

STEP 2 - TRAINING MATERIAL NO. 5 - Value Chain Mapping Exercise

Mapping Exercise

Instructions:

- Read carefully the information provided;
- Perform an effective value chain mapping considering the information included in the case study below.
- Map the actors, the supporting functions and the enabling environment. Provide and adapt the methodology used to map the selected value chain. Please adapt the map to the case study context and include all relevant information.
- Fill the mapping table template below accordingly.

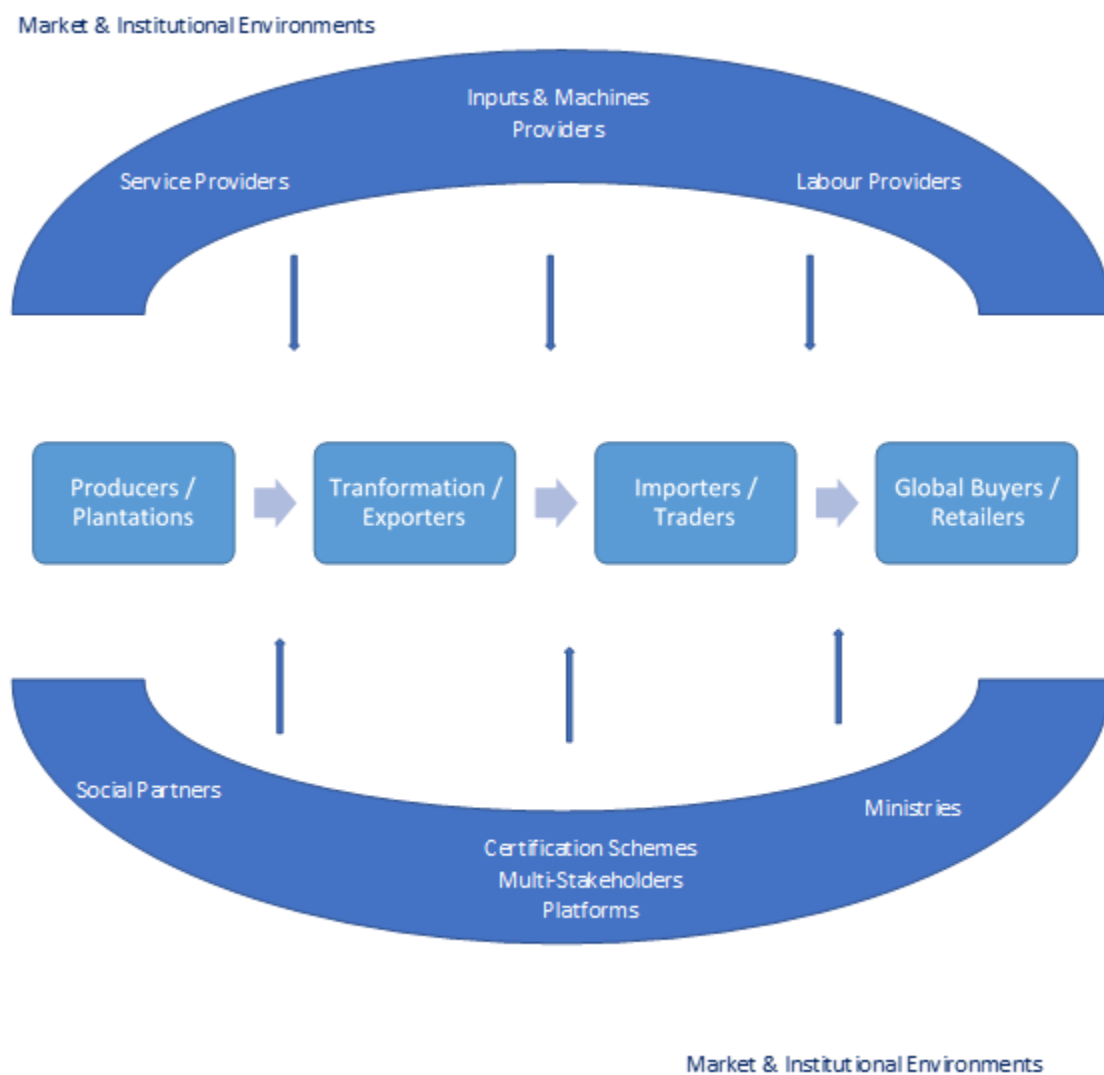
Mapping Table Template

Transformation process					
Products					
Size and types of actors					
Type of actors					
Operations					
Main risk factors					
Supporting industries					

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Supporting functions					
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Value Chain Map Template



The Value Chain of Palm Oil in Indonesia

Palm oil is Indonesia's third largest export commodity after oil/gas and coal. Export revenues from palm oil are likely to become more important in the future given that coal and gas are non-renewable resources. The palm oil sector also provides a basis for local economic development and significant employment generation.

