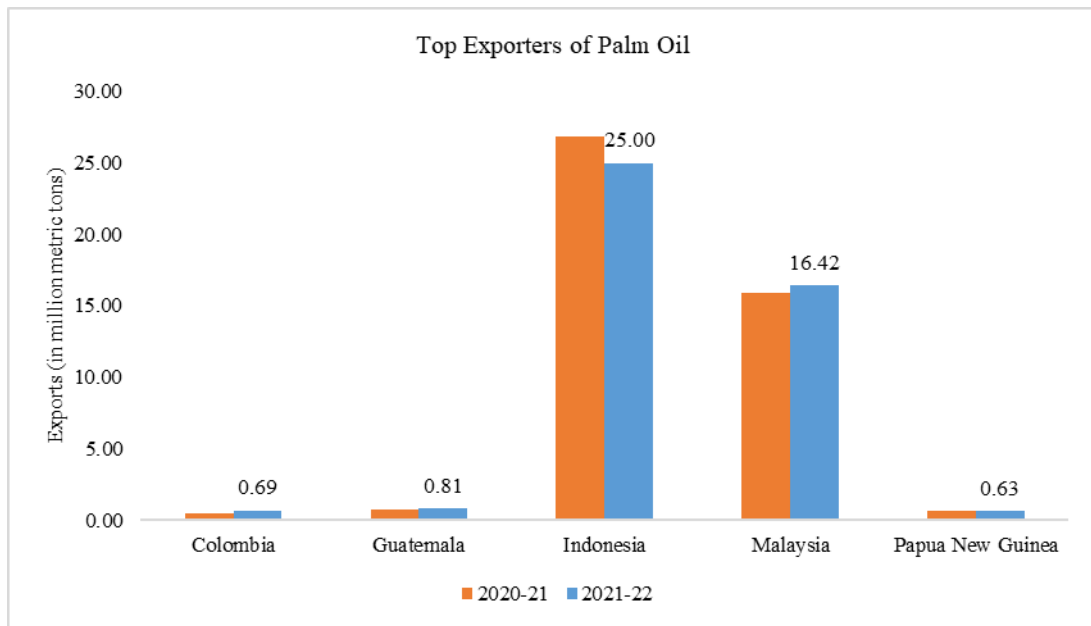


Source: FAS, USDA

Along with being the largest producers of palm oil, Indonesia and Malaysia are also the largest suppliers of palm oil to the world. In 2021-22, they exported 25 million metric tons and 16.4 million metric tons of palm oil, respectively (refer figure 2.8). Together, they fulfill about 88 percent of the palm oil demand across the globe. Guatemala, Colombia and Papua New Guinea have also emerged as significant suppliers of palm oil to the world.

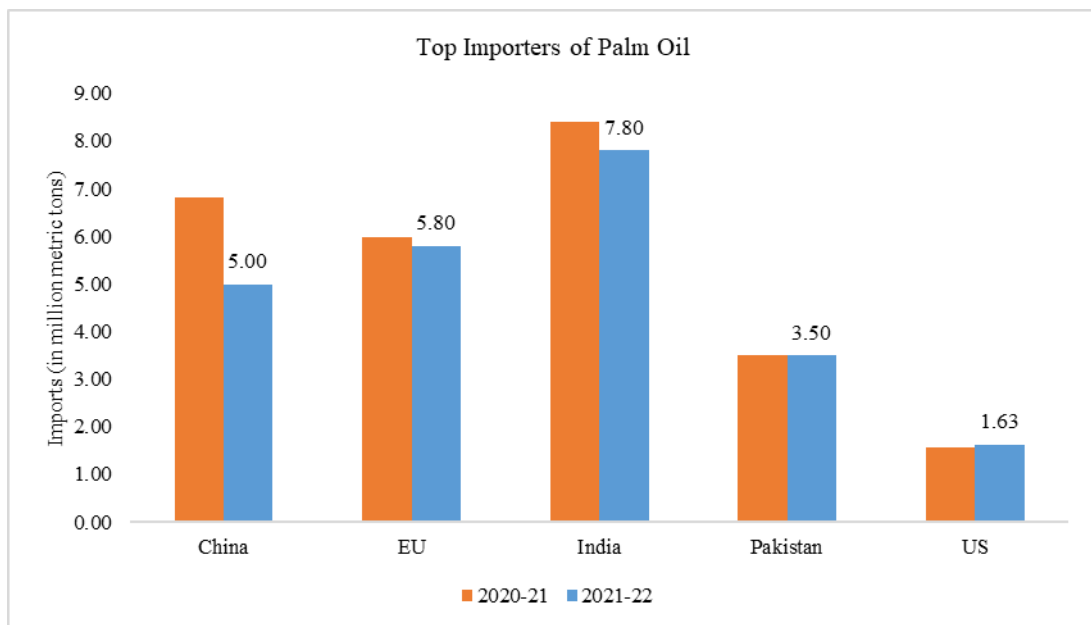
India, China and the EU, which are among the top consumers of palm oil in the world, are also the three largest importers of palm oil. Their production of palm oil is extremely low; hence, they mostly rely on imports to meet their consumption demand. In 2021-22, India's imports of palm oil stand at 7.8 million metric tons, whereas, China and the EU imported 5 and 5.8 million metric tons, respectively (refer figure 2.9). US and Pakistan also import a substantial quantity of palm oil to meet their domestic requirements. Together, these top five importers of palm oil (India, China, EU, US and Pakistan) contribute to more than 50 percent of the world's palm oil trade.

Figure 2.8: Top exporters of palm oil



Source: FAS, USDA

Figure 2.9: Top importers of palm oil



Source: FAS, USDA

3. PALM OIL IMPORTS AND DOMESTIC PRODUCTION IN INDIA

India is the leading importer of palm oil in the world. In 2020-21, India imported 8411 thousand metric tons of palm oil, accounting for around 18 percent of the world's palm oil imports. Along with India, the global demand for palm oil is driven substantially by China, the EU, Pakistan and US which rank among the top five palm oil importing countries in the world.

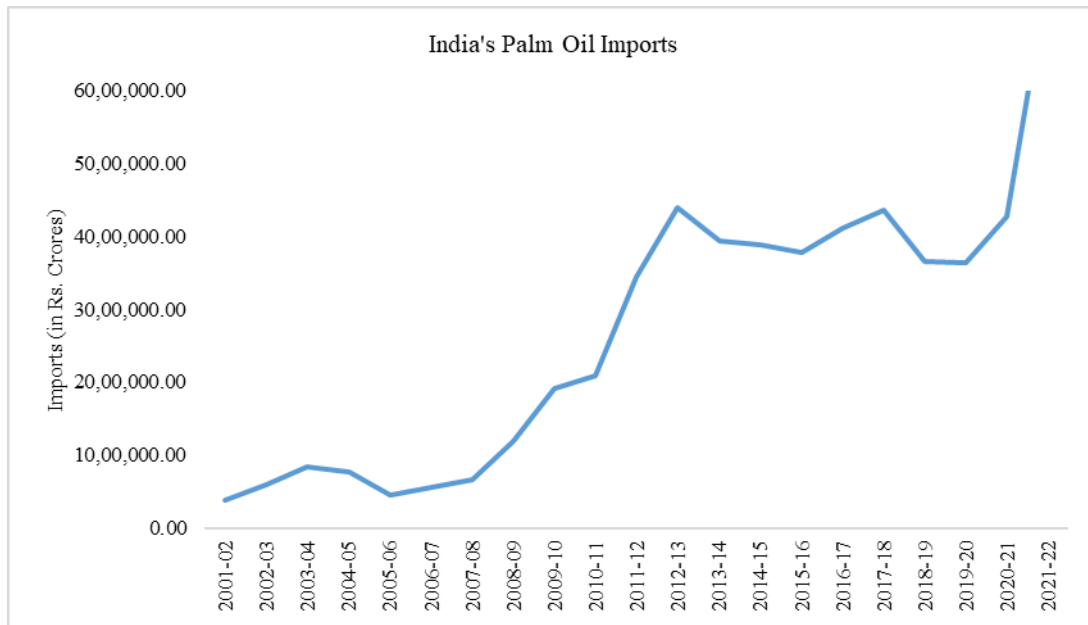
3.1. Trends in Palm Oil Imports in India

Palm oil imports have been rising rapidly over the last two decades. The imports accounted for Rs. 3,755 crores in 2001-02, increasing by around 20 times to Rs. 75,104 crores in 2021-22 (refer figure 3.1). The upsurge in palm oil imports is attributed to its increased consumption demand over the years. Palm oil is widely used as a cooking oil by millions of households due to its comparatively low price than other edible vegetable oils. It is also extensively used by bakery industry and hotels, restaurants and café industry. The import of palm oil particularly witnessed a sharp surge from 2007-08 till 2012-13, remained stagnated thereafter but rose markedly again during the Covid-19 pandemic. An increase in the palm oil imports during 2007-13 and then after 2019 is mainly attributed to the reduction in its import duty. The basic customs duty was reduced to zero for almost 4 years from 2008-13 which led to soaring palm oil imports. During the Covid-19 pandemic, the basic customs duty on crude and refined palm oil was reduced several times to ensure the availability and affordability of edible oils to domestic refiners and consumers. The customs duty on crude palm oil declined from 37.5 percent in January 2020 to an effective duty of 5.5 percent by March 2022.

Palm oil occupies the largest share among the vegetable oil imports in India, followed by soyabean oil and sunflower/safflower oil. Palm oil imports account for more than 50 percent of the edible oils imported in the country. In 2021-22, India imported Rs. 75,727 crores of palm oil (around 54% of the total edible oil imports), whereas, Rs. 41,277 crores and 21,901 crores

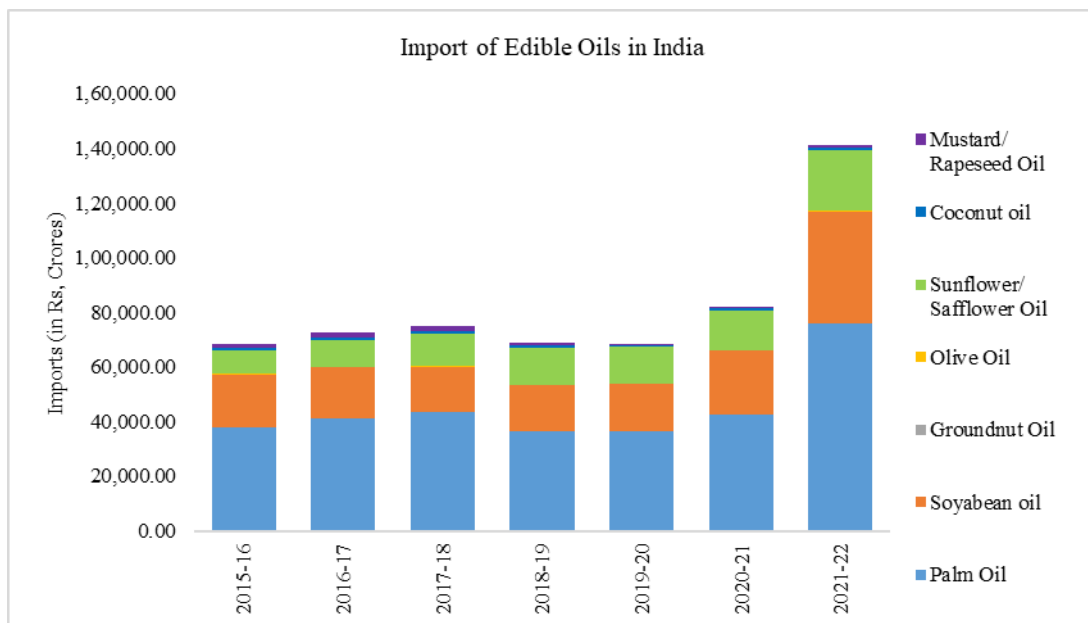
of soyabean oil (29% of the total edible oil imports) and sunflower/safflower oil (15.5% of the total edible oil imports), respectively were imported (refer figure 3.2). Coconut oil, mustard oil, olive oil and groundnut oil have almost negligible share in total edible oil imports.