In 2015, Indonesia produced about 33 million metric tons (MT) of crude palm oil, which was about 53 per cent of the total global production of 62 million MT (Oil World). Forecasted production for 2020 is about 41 MT against which the Indonesian government is aiming to operate a biodiesel blending mandate of 30 per cent.

Indonesia is also an important player to achieve global market transformation towards sustainable palm oil production. The country is the biggest certified sustainable palm oil producer contributing 56 per cent or 6.52 million MT of the 11.71 million MT Certified Sustainable Palm Oil (CSPO) world production. The economic, social, and environmental benefits of the sector, in general, and the working conditions including the safety and health of workers, in particular, are significantly influenced by the nature and structure of the industry. This includes the behaviour and relationships among the different actors across the supply chain. This section provides an overview of the Indonesia palm oil supply chain and the market to which it responds.

Product and market

- **Product**

Oil palm is the world's highest yielding oil crop, with an output five to ten times greater per hectare than other leading vegetable oils. This makes palm oil the least expensive vegetable oil to produce. Oil palms generally begin to produce fruits 30 months after being planted with commercial harvest commencing six months later. While a tree can live up to 50 years, it is usually replaced at 20 to 25 years because of declining yields and because their height makes harvesting difficult.

The fruit is reddish in colour and grows in a large bunch or Fresh Fruit Bunch (FFB). Each FFB weighs between 10 and 25 kilograms with 1,000 to 3,000 oval-shaped fruitlets per bunch. FFBs are harvested every 15 days which makes it attractive to smallholders. Harvesting is labour intensive and, as such, even smallholders contribute to job generation in their communities.

Each fruitlet contains a single seed (palm kernel), surrounded by a soft oily pulp or mesocarp. FFBs contain about 18 to 22 per cent crude palm oil and 3 to 5 per cent palm kernel oil. Palm oil is obtained from the fleshy mesocarp of the fruit which contains a maximum of 24 per cent oil depending on the quality and variety of fruit. Palm kernel oil is obtained from the kernel which contains about 45 to 50 per cent oil and 40 to 45 per cent meal. It is lauric oil, which is similar to coconut oil. FFB must be processed by a mill within 24 to 48 hours after harvest. This is important to maintain the oil content and prevent the build-up of free fatty acids (FFA), which reduces the quality of the oil. A third product is palm kernel meal (PKM), derived from the crushed kernel. It is mainly used as a component of animal feed for livestock.

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Palm oil and palm kernel oil are used in a wide range of products, from margarine and chocolate to ice cream, soaps, cosmetics, and fuel for cars and power plants. The four main traditional uses of palm oil in food products are for cooking/frying oil, shortenings, and margarine and confectionary fats. Palm oil is regularly used in both solid fat products as well as in the liquid cooking oil sector especially in industrial frying applications. The food industry is the biggest user of palm oil accounting for about 72 per cent of the world wide usage. Palm oil is used in about 60 per cent of the products sold in supermarkets.

As a non-food ingredient, palm oil is utilized in the production of cosmetics, toiletries, soaps and detergents. It is also used in the oleo-chemical industry, as a base material for the production of surfactants (washing active substances) for laundry detergents, household cleaners and cosmetics. Personal care, cosmetics, and cleaning materials account for about 18 per cent of palm oil utilization. More recently, the biofuels market has provided a significant new non-food use for palm oil where it is used as the feedstock for the production of biodiesel and as an alternative to mineral oils for use in power stations. About 10 per cent of the palm oil supply is absorbed by the biofuel industry.