Figure 3.1: India's palm oil imports



Source: Export Import Data Bank, Ministry of Commerce and Industry, Government of India (GoI)

Figure 3.2: Import of Edible Vegetable Oils in India

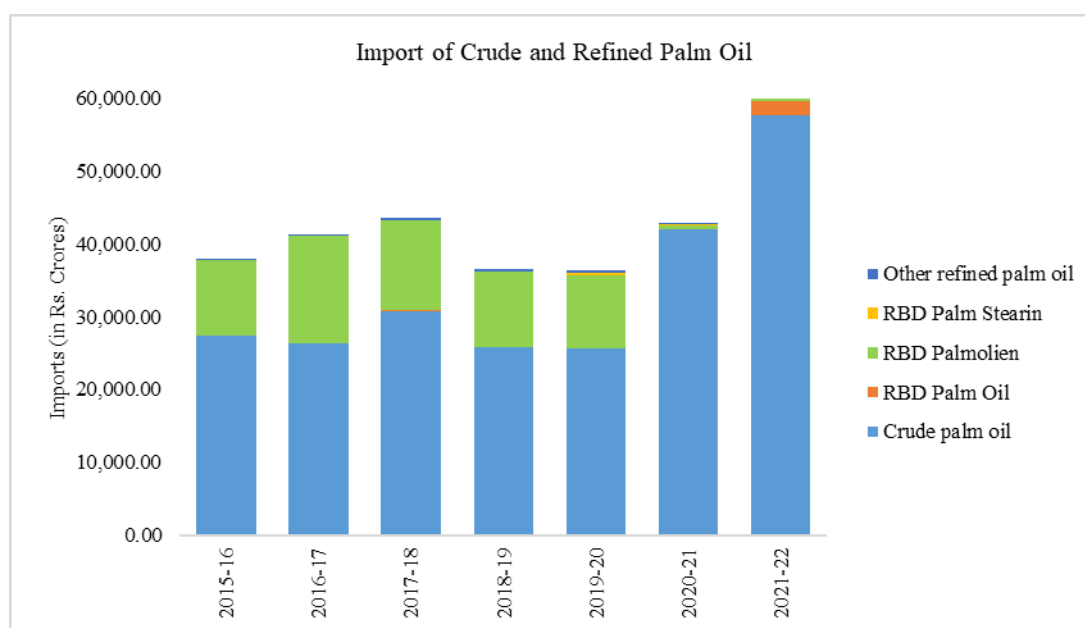


Source: Export Import Data Bank, Ministry of Commerce and Industry, Government of India (GoI)

Palm oil is majorly imported in crude form. This is because of the relatively high trade barrier imposed by the government on imports of refined palm oil compared to crude palm oil in order to protect domestic refineries. Crude palm oil constitutes more than 70 percent of the total palm oil imports. Out of Rs. 75,727 crores of palm oil imported in 2021-22, crude palm oil imports amounted to Rs. 57,758 crores (76% of the total palm oil imports), while only Rs. 17,969 crores worth of refined palm oil (26% of the total palm oil imports) was imported (refer figure 3.3). However, exceptionally high level of palm oil was imported in crude form (about 98%) in 2020-21. This was due to a large reduction in the import duty of crude palm oil leading to a huge price differential between crude and refined palm oil, thereby boosting crude palm oil imports.

Among the categories/fractions of refined palm oil imported by India, Refined, Bleached and Deodorized (RBD) palm olein constitute the major share in imports. The import value of RBD palm oil, RBD palm stearin and other refined palm oil is meagre. Out of Rs. 17,969 crores of refined palm oil imported in 2021-22, RBD palm olein share was around 86 percent amounting to Rs. 15,486 crores, whereas only Rs. 1,968 crores of RBD palm oil (11% of refined palm oil imports) and Rs. 415 crores of RBD palm stearin (2% of refined palm oil imports) were imported (refer figure 3.3). RBD palm olein dominates refined palm oil imports, while the share of RBD palm oil and RBD palm stearin remains extremely low.

Figure 3.3: Import of crude and refined palm oil



Source: Export Import Data Bank, Ministry of Commerce and Industry, Government of India (GoI)

3.2.Domestic Production of Palm oil

India is the largest importer of edible oils in the world out of which palm oil constitutes more than half of the edible oil imports. Among 13.81 million metric tons of edible oils imported by India in 2020-21, the volume of palm oil imports was 8.4 million metric tons with a share of 61 percent. (USDA, 2022). In 2021-22, India has imported 13.58 million metric tons of edible oil, out of which palm oil forms a share of 57 percent (USDA, 2022).

High dependence on edible oil imports in India is explained by the low domestic production of oilseeds that is insufficient to meet growing domestic demand. Table 3.1 presents the domestic production and availability of edible oils in India from 2005-06 to 2019-20. Figure 3.4 illustrates the share of domestic production and imports in total consumption of edible oils. India's imports of edible oil account for more than 55 percent of its total domestic consumption. In 2019-20, India's total consumption of edible oils was 240 lakh tonnes, out of which it produced 116 lakh tonnes of edible oils (44% of total consumption) and imported 134 lakh

tonnes (56% of total consumption) to meet the domestic consumption. The dependence on imports has increased substantially over the years, rising from 42.88 lakh tonnes (34% of total consumption) in 2005-06 to 134 lakh tonnes (56%) in 2019-20. On the other hand, the share of domestic production/availability in total consumption of vegetable oils has reduced from 66 percent in 2005-06 to 44 percent in 2019-20 despite an increase in the volume of production from 83.16 lakh tonnes to 106.55 lakh tonnes during the same period. This implies that the domestic production of edible oils has not been able to keep pace with the rising demand for edible oils. The consumption of edible oils has increased at a rate of 4.4 percent annually while the domestic production has grown annually at a rate of only 1.67 percent. Therefore, the widening gap between demand and supply of edible oils is met through imports which have registered an annual growth of 7.9 percent.

Table 3.1: Total production and availability of edible oils

	Total Production	Exports	Net Domestic Availability	Imports	Total availability/ Consumption
2005-06	91.36	8.20	83.16	42.88	126.04
2006-07	81.50	7.80	73.70	47.15	120.58
2007-08	94.54	8.00	86.54	56.08	142.62
2008-09	91.56	7.00	84.56	81.83	166.39
2009-10	83.98	4.52	79.46	88.23	167.69
2010-11	103.76	5.94	97.82	72.42	170.24
2011-12	99.03	9.46	89.57	99.43	189.00
2012-13	100.60	8.41	92.19	106.05	198.24
2013-14	107.62	7.10	101.90	109.76	211.66
2014-15	98.00	5.94	92.06	138.53	230.59
2015-16	91.80	5.50	86.30	148.50	234.80
2016-17	107.49	6.50	100.99	153.17	254.16
2017-18	110.10	6.30	103.80	145.92	249.72
2018-19	109.52	6.00	103.52	155.70	259.22
2019-20	116.31	9.76	106.55	134.09	240.64
CAGR	1.62%	1.17%	1.67%	7.90%	4.41%

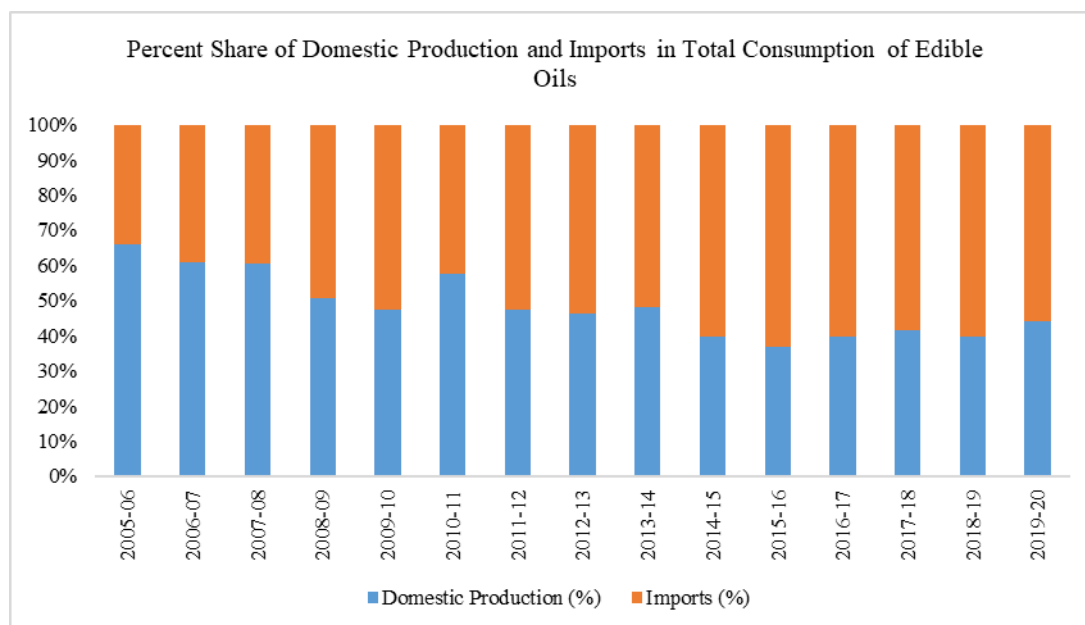
(in lakh tonnes)

Total edible oil production includes production from both primary and secondary sources. Primary sources include groundnut oil, rapeseed and mustard oil, soyabean oil, sunflower oil, sesame oil, nigerseed oil, safflower oil, castor oil and linseed oil. Secondary sources include

coconut oil, palm oil, cottonseed oil, ricebran oil, solvent extracted oils and oils from tree and forest origin.

Source: Directorate of Vanaspati, Vegetable Oils and Fats

Figure 3.4: Percent share of domestic production and imports in total consumption of edible oils



Source: Directorate of Vanaspati, Vegetable Oils and Fats

Table 3.2 presents the production of major vegetable oils in India. Groundnut oil, mustard/rapeseed oil and soyabean oil are the largest produced edible oil in the country. The production of groundnut oil has increased notably from 17.02 lakh tonnes in 2014-15 to 28.28 lakh tonnes in 2019-20. There is also a considerable increase in soyabean oil production from 16.6 lakh tonnes to 22.9 lakh tonnes during the same period. The production of rapeseed/mustard oil, however, has fallen by around 8 percent during 2014-20 from 19.47 million tonnes to 17.97 million tonnes. On the other hand, the production of palm oil is among the lowest out of major vegetable oils produced in the country. While the production of palm oil has increased from 1.7 lakh tonnes in 2014-15 to 2.8 lakh tonnes in 2019-20, it remains low and inadequate to meet domestic demand. Low production of palm oil has, therefore, necessitated excessive reliance on imports.

Table 3.2: Production of edible oils

	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Palm Oil	1.71	1.98	2.3	2.2	2.7	2.77
Groundnut Oil	17.02	15.27	24.74	25.81	28.97	28.28
Rapeseed/ Mustard Oil	19.47	21.08	22.1	17.59	22.09	17.97
Soyabean Oil	16.6	13.73	17.16	20.82	15.18	22.9
Sunflower Oil	1.43	0.98	0.8	0.7	0.73	0.72
Coconut Oil	4.8	4.32	5.2	6.01	5.9	5.95
Cottonseed Oil	12.15	10.05	12.24	12.64	11.23	12.71

(in lakh tonnes)

Source: Directorate of Vanaspati, Vegetable Oils and Fats

Low palm oil production is attributed to limited cultivation of oil palm Fresh Fruit Bunches (FFBs). The production of oil palm FFBs has increased over the years, rising from 8.92 lakh metric tonnes in 2012-13 to 15.44 lakh metric tonnes in 2019-20 (refer table 3.3). Figure 3.5 presents the share of state production in total production of oil palm FFBs in 2019-20. Oil palm FFBs are mainly cultivated in ten states of India, out of which southern states account for the majority production of FFBs. Andhra Pradesh constitutes more than 80 percent of the total production of oil palm FFBs in India, producing about 12.77 lakh metric tonnes in 2019-20. Telangana is another leading state, contributing more than 13 percent to the total oil palm production in the country in 2019-20. The production of FFBs in Telangana has witnessed a considerable increase, rising from 38 thousand metric tonnes in 2012-13 (4 percent of total production) to 208 thousand metric tonnes in 2019-20 (13 percent of total production). Other states that contribute to oil palm production in India are Kerala, Karnataka, Odisha, Tamil Nadu, Mizoram, Goa, Gujarat and Chhattisgarh. However, their contribution to the total production of FFBs in India is less than 2 percent.

Table 3.3: State-wise production of oil palm fresh fruit bunches

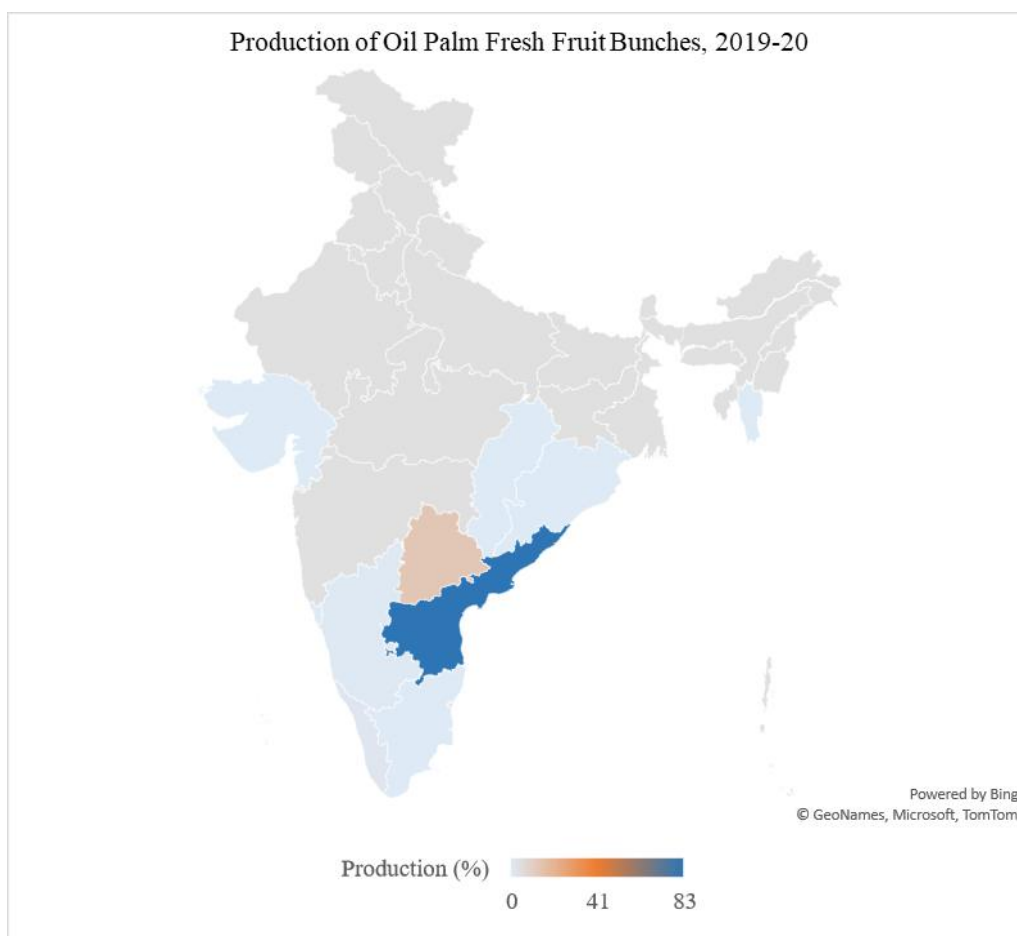
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Andhra Pradesh	790881	933981	1007553	1147780	1137398	1427828	1379215	1277760
Karnataka	10112	9917	12638	14740	11912	12917	13238	12685
Tamil Nadu	5244	5495	6568	7810	7422	6995	7014	3798
Gujarat	134	158	409	523	775	996	1053	745
Odisha	2920	3639	3769	4569	4965	6702	6899	7106
Goa	2056	2046	2146	3217	2430	2108	2281	1716
Kerala	41350	40798	40798	40611	34198	30220	30269	27201
Mizoram	1339	2096	2096	3780	4796	5238	5298	4600
Telangana	38624	57873	57873	75447	88119	147516	197632	208826
Chhattisgarh	0	0	0	0	18	5	6	279
Total	892660	1056003	1133850	1298477	1292033	1640525	1642905	1544716

(in lakh tonnes)

Source: Directorate of Vanaspati, Vegetable Oils and Fats

Andhra Pradesh is also the leading producer of crude palm oil in India, contributing 85 percent (208 thousand metric tonnes) to the total crude palm oil production in the country in 2019-20 (refer table 3.4 and figure 3.6). Telangana also has a significant share in total crude palm oil production in the country. The contribution of Telangana in total crude palm oil production has increased over the years from 4.7 percent (6.8 thousand metric tonnes) to 11.5 percent (28 thousand metric tonnes) due to growing oil palm FFBs in the state. Kerala and Karnataka have a modest share in crude palm oil production that has declined over the years. Production in other states like Tamil Nadu, Mizoram and Goa is extremely low.

Figure 3.5: Distribution of oil palm fresh fruit bunches production in India, 2019-20



Source: Directorate of Vanaspati, Vegetable Oils and Fats

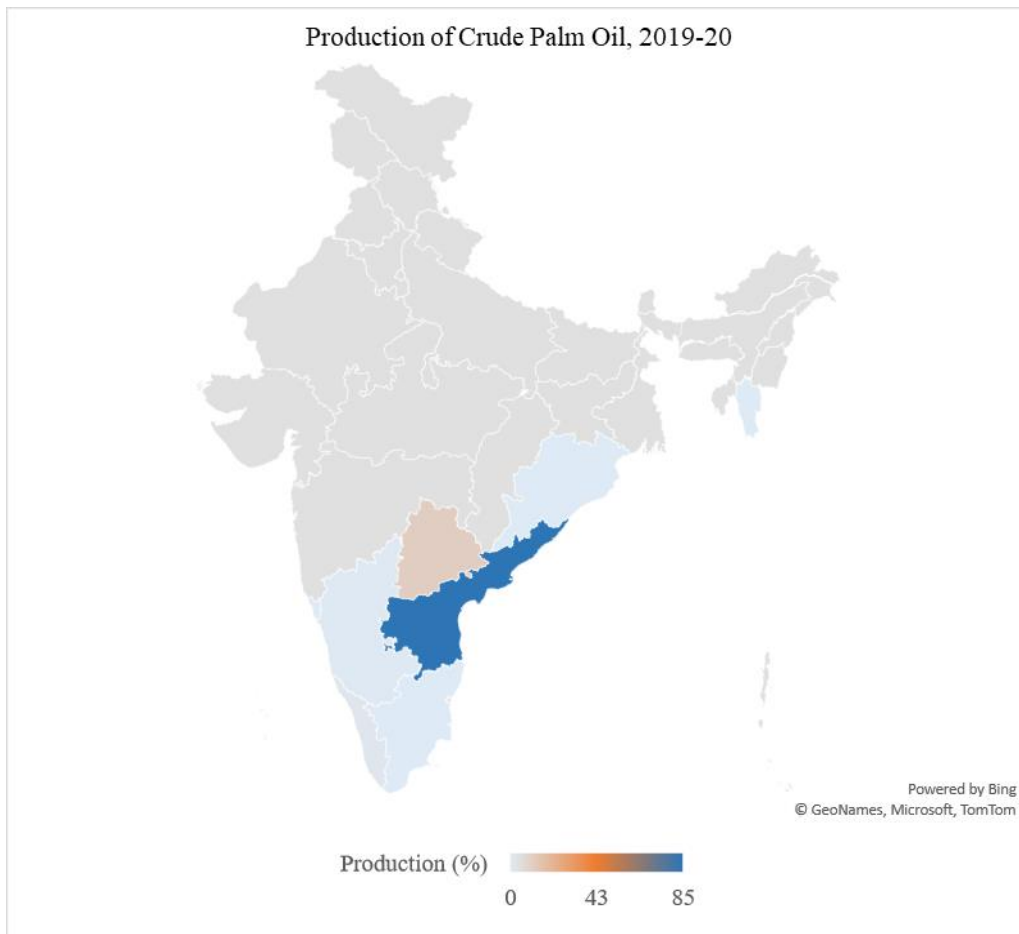
Table 3.4: State-wise production of crude palm oil

	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Andhra Pradesh	127570	161566	170478	193562	190999	234696	232938	208359
Karnataka	1770	1736	2176	2538	2051	2224	2280	2184
Tamil Nadu	1035	820	1019	1222	1115	938	1017	553
Odisha	443	558	557	618	0	0	0	0
Goa	372	371	388	581	437	379	411	309
Kerala	7378	6303	6515	7015	5929	5191	4609	4825
Mizoram	0	0	365	496	603	648	625	535
Telangana	6825	9373	10012	12499	8947	27275	37205	28050
Total	145393	180727	191510	218531	210081	271351	279085	244815

(in tonnes)

Source: Directorate of Vanaspati, Vegetable Oils and Fats

Figure 3.6: Distribution of crude palm oil production in India, 2019-20



Source: Directorate of Vanaspati, Vegetable Oils and Fats

3.3. Government Initiatives to Boost Palm Oil Production

The government has taken several initiatives to boost oil palm cultivation and reduce reliance on imports. Oil Palm Development Programme (OPDP) was launched in 1991-92 to expand oil palm production in Andhra Pradesh, Karnataka, Tamil Nadu, Orissa, Gujarat and Goa. From 2004-05, the scheme is implemented as a part of the Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize (ISOPOM) for oil palm area expansion by providing support for planting material, cultivation cost, irrigation system, training, development of waste land and technology transfer. Oil Palm Area Expansion (OPAE) was another programme launched in 2011-12 under Rashtriya Krishi Vikas Yojana to bring an area of 60,000 hectares under oil palm cultivation. National Mission on Oilseeds and Oil Palm (NMOOP) was later introduced

in 2014-15 focusing on productivity and area expansion of oil palm in 13 states including Andhra Pradesh, Assam, Arunachal Pradesh, Chhattisgarh, Gujarat, Karnataka, Kerala, Mizoram, Nagaland, Odisha, Tamil Nadu, Telangana and Goa. NMOOP was later merged under National Food Security Mission (NFSM) – Oilseeds and Oil Palm in 2018-19. NFSM aimed to augment the production and productivity of vegetable oils sourced from oilseeds and oil palm to reduce reliance on imports of edible oils.

The government recently introduced National Mission on Edible Oils-Oil Palm (NMEO-OP) in 2021 to augment domestic production of oilseeds and oil palm, focusing mainly on North-eastern states and Andaman and Nicobar Islands due to their conducive weather conditions. The mission aims to achieve self-sufficiency by increasing the cultivation of oil palm through additional coverage of 6.5 lakh hectares to achieve the target of 10 lakh hectares under oil palm cultivation by 2029-30. It also aims to benefit oil palm farmers through a remunerative price mechanism that will provide price assurance to them by hedging against international price volatility.

Despite several government initiatives, the domestic production of oil palm has remained stagnant or shown marginal improvement in a few states. Table 3.5 presents the target and achievement of area expansion under various government schemes including ISOPOM, NMOOP, OPAAE and NFSM. The target for oil palm cultivation has not been met over the years in most states. In 2019-20, the target for oil palm cultivation was around 18 thousand hectares, but only 13.25 thousand hectares were brought under cultivation.

Table 3.5: Target and achievement of area expansion under government schemes

	2016-17		2017-18		2018-19		2019-20	
	Target	Achievement	Target	Achievement	Target	Achievement	Target	Achievement
Andhra Pradesh	12500	6002	11500	6157	12000	6508	8000	6642
Karnataka	1600	966	1500	1120	1600	1463	1700	1350
Tamil Nadu	1500	801	1500	906	1200	741	600	451
Gujarat	451	217	550	428	608	245	600	389
Odisha	1260	1918	2050	812	1527	629	750	463
Goa	0	0	20	5	20	2	0	9
Assam	1500	465	1000	814	1914	357	300	0
Kerala	50	9	50	6	50	2	0	8
Mizoram	3000	1669	2400	896	1400	608	500	111
Chattisgarh	2500	1288	1500	844	2000	863	460	226
Telangana	3000	673	2000	1413	1930	870	2400	2133
Arunachal Pradesh	1500	750	1215	843	1738	1159	1500	374
Nagaland	1200	1032	1000	800	1000	1000	1100	1100

(in hectares)

Government schemes include the Integrated Scheme of Oilseeds, Pulses, Maize and Oil Palm (ISOPOM), National Mission on Oilseeds and Oil Palm (NMOOP), Oil Palm Area Expansion (OPAE) and National Food Security Mission (NFSM).