- **Markets**

Export Markets

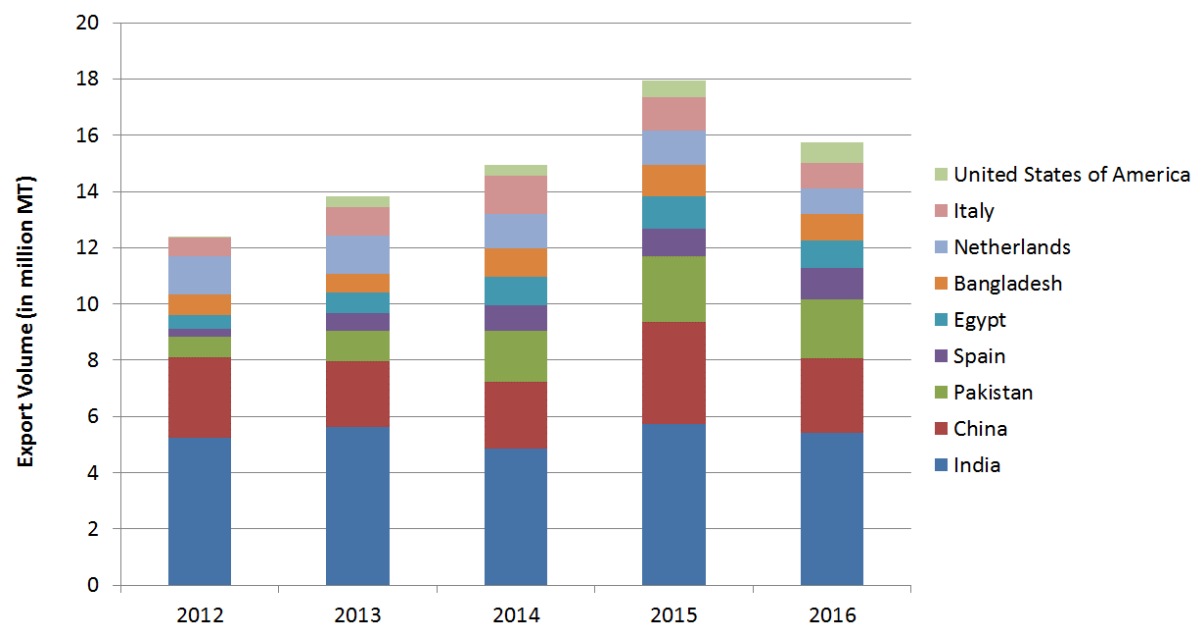
Palm oil is the single largest consumed vegetable oil in the world. Share of palm oil to world vegetable oil consumption in 2015 to 2016 was about 34 per cent or 60.30 million MT. This was followed closely by soybean, which comprised 29 per cent of vegetable oils consumed. Soybean oil and palm oil are considered “substitute goods”. Users such as food processing companies often switch between palm oil and soybean oil as the prices fluctuate. Palm oil competes directly with other oils and fats in most of its applications and demand is therefore determined by its competitive position within the overall world market price for these products. Stiff price competition between palm oil producing countries and alternative oil crops usually affects plantation margins which then require companies to embark on cost reduction practices. Exposure to volatile commodity prices and price competition are a constant feature of the business environment within which the Indonesia palm oil industry operates.

Indonesia is not yet positioned in the organic palm oil market, which offers less opportunities for product differentiation and accessing markets with high product quality requirements (SSI Review, 2014). Product differentiation is, thus, limited for Indonesian palm oil, with most of the focus remaining on volume and price.

In fiscal year 2015 over 83 million MT of oils and fats were exported worldwide. Palm oil and palm kernel oil accounted for the largest individual export total at almost 50 million MT. Palm and palm kernel oil also had the highest ratio of export to production at 74 per cent. Indonesia is the largest producer and exporter of palm oil globally. In 2016, the country accounted for about 52 per cent of the total global export sales of US\$27.8 billion. On the average, about 70 per cent of Indonesia’s palm oil production is geared towards the export market.

Figure 1. Top 10 export markets for palm oil from Indonesia (HS 1511), 2012 to 2016

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Source: Trade Map, International Trade Centre.

India is the largest global importer of palm oil and is the largest market of Indonesia. India's import of vegetable oil has trebled due to a consistent rise in demand and slow growth of domestic oil production. About 90 per cent of the total volume of palm oil in India is used for edible, food-based products and 10 per cent goes towards non-food based usage. About 90 per cent of the food products are sold in loose forms which infers little reputational risks. Only about 10 per cent of the products are branded and packaged (Center for Responsible Business, 2014). Companies with branded products typically take stronger measures to assess environment and social risks across their supply chain to reduce vulnerability to criticism.

Although price sensitivity appears to take over environmental and social concerns for a majority of the supply chain players and consumers in India, there are now ten companies managing 18 different facilities with supply chain certifications from the Roundtable on Sustainable Palm Oil (RSPO). Multinational companies operating in India and large domestic companies have all made time-bound commitments to sustainable palm oil.¹

The European Union (EU) (mostly Netherlands, Spain, Italy, and Germany) is Indonesia's second largest market comprising about 15 to 20 per cent of its total palm oil exports. According to Oil World, Indonesia was the largest single exporter of palm oil to Europe, accounting for more than 5 million MT out of 7 million MT total imports. Of Europe's total palm oil imports in 2016, approximately 3.1 to 3.2 MT were used for biodiesel production. About 2.5 million MT of the palm oil exported by Indonesia to EU was used for biodiesel production.

¹ Hindustan Unilever is one of the primary drivers of sustainability policies to Indian suppliers. The company's Sustainable Living Plan includes a goal for all palm oil to come from traceable, sustainably certified sources by 2020.

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The EU is a major consumer of sustainable palm oil and the market is meant to increase due to recent policy and trade developments.² In addition, in response to environment activists' and consumer groups' pressures, many of the companies that are large users of palm oil in the European Union have adopted some type of commitment to sustainable palm oil. About 57 per cent of the physical palm oil that entered Europe in 2015 was certified as sustainable palm oil (Sustainable Palm Oil in Europe, 2016). Compared to 2014, this represented an increase of 11 per cent.³ On the other hand, biodiesel companies have established the European Sustainable Palm Oil (ESPO) initiative with its commitment toward 100 per cent sustainable palm oil in 2020.⁴

China is the world's third largest importer of palm oil with average annual imports of 5.9 million MT. It is the third largest market for palm oil from Indonesia. China, like India, is a price-sensitive market. The uptake of sustainable palm oil has generally been slow among Chinese buyers since a significant percentage of the palm oil is for domestic consumption. An important factor in purchasing decisions is the discount between crude palm oil and soybean oil. In November 2016 though, large China-based palm oil buyers visited Indonesia to better understand the efforts being made to achieve sustainable palm oil production. Some of the key buyers, particularly those using the oil in export-oriented products, have already started buying CSPO in response to buyer demand for ethically and environmentally sound products.⁵

Pakistan has an annual consumption of edible oil at four million tonnes with an average growth of about four per cent. Palm oil accounts for a 65 per cent share in total edible oil consumption. Refined palm oil accounts for about 98 per cent of Pakistan's total edible oil imports, but imports of soybean oil are expected to increase as importers look to alternative supply sources based on pricing. Palm oil though is still preferred since cost of processing and modification of palm oil products for downstream uses is lower compared to other vegetable oils such as soybean, sunflower seeds, canola, and cottonseed. About 90 per cent of the palm oil supply in Pakistan is utilized for Vanaspati (a thick vegetable oil) or for frying and cooking. The remaining 10 per cent is used for other food products with special requirements.

Indonesia's palm oil exports to the United States in 2016 increased by 27 per cent over 2015 figures. The significant increase was attributed to a change in edible oil usage in the United States. The US Food and Drug Administration announced in mid-2015 that it would ban the use of (artificial) trans-fat in food products. Companies only have until 2018 to eliminate trans-fat from their food products.

In major markets such as India and China there is not yet much demand for sustainable palm oil. Most of the demand for CSPO comes from Europe, but this is mainly for palm stearin, which is the solid fraction of palm oil and is widely used in food products. However, palm stearin represents only 20 per cent of the palm oil volume. The remaining 80 per cent is palm olein, but there is currently no demand for CSPO olein. Most of the olein is sold as cooking oil in China and India, where the call is for the cheapest supply and

² Last 4 April 2017, the EU parliament called for a single certification scheme for palm oil entering the EU market. The non-binding resolution suggested that only palm oil supplied through sustainable methods could enter the bloc after 2020. The Parliament's report, while not binding, could pave the way for binding legislation in Europe that could reshape the palm oil industry.

Indonesia started negotiating a trade agreement with the European Union. In the framework of those negotiations, a number of topics are scheduled to be at the agenda, those will seemingly include a "trade and sustainable development" chapter, as it is the case for most new EU agreements.

³ The reported share is equivalent to 2.1 million MT of sustainable palm oil consisting of around 80 per cent Segregated and Identity Preserved and 20 per cent Mass Balance supply chain models.