Source: Department of Agriculture, Cooperation and Farmers' Welfare

Table 3.6 presents the state-wise potential area and cultivated area under oil palm up till 2020.

There is a large scope of area expansion under oil palm to boost domestic production as the potential area under oil palm is more than the cultivated area. The total area under oil palm cultivation up to March 2020 is 3.54 lakh hectares, much below the potential area of 28 lakh hectares identified by the National Re-assessment Committee, 2020. North-eastern states including Meghalaya, Manipur, Nagaland, Arunachal Pradesh, Mizoram, Assam and Tripura have immense potential to enhance the area under oil palm cultivation. The total cultivated area in North-eastern states is 36 thousand hectares which is only 3.8 percent of the potential area of 962 thousand hectares. Oil palm cultivation has remained low despite several government initiatives to boost production. Farmers' profitability, long gestation period and lack of irrigation facilities are the major challenges that discourage farmers to adopt oil palm cultivation. The price of FFBs is influenced by the price of crude palm oil which is extremely

volatile due to high import dependence. Thus, farmers do not receive remunerative price for their crops due to market fluctuations. Oil palm cultivation also has a long gestation lag before it starts yielding returns to farmers which further discourages its large-scale adoption. Cultivation of oil palm requires access to irrigation systems as it is a water guzzling crop but farmers are constrained by water shortage and erratic monsoon.

Table 3.6: State-wise potential area and area covered under oil palm cultivation

	Potential area*	Total Cultivated Area#	Cultivated Area (as % of potential area)
Andhra Pradesh	531379	175839	33.09
Karnataka	72642	46330	63.78
Tamil Nadu	95719	32409	33.86
Gujarat	62361	6049	9.70
Odisha	34291	22667	66.10
Goa	2000	970	48.50
Tripura	146364	530	0.36
Assam	375428	2196	0.58
Kerala	43676	5794	13.27
Maharashtra	162210	1474	0.91
Andaman & Nicobar	3000	1593	53.10
Mizoram	66792	26642	39.89
Chattisgarh	57149	5383	9.42
Telangana	436325	19522	4.47
Arunachal Pradesh	133811	3126	2.34
Nagaland	51297	4072	7.94
Manipur	66652	0	0.00
West Bengal	45463	0	0.00
Meghalaya	122637	0	0.00
Bihar	123148	0	0.00
Madhya Pradesh	118079	0	0.00
Uttar Pradesh	48663	0	0.00
Total	2799086	354596	12.67

(in hectares)

The potential area of oil palm cultivation is as per Re-assessment Committee, 2020. The total cultivated area under oil palm is up to March 2020.

Source: Department of Agriculture, Cooperation and Farmers' Welfare

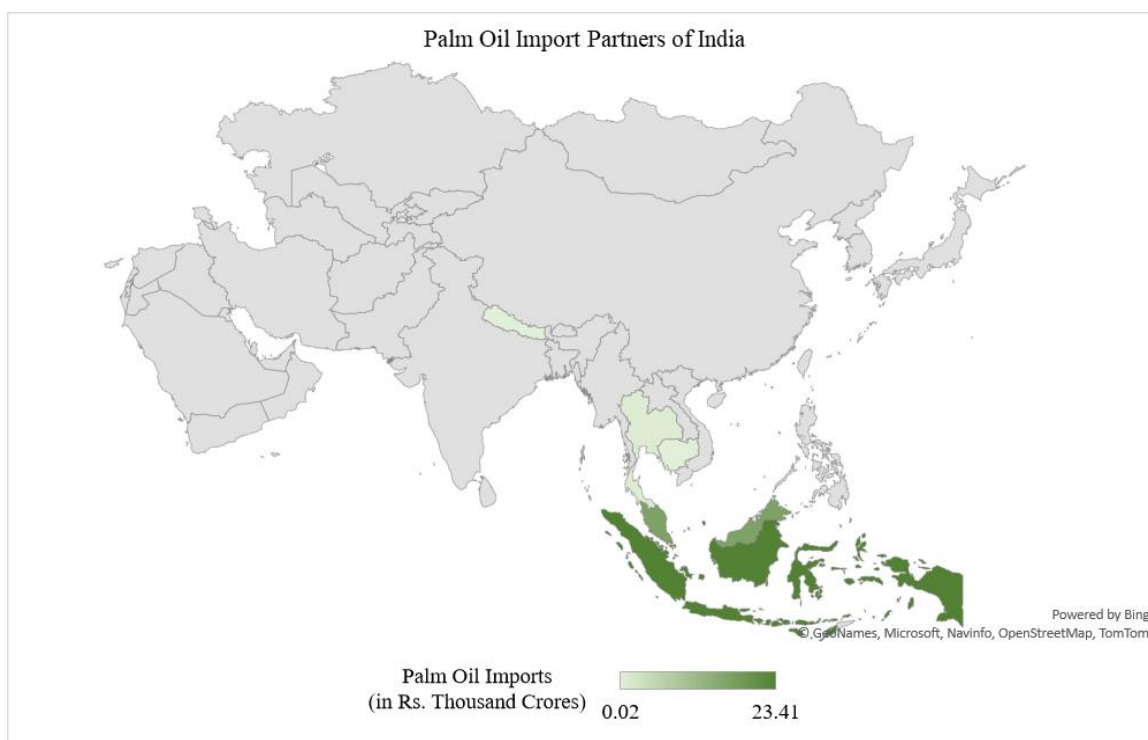
4. PORT-WISE LANDING OF IMPORTED PALM OIL

4.1. Leading palm oil import partners of India

India is the largest importer of palm oil in the world. The majority of the palm oil is imported from Indonesia and Malaysia which are the dominant producers and suppliers of palm oil. Figure 4.1 illustrates the top countries from where India imports palm oil and its fractions. Indonesia is the leading supplier of palm oil to India, followed by Malaysia. In 2020-21, Rs. 23.41 thousand crores of palm oil were imported from Indonesia which accounts for around 55 percent of the total palm oil imports in the country (refer figure 4.2). Imports from Malaysia had a share of 38 percent of total palm oil imports amounting to Rs. 16.31 thousand crores in 2020-21. The contribution of Malaysia's palm oil in total imports has increased substantially in the past years rising from 27 percent in 2018-19 to 38 percent in 2020-21, while Indonesia's share has reduced from 64.5 percent to 54.8 percent during the same period. Singapore is the third-largest importer of palm oil to India with a share of 4.3 percent of total palm oil imported by India (Rs. 1.84 thousand crores) in 2020-21. Other top palm oil importing partners of India are Thailand, Papua New Guinea and Nepal.

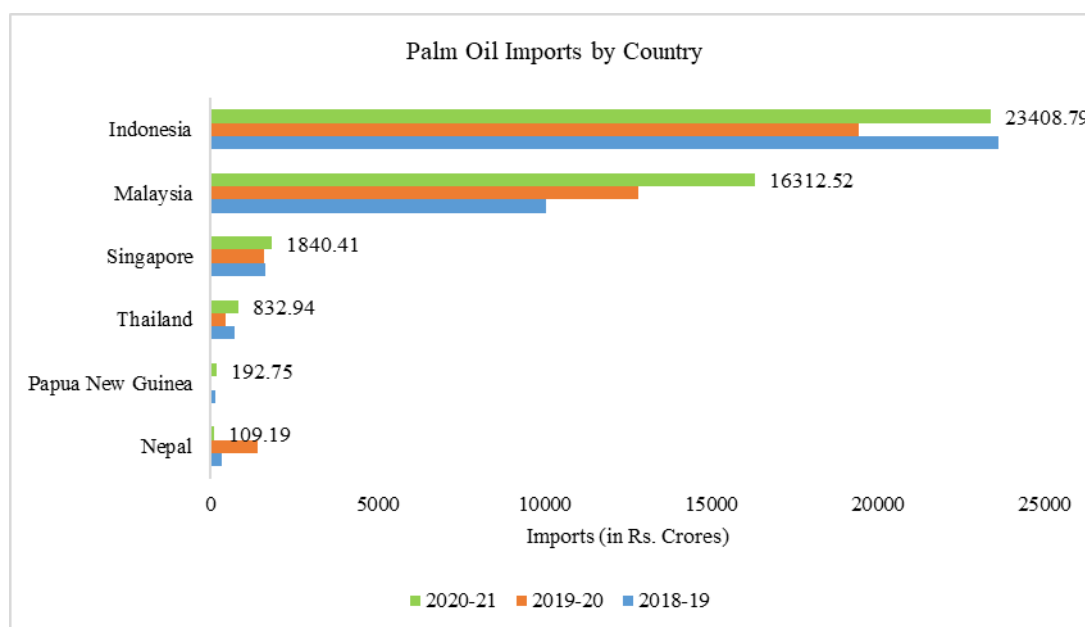
India's import of palm oil majorly comprises crude palm oil. Indonesia and Malaysia account for the largest share of crude palm oil imports in India. Rs. 22.79 thousand crores of crude palm oil (54.3 percent of total crude palm oil imports) were imported from Indonesia, whereas Rs. 16.28 crores of crude palm oil (38.8 percent of total crude palm oil imports) were imported from Malaysia in 2020-21 (refer figure 4.3). Crude palm oil is also imported from Singapore, Thailand and Papua New Guinea that rank among the top 5 crude palm oil importing partners of India.

Figure 4.1: Top palm oil import partners of india



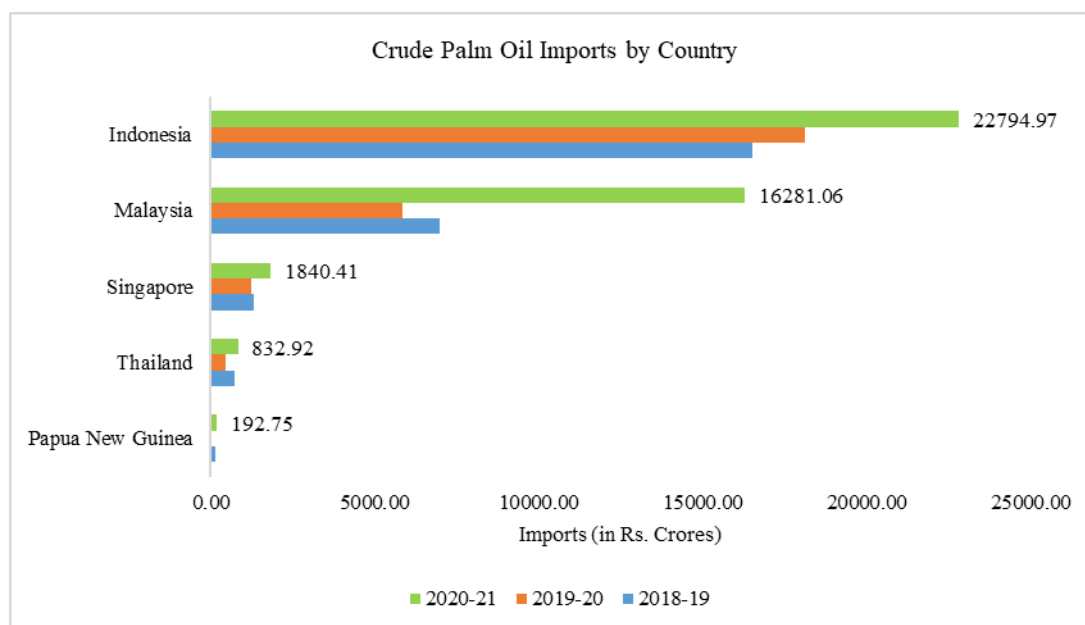
Source: Directorate General of Commercial Intelligence and Statistics, Ministry of Commerce and Industry

Figure 4.2: India's palm oil imports by country



Source: Directorate General of Commercial Intelligence and Statistics, Ministry of Commerce and Industry

Figure 4.3: India's crude palm oil imports by country



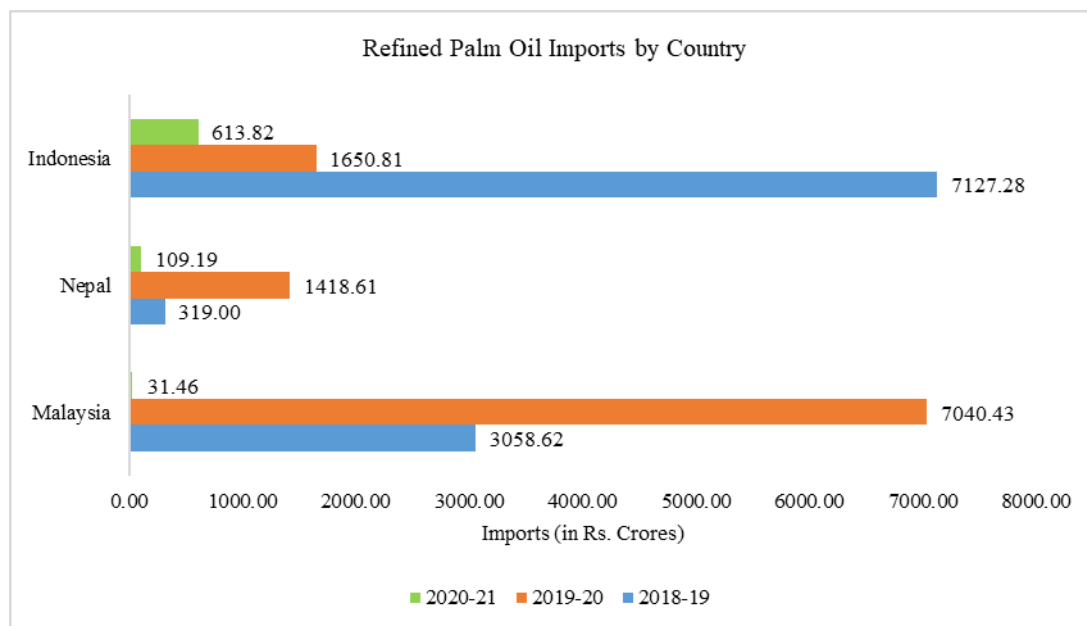
Source: Directorate General of Commercial Intelligence and Statistics, Ministry of Commerce and Industry

Refined palm oil imports account for around 30 percent of the palm oil imports in India. However, the proportion of refined palm oil was meagre (less than 2%) in total palm oil imports in 2020-21 due to a revision in import policy that amended refined palm oil from free to restricted category. In 2020-21, only Rs. 613 crores of refined palm oil were imported from Indonesia which accounted for 81 percent of the refined palm oil imports (refer figure 4.4). Imports from Nepal amounted to Rs. 109 crores which are 14.5 percent of the total refined palm oil imports in 2020-21. However, in 2019-20, Malaysia was the leading supplier of refined palm oil to India contributing 65.6 percent to the total refined palm oil imports.

The fractions of refined palm oil imported into India are RBD (refined, bleached and deodorized) palm oil, RBD palm olein, RBD palm stearin and other refined palm oil. RBD palm olein constitutes the major component of refined palm oil fractions imported into India. In 2019-20, out of Rs. 10,739 crores of refined palm oil imports, RBD palm olein imports

amounted to Rs. 10,038 crores (93.5 percent of refined palm oil imports), while only Rs. 349 crores of RBD palm stearin and Rs. 17 crores of RBD palm oil were imported. In 2020-21, among Rs. 755 crores of refined palm oil imports, RBD palm olein and RBD palm stearin amounted to Rs. 543 crores (72 percent) and Rs. 179 crores (24 percent), respectively.

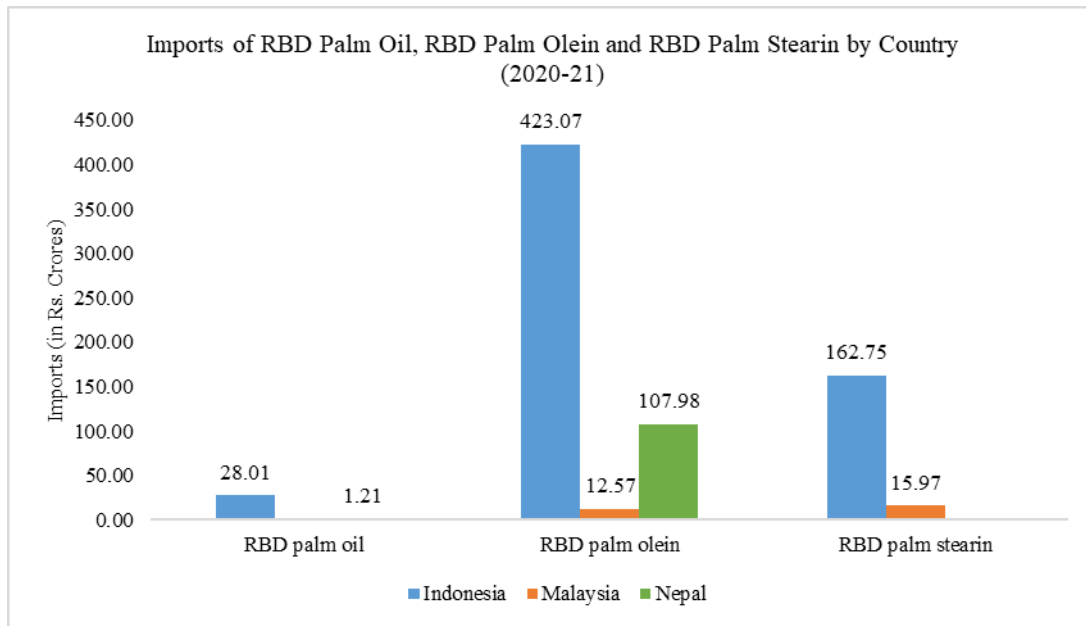
Figure 4.4: India's refined palm oil imports by country



Source: Directorate General of Commercial Intelligence and Statistics, Ministry of Commerce and Industry

Indonesia, Malaysia and Nepal are the top countries of RBD palm olein imports. In 2020-21, about 78 percent (Rs. 423 crores) of the RBD palm olein imports came from Indonesia, followed by Nepal (Rs. 13 crores) and Malaysia (Rs. 108 crores) (refer figure 4.5). RBD palm stearin is predominantly imported from Indonesia, followed by Malaysia. About 91 percent (Rs. 163 crores) of the RBD palm stearin was imported from Indonesia in 2020-21 and 9 percent (Rs. 16 crores) came from Malaysia. Indonesia is also the supplier of RBD palm oil to India contributing about 96 percent (Rs. 28 crores) of RBD palm oil imports to India.

Figure 4.5: India's imports of RBD palm oil, RBD palm olein and RBD palm stearin by country, 2020-21



Source: Directorate General of Commercial Intelligence and Statistics, Ministry of Commerce and Industry

4.2.Landing Ports of Imported Palm Oil in India

India imports the majority of its palm oil requirements from South-east Asian countries, particularly Indonesia and Malaysia. The shipment of palm oil arrives at Indian sea ports from where it is transported to the traders, refiners, manufacturers or retailers. Figure 4.6 illustrates the major ports of India's palm oil imports. These include Kandla sea, Kolkata sea, Krishnapatnam sea, Nhava Sheva sea, New Mangalore sea, Kakinada sea, Chennai sea, Mundra sea, Tuticorin sea, among others.

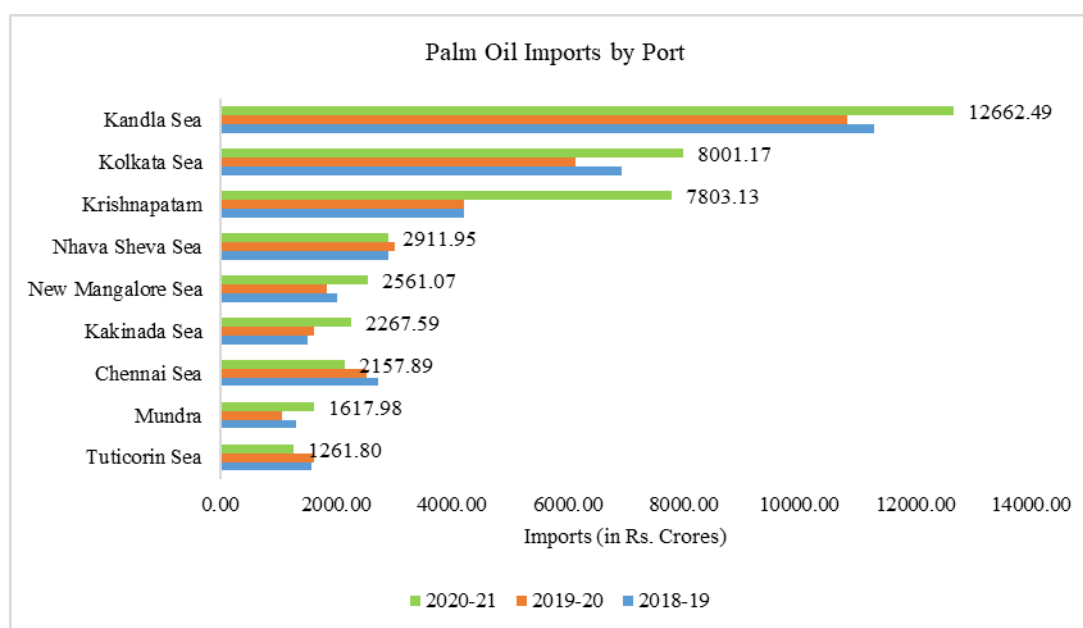
Figure 4.7 presents the value of palm oil imports arriving at various ports from 2018-19 to 2020-21. Kandla sea in Gujarat state is the largest port of palm oil imports where 30 percent of the total palm oil shipments arrive. It received palm oil shipment worth Rs. 11.3 thousand crores in 2018-19, Rs. 10.84 thousand crores in 2019-20 and Rs. 12.66 thousand crores in 2020-21 (refer figure 4.7). Kolkata sea port in West Bengal and Krishnapatnam sea in Andhra Pradesh are also the major ports where a substantial proportion of total palm oil shipments

arrive. In 2020-21, Kolkata sea received palm oil imports amounting to Rs. 8 thousand crores (18.7 percent of total palm oil imports), whereas Rs. 7.8 thousand crores (18.2 percent) of palm oil imports landed at Krishnapatnam sea. Nhava Sheva sea or Jawaharlal Nehru Port in Mumbai, New Mangalore sea in Karnataka, Kakinada sea in Andhra Pradesh, Chennai sea in Tamil Nadu, Mundra port in Gujarat and Tuticorin sea in Tamil Nadu are other sea ports in India where palm oil shipments arrive.