⁴ The agreement is supported by an alliance of refineries, food and feed manufacturers and retailers in the Netherlands, Denmark, France, Belgium, Germany, the UK, Italy, and Sweden.

⁵ Since 2013, Chinese RSPO membership has grown from 17 to 52 companies as of 30 June 2016.

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sustainability is not a priority. To compensate for the loss incurred on the sale of CSPO olein to Asian markets, the premium for producing CSPO olein as well as stearin is passed on to the European market, which further increases the price of CSPO in Europe (SPOTT).

In essence, Indonesia is dealing with two different markets – a market such as the European Union where buyers and governments mandate compliance with certain social and environmental standards and another market such as India, China and Pakistan where the emphasis is put primarily on price competitiveness.

Certified sustainable palm oil is a phenomena historically pushed by the EU market and, to some extent, other high-income countries. Palm oil certification under the RSPO has reached a 21 per cent penetration of the global market (press release from the SCS Global Service dated 5 June 2017). Nevertheless, palm oil production currently destined for Indonesian consumers and for export to markets such as India, China, and Pakistan is largely left outside of those sustainability initiatives.

Domestic Market

Indonesia is the second largest consumer of palm oil after India with an average annual consumption of about 8.19 million during the period 2012-13 to 2015-16. Domestic consumption represents about 25 to 30 per cent of Indonesia's total production, of which cooking oil alone accounts for 50 to 60 per cent. Palm oil certified by RSPO is mostly destined for export. Local demand remains limited.⁶

The government has several systems in place to increase or decrease local demand and this has a great influence on local palm oil prices. One of the most important support systems is the biodiesel mandate. Indonesia Regulation 12/2015 sets a target blending rate of 20 per cent for the transportation sector. Regulation 12/2015 also targets 30 per cent blending for electricity generation. In times of surplus and low palm oil prices, the government has the possibility to increase the biodiesel mandate and increase demand. Biodiesel is a new market opportunity for palm oil, it also increases the correlation of the market with the fossil fuel market.

Rapid growth in Indonesia's biodiesel blending and consumption is directly attributable to the country's biodiesel subsidy, which is financed through a levy on palm oil and palm oil product exports. More than 1 billion litres of biodiesel were consumed under this program between January and June 2016, using the revenues generated by the levy to cover the difference between the cost of biodiesel and fossil fuels. The

⁶ A market survey commissioned by the RSPO in 2015 showed that about 8 million Indonesian consumers are ready to support and shift to sustainable palm oil products. Some of the key findings of the study point to the challenges inherent to promoting sustainable palm oil in Indonesia:

- Consumers have difficulty in understanding the concept of sustainable palm oil. After hearing about it, half of respondents either described this as the government's problem, or were of the opinion that consumers could only make a small impact.
- Consumers are unaware of how versatile palm oil is. When respondents were prompted about the first product that came to mind regarding palm oil, they could only identify it as cooking oil – whereas it is found in a much broader range of products they use daily.
- Only a minority of respondents (16 per cent) think that it is their responsibility to do something about possible, negative impacts of palm oil. When it comes to who they consider responsible for promoting and ensuring sustainable palm oil products, respondents feel that in addition to the government (93 per cent) and oil palm plantations (66 per cent), consumer goods manufacturers (52 per cent) also play an important role.
- Only 11 per cent of respondents claim to recognize the RSPO logo (more than most sustainability Trademarks), but they don't know what it means.

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fund was established based on regulations 24/2015 and 61/2015. It is being managed by the CPO fund agency (BPDPKS).

Value chain structure

Upstream production, which covers the series of activities from cultivation to milling, takes place in Indonesia. Midstream and downstream processing including trading of palm oil and its derivatives are distributed globally and also within Indonesia. Palm oil is traded in the following forms: a) Crude Palm Oil (CPO) and Crude Palm Kernel Oil (CPKO); b) Refined palm oils to be further processed in Indonesia and importing countries; and c) Manufactured products to be marketed in Indonesia and importing countries.

Many of the commodity traders are vertically integrated (from plantations to refinery) and have their own refineries located strategically in major markets and, thus, are able to capture bigger margins. During recent years though, Indonesia has increasingly built up its refining capacity and allowed firms located in the country to benefit from additional revenues from this value added activity. Refineries and traders sell refined palm oil and its derivatives to manufacturers or directly to end retailers such as food service operators, grocery stores, and oil vendors. The wide range of buyers of palm oil reflects the myriad of palm oil uses. The consumption of palm oil can be segmented into palm oil sold as cooking oil, palm oil in manufactured and processed goods, and palm oil used for biodiesel production.