Figure 4.6: Top ports of palm oil imports in India



Figure 4.7: India's palm oil imports by port



Source: Directorate General of Commercial Intelligence and Statistics, Ministry of Commerce and Industry

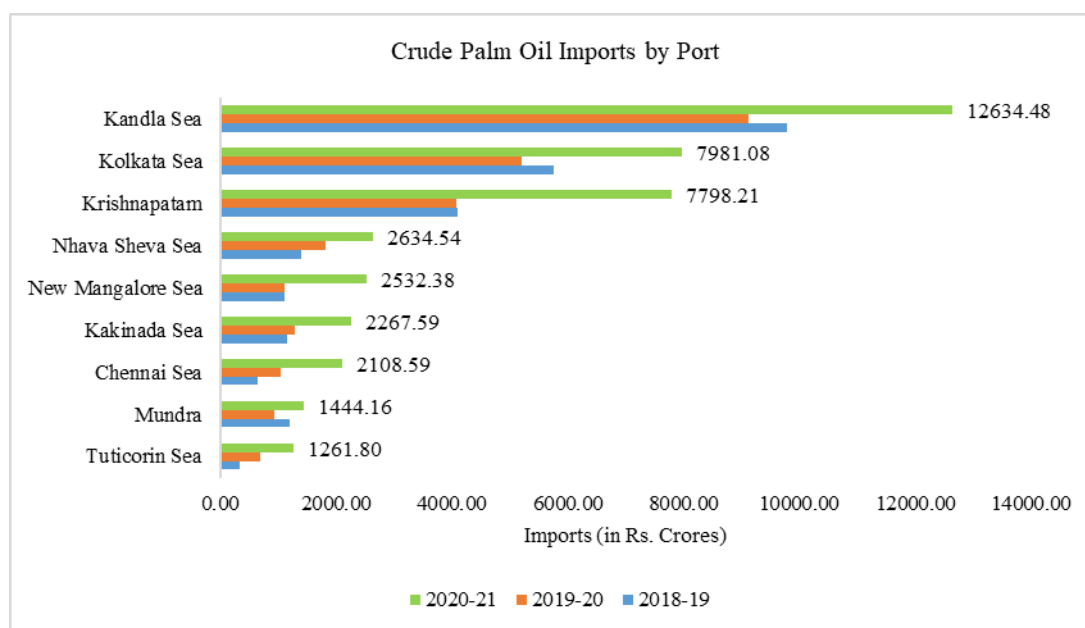
Kandla sea is also the largest port of import specifically for crude palm oil, accounting for more than 30 percent of the total crude palm oil shipments. It received shipments worth Rs. 9.78 thousand crores (38 percent of total crude palm oil shipments) in 2018-29, Rs. 9.12 thousand crores (35.6 percent) in 2019-20 and Rs. 12.63 thousand crores (30.1 percent) in 2020-21 (refer figure 4.8). Kolkata sea and Krishnapatnam sea also received major shipments of crude palm oil amounting to Rs. 7.98 thousand crores (19 percent) and Rs. 7.8 thousand crores (18.6 percent), respectively in 2020-21. About Rs. 2 to 3 thousand crores of crude palm oil imports arrived at Nhava Sheva sea, New Mangalore sea, Kakinada sea and Chennai sea that account for 5 to 6 percent of the total crude palm oil imports.

With regard to refined palm oil, Nhava Sheva sea, followed by Mundra port and Raxaul land is the major port of entry. Nhava Sheva sea received shipment worth Rs. 277 crores in 2020-21 which accounted for 37 percent of the total refined palm oil imports (refer figure 4.9). Rs. 173 crores worth of shipment (23 percent of total refined palm oil imports) landed at Mundra

port, while Raxaul land received shipment amounting to Rs. 76 crores (10 percent) in 2020-21. However, in 2019-20, the bulk of the refined palm oil shipments amounting to Rs. 1,733 crores landed at Kandla sea, followed by Chennai sea (Rs. 1,473 crores) and Nhava Sheva sea (Rs. 1,194 crores). Other ports of refined palm oil arrival are Kolkata sea, Tuticorin sea, New Mangalore sea, Kakinada sea, Jogbani and Mundra port.

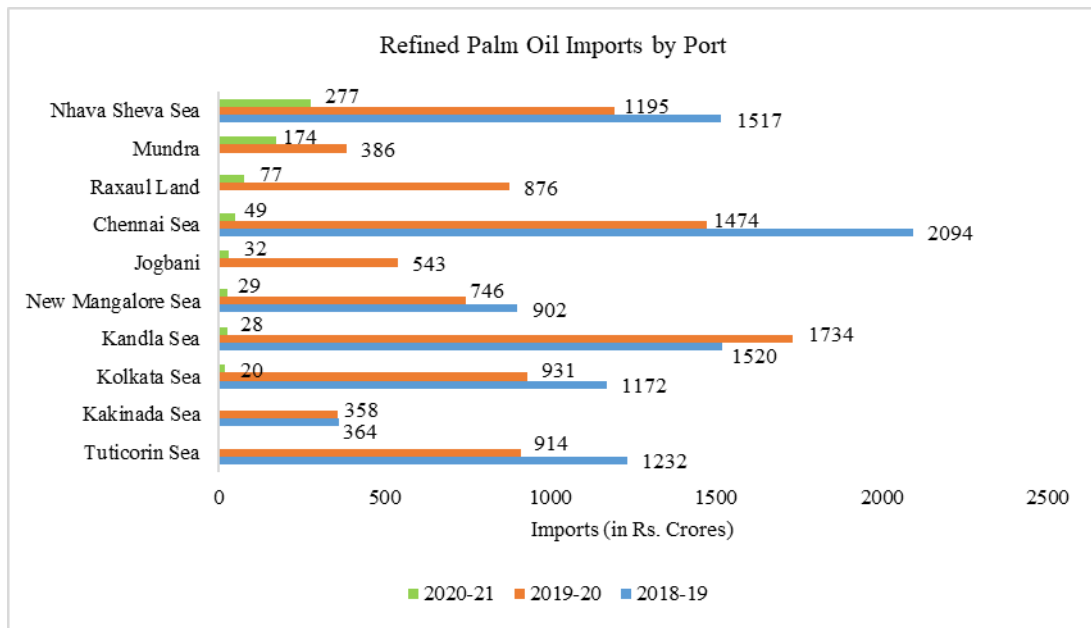
Nhava Sheva sea is also the major port of entry for RBD palm olein which constitutes the major component of refined palm oil imports in India. In 2020-21, 51 percent (Rs. 277 crores) of the total RBD palm olein imports landed at Nhava Sheva sea, followed by Raxaul land (14 percent). For RBD palm oil, Kandla sea is the major port of import that accounted for 96 percent of the total RBD palm oil imports in 2020-21, whereas Mundra received the largest shipment for RBD palm stearin (97 percent of the total RBD palm stearin imports amounting to Rs. 174 crores) in 2020-21.

Figure 4.8: India’s crude palm oil imports by port



Source: Directorate General of Commercial Intelligence and Statistics, Ministry of Commerce and Industry

Figure 4.9: India's refined palm oil imports by port



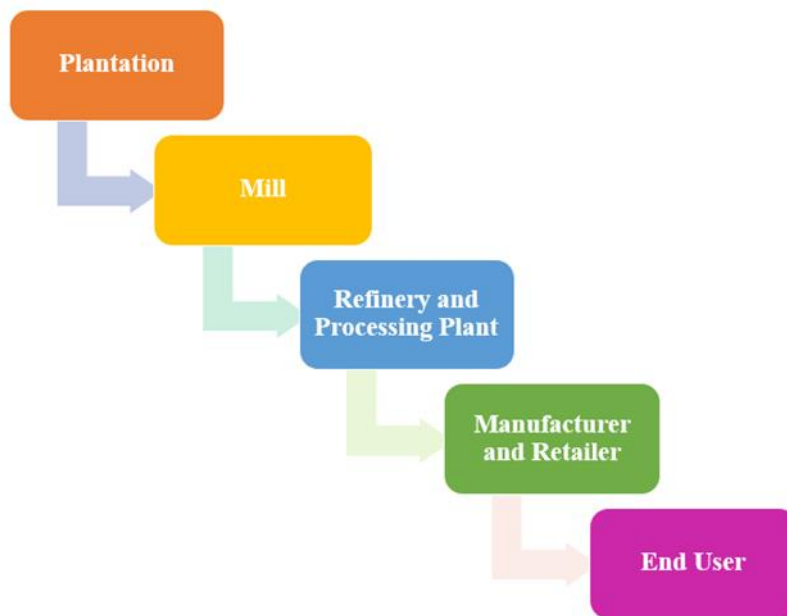
Source: Directorate General of Commercial Intelligence and Statistics, Ministry of Commerce and Industry

5. END USES OF PALM OIL

5.1. Palm oil supply chain

The palm oil supply chain is highly complex that involves a large number of stakeholders, including plantation companies or smallholders, millers and crushers, refiners and processors, traders, consumer goods manufacturers and retailers. Figure 5.1 illustrates the supply chain of palm oil. Figure 5.2 depicts the production process of palm oil and its fractions involving different stages of plantation, milling, refining, processing and manufacturing.

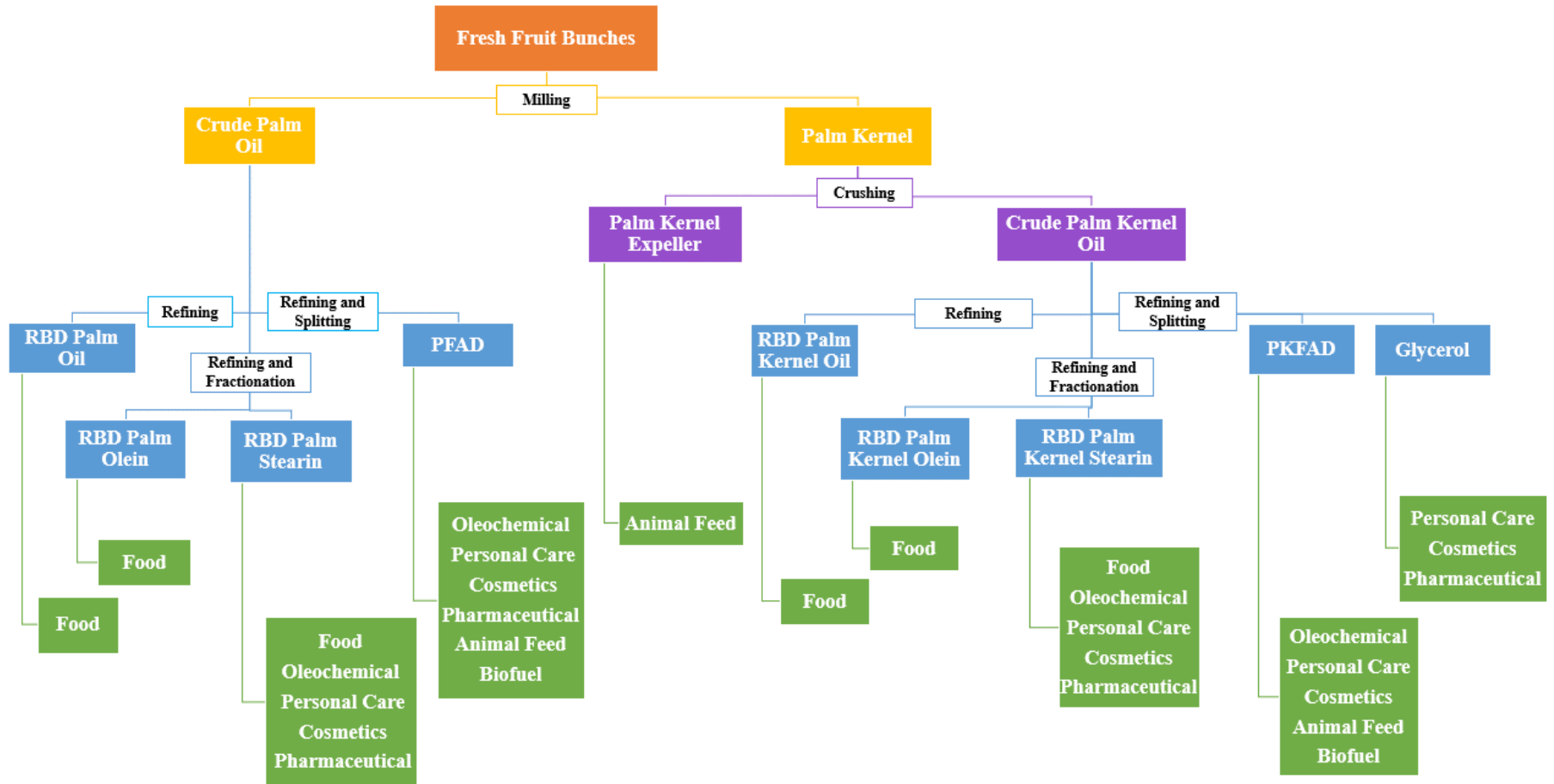
Figure 5.1: Palm oil supply chain



Oil palm is cultivated by large plantation companies or smallholders. Fresh Fruit Bunches (FFBs) harvested by plantations are transported from farms to mills where crude palm oil and palm kernel oil are extracted from FFBs. Crude palm oil is obtained by extracting the pulp, i.e., the fleshy mesocarp, of the oil palm fruit, whereas palm kernel oil is obtained from crushing

and heating the palm kernel using an oilseed expeller in the crushing plant. Extraction of palm kernel also yields a fibrous residue called Palm Kernel Meal or Expeller, largely used as animal feed. Both Crude palm oil and palm kernel oil are extracted from different parts of oil palm fruit and have a distinct mechanical process of extraction; thus, enter separate supply chains (Murphy et al., 2021). The extracted crude palm oil and palm kernel oil are then transported from mills to refineries to be refined or processed into their fractions. Crude palm oil is refined, bleached and deodorized to remove impurities (unpleasant taste, colour and odour). RBD (refined, bleached and deodorized) palm oil can be fractionated using the process of crystallization and separation into liquid and solid fractions to obtain RBD palm olein and RBD palm stearin, respectively. Palm fatty acid distillate (PFAD) is the by-product of the refining process obtained from steam distillation at high temperatures. Palm kernel oil is similarly refined and fractionated to produce RBD palm kernel oil, RBD palm kernel olein and RBD palm kernel stearin. Palm kernel fatty acid distillate (PKFAD) and glycerol are the by-products resulting from the refining process of palm kernel oil. The fractions of RBD palm oil and RBD palm kernel oil are further processed into their more complex fractions and derivatives and are channelized by processors and traders to manufacturing and retail facilities for use in the food and non-food industry. The end products of palm oil and their fractions are produced by consumer goods manufacturers and retailers that deliver a range of products in food, personal care, cosmetics, pharmaceutical, chemical, livestock and bio-energy industries to end consumers.