The Indonesia palm industry is regulated by a number of ministries including: Agriculture, Industry, Trade, Manpower, and Environment and Forestry. There are also industry organizations representing the interests of the upstream and downstream producers as well as workers. Public and private compliance initiatives such as the Indonesian Sustainable Palm Oil (ISPO) and the Roundtable on Sustainable Palm Oil (RSPO) together with various non-government organizations (NGOs) and international development agencies provide support to the industry, particularly in the promotion of sustainable production.

As can be gleaned from the flow and number of actors in the value chain map, the industry has an hour glass structure. The raw material supply base of palm oil is made up by more than two million growers with a majority comprised of smallholders. As one moves up the value added processing stage, the number of companies becomes smaller. There are about 600 palm oil mills in Indonesia. Large companies (private and state owned) that operate milling facilities as part of an integrated plantation business model dominate the crude palm oil production. The refining and palm oil trade stages are concentrated in the hands of a few corporate groups. Six companies⁷ account for over 90 per cent of the global trade (Elias et al, 2016). The aggregators (refiners, commodity brokers, bulking facilities) control the flow of majority of the world's palm oil production. Although these trading companies are vertically integrated, they collectively source a significant percentage of their supply from thousands of plantations and hundreds of mills. On the demand side, hundreds of thousands of companies across the globe buy palm oil or palm oil fractions to include in a wide variety of products. Consumer brands with a high utilization of palm oil are inclined to actively address sustainability, which includes labour and working conditions. Doing so offers marketing benefits, helps minimize reputational damage, and secures a long-term supply. These companies are now increasingly putting pressure on aggregators to positively transform their supply chains.

⁷ Wilmar, Musim Mas, Golden Agri (GAR), Cargill, IOI, and Bunge.

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Oil palm cultivation accounts for much of the job creation associated with the palm oil industry. The industry, with its large plantation companies and mills, is an important provider of formal employment in rural settings where this type of opportunity is much less common than in urban areas.⁸

The profit margin of mills is very narrow and tight especially when price at the international market is weak⁹. Given that many of the large estates in Indonesia operate as vertically integrated firms, the general tendency is to try to lower production cost at the plantation level to improve overall profitability. Mills and refineries generally depend on volume to generate profit and are among the hardest hit when the market price is low. The traditional explanation for the lower marginal returns for CPO and its derivatives is because it is not “visible” to the consumers and therefore has less value added to it than soft commodities such as cocoa or coffee.

- **Input Suppliers**

Seeds/Seedlings. The main suppliers of germinated oil palm seeds in Indonesia are subsidiaries of large palm oil companies and the Indonesian Oil Palm Research Institute. Cost of seed ranges from US\$0.60 to 1.00 per piece. Medium and large plantations usually have their own nurseries.

In the oil palm seed market, there are difficulties for buyers to guarantee the identity of the germplasm offered. In this respect, a high level of confidence between the producer and the buyer is of paramount importance. A strategy among large plantations without their own seed production facilities is to diversify supply sources in order to guarantee their plantations an “average” yield.

The varieties under production are a critical function of the long term productivity and financial sustainability of oil palm plantations. The most preferred variety by oil mills is the Tenera as it has a high oil concentration.¹⁰

Another criterion that is important to plantations in the selection of germplasm or variety is the vertical growth or height of the palm at maturity as this has implications on safety and ease of harvesting. Vertical

⁸ One hectare of immature plantation requires about 56.50 person days of labour excluding administrative staff or a fulltime equivalent employment of 0.18 at 312 working days per year. A mature plantation with an annual yield of 20 MT of FFB generates 0.19 fulltime equivalent employment per year. In high input plantations with all operations done manually and those located in peatland and difficult terrains, FTE can reach as high as 0.26 or about 80 person days per year. For every hectare of mature plantation, an equivalent of .03 fulltime job is generated at the mill level. Milling is a highly automated process and generates less number but generally better paying jobs compared to oil palm cultivation.

Labour inputs in smallholder plantation range from 30 to 60 days per hectare. Independent smallholders, using a mix of certified and uncertified seeds and only about 50 per cent of recommended fertilizer and pesticide dosage, had the lowest labour requirements ranging from 30 to 40 person days. Some smallholder farms that were interviewed by the team appeared to have higher FTE than plantations primarily because of their location (e.g., peatland), non-contiguous areas, problems with flooding, and general lack of efficiency.