Figure 5.2: Stages of production of palm oil and its fractions



5.2.Applications of Palm Oil

Palm oil is a highly commercialized crop with diverse applications in the food and non-food industry. It is used vastly in food applications including cooking oil, vanaspati, bakery fats, shortening, margarine, spreads, confectionary fats, ice cream, etc. It is also used prominently in the manufacturing of oleochemicals, cosmetics, personal care products, pharmaceutical/nutraceutical products, animal feed and biofuel.

Palm oil has a balanced composition of saturated and unsaturated fatty acids which gives it a semi-solid consistency without requiring to go through the hydrogenation process. This unique composition of palm oil makes it versatile to be used in many food applications. Refined palm oil is vastly used in the food processing industry due to its several benefits. It has a neutral taste, colour and odour and therefore, can be used in a variety of food products without altering their taste and flavour. Its stability at high temperatures also makes it suitable for cooking and frying purposes. Further, it is resistant to oxidation which helps in maintaining the longer shelf life of products. RBD palm oil is fractionated to produce RBD palm olein and RBD palm stearin. RBD palm olein is vastly used in the food processing industry for manufacturing of processed food like potato chips, instant noodles, French fries and other snack foods. RBD palm stearin has a high melting point compared to RBD palm olein which makes it solid at room temperature. It is widely used to manufacture bakery fats, shortening, margarine, vanaspati etc. RBD palm stearin is also used to make fatty acids for industrial purposes. Palm fatty acid distillate (PFAD) is used in the manufacturing of detergents, oleochemicals and animal feed.

Palm kernel oil has a high concentration of saturated fatty acid and oleic-to-linoleic ratio than palm oil. Due to the high composition of lauric and myristic acid, palm kernel oil applications are similar to that of coconut oil (do Prado and Block, 2012). Palm kernel oil is refined and

fractionated to produce liquid (RBD palm kernel olein) and solid (RBD palm kernel stearin) components that also have diverse uses in the manufacturing of food and non-food products. They are used to make margarine, confectionary, coffee whiteners, biscuit cream, chocolate spreads, coating fats, vanaspati, etc. They are also used in the manufacturing of oleochemicals like fatty acids and glycerol to produce consumer goods like soap, detergent, shampoo, ointments, toothpaste, deodorant and other personal care, cosmetic and pharmaceutical products. Palm kernel meal, the residue from the oil extraction of palm kernel, is widely used as livestock feed. Palm kernel fatty acid distillate (PKFAD) and Glycerol are used for the production of oleochemicals, animal feed and biofuel.

Box 1: Some common palm oil ingredients in food products

Hydrogenated Palm Kernel Oil	Palm Oil
Hydrogenated Palm Kernel Stearin	Palm Olein
Modified Palm Kernel Oil	Palm Stearin
Palm Kernel Oil	Palmitate
Palm Kernel Stearin	Partially hydrogenated palm oil
Palm Mid-fraction	RBD Palm Oil

Source: Thomas et al. (2015)

Box 2: Some common palm oil derivatives for industrial use

Alkylpolyglycoside	Fatty Isethionates	Octyl Stearate
Aluminium Isostearate	Glyceryl	Oleic Acid
Ascorbyl Palmitate	Glyceryl Stearate	Palm Stearine
Ascorbyl Stearate	Heptadecyl Alcohol	Palmitic Acid
Benzyl Alcohol	Hexadecylic	Palmitoyl Oxostearamide
Butyl Alcohol	Hydrated Palm Glycerides	Palmitoyl Tetrapeptide-3
Calcium Stearate	Isoamyl Laurate	Palmityl Alcohol
Capric Acid	Isopropyl Myristate	Propylene Glycol
Caprylic Triglyceride	Isostearyl Alcohol	Salicylic Acid
Caprylyl Alcohol	Lactic Acid	Sodium Kernelate
Cetyl Alcohol	Lauric Acid	Sodium Laureth Sulphate
Cetyltrimethylammonium Chloride	Lauryl Glucoside	Sodium Lauryl Sulphate
Citric Acid	Laurylamine Oxide	Sodium Palm Kernelate
Distilled Monoglycerides	Linoleic Acid	Stearamidopropyldimethylamine
Elaidic Acid	Magnesium Stearate	Stearate
Ethylhexyl Palmitate	Methyl Alcohol	Stearic Acid
Ethylhexyl Stearate	Myristic Acid	Tocopherol
Fatty Alcohol Sulphates	Octyl Palmitate	Tridecyl Alcohol

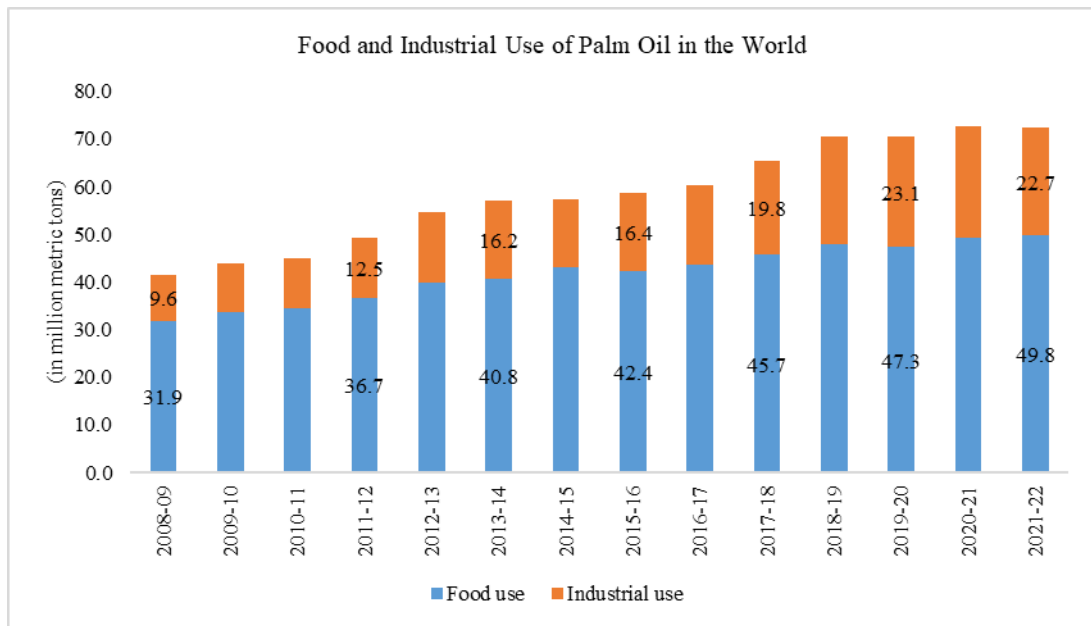
Source: Orangutan Alliance - <https://orangutanalliance.org/whats-the-issue/alternative-names-for-palm-oil/>, Thomas et al. (2015)

5.3.Palm Oil Uses across the World

Palm oil is a versatile edible vegetable oil that has diverse uses in the food as well as industrial sector. Figure 5.3 illustrates the food and industrial use of palm oil in the world. Food use constitutes a major part of palm oil usage. The utilization of palm oil in the food industry has increased consistently from 31.88 million metric tons in 2008-09 to 49.76 million metric tons in 2021-22. However, its share in domestic production has fallen over time from 75.6 percent to 66.7 percent during the same period. The industrial utilization of palm oil has gained prominence in the last decade. The proportion of industrial use in total consumption has increased from 22.8 percent (9.63 million metric tons) in 2008-09 to 30.4 percent (22.68 million metric tons) in 2021-22.

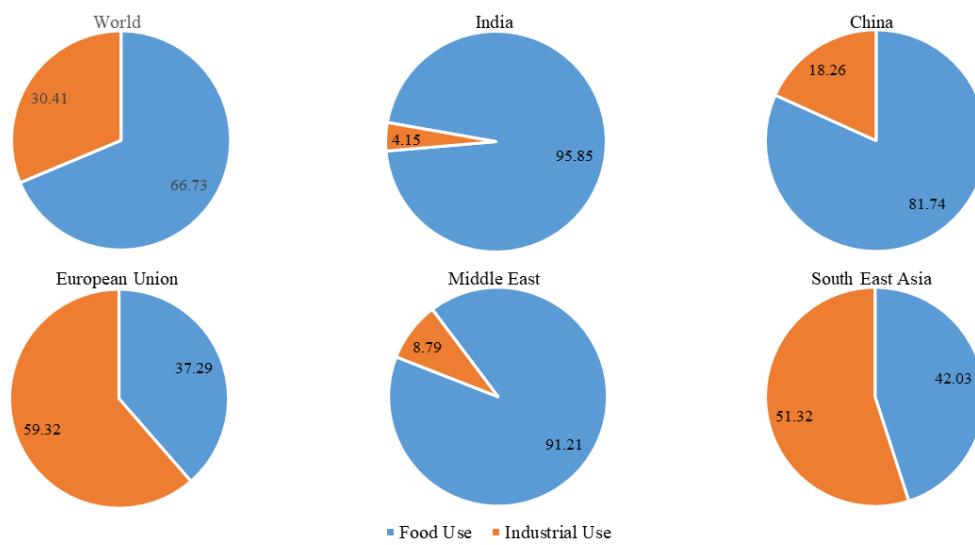
While the food use of palm oil dominates globally, there are substantial variations across the countries. Figure 5.4 presents the proportion of palm oil usage in the food and industrial sector for major countries/regions across the world in 2021-22. In India, palm oil is used enormously in the food sector with a share of 95.85 percent, whereas its industrial applications are minimal (only 4.15 percent). Middle East countries also utilize palm oil predominantly in food applications (91 percent). Food usage of palm oil in China is also substantial with a share of around 82 percent, close to the world average, while its share of industrial application is about 18 percent. Contrastingly, the industrial sector dominates palm oil utilization in European Union (EU) with a share of 59 percent. The demand for palm oil in the EU is driven mainly by the demand for biofuel feedstocks (Pacheco et al., 2017). South-east Asia also employs more than half of its palm oil (51 percent) in industrial applications which can be attributed to an increase in their biofuel mandate.

Figure 5.3: Food and Industrial Use of Palm Oil in the World



Source: FAS, USDA

Figure 5.4: Proportion (in percent) of Food and Industrial Use of Palm Oil across the World, 2021-22



Source: FAS, USDA

5.4.Palm Oil Supply Chain and End Use Segments in India

India has almost negligible production of palm oil, thus, relies on imports to meet its domestic demand. The majority of the palm oil is imported in crude form. Sourcing of crude palm oil is undertaken by traders, refiners or directly by manufacturers. Traders import palm oil exclusively for supplying raw materials to refineries or manufacturers that refine and process palm oil into its fractions. Manufacturing involves the production of a wide range of products like refined oil of edible grade, interesterified fats, oleochemicals, etc. for applications in different industries. Consumer goods manufacturers then produce consumer goods that are supplied to end users through retailers. The processing and refining of crude palm oil and manufacturing of palm oil products in India are concentrated in a handful of large corporate groups that import crude palm oil mainly from Indonesia and Malaysia. The major corporations own their refining capacity, hence, are involved in both refining and manufacturing of goods using imported crude palm oil. Palm oil products then enter the wholesale and retail market as finished products or supplied to consumer goods manufacturers for producing other consumer goods. These products are finally sold to end users for consumption. Following are the palm oil-based products in different segments and their applications in India:

1. **Cooking Oil and Fats:** Refined palm oil, refined palmolein oil and vegetable ghee (vanaspati) for cooking or frying purposes.
2. **Bakery and Confectionary:** Bakery fats, shortening and margarine for use in different applications like puffs and kharis, biscuits, cookies, cakes, pastries, etc.; vegetable fat (vanaspati) for deep frying namkeen, chips, instant noodles, other snacks, etc.; vanaspati for breads and rusks; specialty fats for frozen desserts and ice-cream; fat spreads for chocolate spreads, cookies filling, etc.; coating fats for coating chocolates, toffees, ice-cream; cocoa butter substitute for chocolates, truffles, ice-creams, etc.

3. Oleochemicals: Fatty acid distillate, Hydrogenated palm stearin, Stearic acid, Glycerine for various industrial applications including rubber tyres, pipes and plastics, textile auxiliaries, leather and paper auxiliaries, candle-making, cutting oil, lubricants, greases, alkyd resins for paints, etc.
4. Personal Care and Cosmetics: Stearic acid, Magnesium stearate, Glycerine/Glycerol, soap noodles, etc. for various applications including make-up or cosmetic products like foundation, eyeliner, eyeshadow, kajal, mascara, lipstick; body care products like soap, body wash, body spray, deodorants, creams, lotions, etc.; hair care products like shampoo, conditioner, hair serum, etc.
5. Pharmaceuticals: Stearic acid, Glycerine, Magnesium stearate, Calcium stearate used for the manufacturing of pharmaceutical and nutraceutical products.
6. Animal feed: Palm kernel expeller used for manufacturing of animal feed supplements.
7. Bioenergy: Palm fatty acid distillate used as a renewable raw material in biofuel production.

The complexity of the palm oil supply chain along with highly fragmented end usage makes it extremely challenging to quantify which fraction or derivative of palm oil is produced and consumed in which industry. The assessment of end uses of palm oil is undertaken through online questionnaires and structured telephonic interviews administered on palm oil importers. Also, information available in the public domain (websites of the importing companies) is collected and reviewed.

Imports of palm oil are concentrated among large manufacturing companies that are engaged in sourcing, refining and manufacturing of various products for use in various industries like food, bakery, personal care, pharmaceutical and chemical industry. The imports of the top 30 palm oil importing companies constitute about 90 percent of the total palm oil imports in the country. Emami Agrotech, Adani Wilmar, Ruchi Soya Industries, Gokul Agro Resources and

South India Krishna Oils and Fats are the key players in palm oil processing and manufacturing, sourcing about 50 percent of the total crude palm oil imports in India. Table 5.1 lists the major palm oil importing companies in India that were surveyed to assess the end-uses of palm oil. Palm oil use in India is dominated by the food manufacturing sector as all major companies are involved in the production of cooking oil and fats for home and institutional use. The majority of these companies produce fats, shortening and margarine for applications in bakery and confectionary. Some companies also produce oleochemicals for use in different sectors like personal use, cosmetics, pharmaceuticals, and other industries. The market for livestock feed and biodiesel is extremely small with only a limited number of companies involved in its production.

Table 5.1: Top Palm Oil Importers in India

Top Palm Oil Importers in India	End Use Sectors					
	Cooking Oil and Fat	Bakery and Confectionary	Oleochemicals	Personal Care and Cosmetics	Pharmaceuticals	Animal Feed
Emami Agrotech Limited	✓	✓				
Adani Wilmar Limited	✓	✓				
Ruchi Soya Industries Limited	✓	✓				
Gokul Agro Resources Limited	✓	✓	✓			
South India Krishna Oil and Fats Private Limited	✓	✓	✓			
Gemini Edibles & Fats India Private Limited	✓	✓				
Kanpur Edibles Private Limited	✓			✓		
Frigorifico Allana Private Limited	✓	✓				
Bunge India Private Limited	✓					
Cargill India Private Limited	✓	✓				✓
Budge Budge Refineries Limited	✓	✓				
Santhoshimathaa Edible Oils Refinery Private Limited	✓					
K T V Health Food Private Limited	✓					
3F Industries Limited	✓	✓	✓	✓	✓	✓
Mantora Oil Products Private Limited	✓					
Louis Dreyfus Company India Private Limited	✓					
Yentop Manickam Edible Oils Private Limited	✓	✓	✓			
Ajanta Soya Limited	✓	✓				
Parisons Foods Private Limited	✓					
Aak Kamani Private Limited	✓	✓		✓	✓	
Tvarur Oils and Fats Private Limited	✓					
Sheel Oil and Fats Private Limited	✓	✓	✓			

Top Palm Oil Importers in India	End Use Sectors					
	Cooking Oil and Fat	Bakery and Confectionary	Oleochemicals	Personal Care and Cosmetics	Pharmaceuticals	Animal Feed
Ana Oils and Fats India Private Limited	✓					
Bcl Industries Limited	✓					
Lohiya Edible Oils Private Limited	✓	✓				
N K Proteins Private Limited	✓					
G One Agro Products Limited	✓	✓				
Agarwal Industries Private Limited	✓	✓				
Able Oils and Agro Private Limited	✓	✓	✓			

6. Conclusion and Policy Recommendations

6.1. Findings of the Study

- India is the leading importer of palm oil in the world. In 2021-22, India imported 7.8 million metric tons of palm oil, which is about 95 percent of the domestic consumption of palm oil.
- Palm oil is mostly imported in crude form in India. About 70 percent of the palm oil imports constitute crude palm oil, while 30 percent is imported in refined form. In 2020-21, crude palm oil imports accounted for 98 percent of the palm oil imports in the country. This was due to a large reduction in the import duty of crude palm oil leading to a huge price differential between crude and refined palm oil, thereby boosting crude palm oil imports.
- Among refined palm oil, RBD palm olein constitutes a major share in the imports (about 93.5 percent in 2020-21). The share of RBD palm oil and RBD palm stearin in refined palm oil imports is meagre.
- Palm oil is majorly imported from Indonesia and Malaysia which are the dominant producers and suppliers of palm oil to the world. Indonesia is the leading supplier of palm oil to India, followed by Malaysia. Together, they supply about 93 percent of India's palm oil requirements. They are the top suppliers of both crude and refined palm oil to India.
- The shipment of imported palm oil arrives at Indian sea ports from where it is transported to traders, refiners, manufacturers or retailers. Kandla sea in Gujarat, Kolkata sea in West Bengal, Krishnapatnam sea in Andhra Pradesh, Nhava Sheva sea in Maharashtra and New Mangalore sea in Karnataka are the top seaports of palm oil imports.

- Kandla sea is the largest port of palm oil imports where 30 percent of the total palm oil shipments arrive (amounting to Rs. 12.66 thousand crores in 2020-21). Kolkata sea and Krishnapatnam sea also received major shipments of crude palm oil amounting to Rs. 8 thousand crores and Rs. 7.8 thousand crores, respectively in 2020-21.
- With regard to refined palm oil, Nhava Sheva sea, followed by Mundra port and Raxaul land is the major port of entry. Nhava Sheva sea received shipments worth Rs. 277 crores in 2020-21 which accounted for 37 percent of the total refined palm oil imports.
- Nhava Sheva sea is also the major port of entry for RBD palm olein which constitutes the major component of refined palm oil imports in India. For RBD palm oil, Kandla sea is the major port of import that accounted for 96 percent of the total RBD palm oil imports in 2020-21, whereas Mundra received the largest shipment for RBD palm stearin (97 percent of the total RBD palm stearin imports) in 2020-21.
- Palm oil is a versatile edible vegetable oil that has diverse uses in the food as well as industrial sector. The utilization of palm oil in the food industry has increased consistently from 31.88 million metric tons in 2008-09 to 49.87 million metric tons in 2021-22. However, its share in domestic production has fallen over time from 75.6 percent to 67.2 percent during the same period. The industrial utilization of palm oil has gained prominence in the last decade. The proportion of industrial use in total consumption has increased from 22.8 percent in 2008-09 to 31.9 percent in 2021-22.
- While the food use of palm oil dominates globally, there are substantial variations across the countries. In India, palm oil is used enormously in the food sector with a share of 95.75 percent, whereas its industrial applications are minimal (only 4.25 percent). Middle East countries and China also utilize palm oil predominantly in food applications. Contrastingly, the industrial sector dominates palm oil utilization in the EU and South-east Asia.

- Imports of palm oil in India are concentrated among large manufacturing companies that are engaged in sourcing, refining and manufacturing of products for use in various industries like food, bakery, personal care, cosmetics, pharmaceutical and chemical industry. The imports of the top 30 palm oil importing companies constitute about 90 percent of the total palm oil imports in the country. Emami Agrotech, Adani Wilmar, Ruchi Soya Industries, Gokul Agro Resources and South India Krishna Oils and Fats are the key players in palm oil processing and manufacturing, sourcing about 50 percent of the total crude palm oil imports in India.
- Palm oil use in India is dominated by the food manufacturing sector as all major companies surveyed are involved in the production of cooking oil and fats for home and institutional use. The majority of these companies produce fats, shortening and margarine for applications in bakery and confectionary. Some companies also produce oleochemicals for use in different sectors like personal use, cosmetics, pharmaceuticals, and other industries. The market for livestock feed and biodiesel is extremely small with only a limited number of companies involved in its production.

6.2.Policy Suggestions

India's heavy reliance on palm oil imports increases its vulnerability to international price fluctuations. Despite protectionist measures and trade barriers, India remains the largest importer of palm oil in the world. The increasing use of palm oil for biofuel production in developed countries, especially the EU, has also contributed to its susceptibility to global price volatility. Due to high fluctuations in domestic prices as a result of international price volatility, farmers are not able to realize the remunerative price for their produce. This discourages farmers to undertake oil palm cultivation. Farmers, therefore, need to be hedged against

international price volatility. Providing viability price to farmers can protect them from global price fluctuations.

Expansion of oil palm plantations is required to meet the growing domestic demand for palm oil. India has enormous potential for the development and expansion of oil palm plantations to achieve self-sufficiency in palm oil. However, its efforts to promote domestic production and processing of oilseeds through various government programmes have not been able to yield significant results. Oil palm competes with other commercially viable crops like rubber, sugarcane, coconut, etc. It also has a long gestation lag which restricts the flow of income for farmers for 3-5 years. Farmers, therefore, need to be incentivized to undertake oil palm cultivation. Post-harvest practices also play a major role in providing remunerative prices to farmers for their produce. Hence, farmers should be provided with easy access to the mill to extract palm oil from harvested FFBs to minimize the time between harvest and arrival of bunches at the mill. Mills and refineries should be provided with access to technology and technical assistance to stimulate palm oil production.

Palm oil can be replaced with mustard oil or coconut oil that are domestically produced in India. Given that India's dependency on palm oil is mainly in the food sector, substitution with other vegetable oils can easily be achieved. For cooking and deep-frying, soyabean oil or sunflower oil can be used by snack manufacturers. Coconut Oil can be a good alternative to palm kernel oil for manufacturing of specialty fats in the bakery industry, soaps, detergents and other personal care and cosmetic products due to its fatty acid profile. The government can, therefore, initiate programmes to educate manufacturers and consumers regarding alternatives to palm oil.

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