⁹ An analysis of the distribution of costs, profit, and unit margin in the upstream segment of the palm oil supply chain showed that total added unit costs in the trade of one MT of CPO comprise about 35 per cent of the selling price. Plantation accounts for about 79 per cent of the value added costs to the product. The mill has about 21 per cent of the total value added costs in the chain. Gross profit (excluding indirect costs) comprises about 65 per cent of the selling price of CPO. About 84 per cent of the profit generated from production and trade of one MT of CPO accrues to the plantation. The mill gets only about 16 per cent of the profit.

¹⁰ The Tenera, is a hybrid cross of the Dura and Pisifera oil palm varieties. The Dura line is the mother line, while pollen is used from the Pisifera. The fruit of the Tenera variety contains 25 per cent oil, by weight. Other varieties such as the Dura contain only 18 per cent oil. The same amount of Tenera can yield 30 per cent more oil than the equivalent fruit of the Dura. As such, mills generally do not accept FFB of the Dura variety. When accepted, the farmer receives a discounted price.

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growth of oil palm differs substantially depending on genetic origins, some of which have their own reputations.¹¹ As trees grow taller, the risk of developing musculoskeletal disorders among workers increases.

Growers, especially smallholders, have considerable difficulty judging, a priori, the quality of the planting materials offered to them. Large scale oil palm growers generally have access to information and means of buying directly from registered seed producers. Smallholders, on the other hand, depend on intermediaries and/or plantation they are affiliated with for their planting material requirements. Interviews with independent smallholders in North Sumatra indicate that many of the farmers did not know the specific variety or germplasm of the seedlings, the primary origin of the planting materials, and the quality at the time they bought it.¹²

Legally, farmers cannot purchase certified planting material without land documentation (Jelsma and Schoneveld, 2016). Farmers reported during the interviews that access to inputs was often impeded by the legal status of farms (i.e. access to secure inputs via regular channels were somewhat inaccessible to farmers who often cannot justify legal entity status). This is strongly reinforced by limited organization of farmers in comparison to other sectors and countries (i.e. cooperatives are not the norm).

The findings from the interviews conducted in North Sumatra and Kalimantan are also consistent with the results of the survey conducted by the German Development Institute (Brandi et al, 2013) covering smallholders in North Sumatra and Jambi. The survey indicated that key sources of planting materials among smallholders are salesmen, relatives/friends, and plantations/mills (for tied or supported smallholders/plasma). Seedlings from intermediaries were in many cases of dubious and inconsistent quality. Intermediaries, however, are the most accessible sources of seedlings among smallholders and usually the cheapest both in terms of unit cost and savings in transportation cost. Additionally, the use of inferior planting materials is in conflict with governmental seed regulations and reduces productivity significantly. Likewise, occupational safety of harvesters and efficiency in harvesting can be improved by deliberately planting oil palm known for their short height at maturity.

Fertilizer and Pesticides. Crop productivity in oil palm is largely influenced by effective fertilization beginning with planting and until maturity. The Government of Indonesia provides subsidized fertilizers to smallholders farming various commodities including oil palm (Samosir et al. 2013). Distribution of fertilizer in Indonesia follows a ‘regionalization policy’, in which suppliers are assigned to geographical areas.¹³ The regionalization of fertilizer distribution has, to some extent, resulted in a lack of competition for market share and customers and has removed incentives to innovate and invest in producing and distributing fertilizer more efficiently.¹⁴

¹¹ “Avros”, for example, is known for being very tall and “La Me” for being among the shortest. It is, however, difficult to predict the height of “Yangambi” or “Nifor” as this trait varies.

¹² Smallholders said that they were only able to assess the quality of planting materials when these reached fruiting stage. Key issues faced by smallholders particularly those who bought seeds from intermediaries were low germination rate and yield. Some of the smallholders interviewed indicated that they used seeds gathered from their own palm (F2 hybrid). Use of seeds from existing plantation to set-up another plantation or replanting almost always results in a loss of two-thirds of the potential yield. In many cases, smallholders buy planting materials ready for replanting as they have limited land for the set-up of a pre-nursery and nursery.

¹³ Each of the area producers, for example, is responsible for several provinces and tasked with identifying and monitoring distributors in each of the provinces, which are made responsible for organizing distribution at the village level.

¹⁴ In a study conducted by Daemeter Consulting (Samosir et al, 2013) for Solidaridad Network, the following were the key challenges faced in the fertilizer subsidy program for oil palm:

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Based on interviews in North Sumatra and Kalimantan, smallholders have difficulty in obtaining the correct quantity of subsidized fertilizer and at the right time. Aside from the above challenges cited in the study conducted by Daemeter, the volume of subsidized fertilizer appears to be insufficient for that required by smallholders. Likewise, many of the smallholders are not members of farmer groups, which means that they do not benefit from subsidized fertilizer as purchases must be made via the farm group leader, extension officers, and village heads.

Indonesia's pesticide industry is highly dependent on importation. In 2012, Indonesia's pesticide market was valued at approximately US\$2 billion with 64 per cent of the market controlled by multinational corporations.¹⁵ In terms of product category, herbicides had the highest consumption at 42.5 per cent with glyphosphate and paraquat reaching almost 120 thousand MT. Insecticide ranked second and accounted 37.5 per cent of consumption. The most used active ingredient was carbofuran (40,000 MT). Fungicide accounted for about 18 per cent of the consumption with mancozeb and propineb as the most active ingredients (Chem-linked, 2015).

Paraquat¹⁶ is classified as T+ /very toxic under the Globally Harmonized System of Classification and Labelling of Chemicals.¹⁷ When used under poor conditions and without proper personal protective equipment (PPE), exposure to paraquat can cause a range of symptoms, including: localized skin damage (dermatitis and burns), eye injuries, finger and toenail damage, nose bleeds, excessive sweating, nausea and vomiting. The mode of action of paraquat toxicity and lack of an antidote leads to many cases of acute poisoning, both suicidal and unintentional. Damage to the lungs may occur if paraquat is absorbed over time, and long-term exposure is associated with Parkinson's disease (Watts, 2011). Based on the research team's interviews with smallholders, they indicated they do not receive any information or training on chemical handling from their input provider (which can be a further consequence of going through intermediaries for input provision). Plantation workers reported mixed information about chemical handling, where training and PPEs seem to be highly correlated with status in employment. What workers did systematically report, though, is that they did not know what chemicals they were spraying. Most of the time preparations were already mixed before being distributed to workers to use.

The Indonesian government recognizes the level of hazard associated with exposure to paraquat. Eighteen products are classified for limited use in Indonesia, and three of these contain the active ingredient paraquat. With the limited use classification, paraquat can technically be used only by certain estate crops by professional applicators possessing a special permit.

Under the RSPO principles and criteria, paraquat can only be used in ways that do not endanger health or the environment. Individual growers must work towards minimizing and eliminating the use of paraquat and document that they are actively seeking alternatives. In addition, the RSPO has strict requirements

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- a) Delay of fertilizer delivery based on the 'Definitive Plan of the Farmer Group Needs' (DPGN) report, which is required for fertilizer distribution to farmer groups
 - b) Fertilizer sold at a higher price than the recommended retail price
 - c) Competition for fertilizer usage and leakage to other crops
 - d) Leakage of subsidized fertilizer from the system throughout the supply chain away from smallholders

¹⁵ The leading companies in Indonesia include BASF SE, Bayer CropScience, Dow AgroSciences, Monsanto, and Syngenta. In 2012, the largest pesticide consumers were rice sector (41 per cent) and palm plantations (27 per cent).

¹⁶ In Indonesia, paraquat is sold under the trade name Gramoxone.

¹⁷ In China where many of the paraquat manufacturers are located, the use of herbicide has been banned by the Ministry of Agriculture effective June 2016. The production of paraquat though is still allowed provided it is intended for export. (Multiwatch et al., 2016)

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on the safe handling, storage, and disposal of pesticides. Over recent years, a growing number of RSPO grower members have voluntarily phased out the use of paraquat.¹⁸ As paraquat is becoming more restricted, glyphosate is reported to be taking its place (Chemical Safety Card - Glyphosate). It's environmental and health impacts are unclear.¹⁹ Although glyphosate is much less toxic than paraquat, some of the surfactants included in the preparation for spraying it are highly toxic. There were also issues raised about water pollution associated with paraquat and glyphosate.²⁰

Ease of access to affordable, safe, and high-quality inputs and technologies especially among smallholders is a crucial precondition to securing higher yields and reducing work hazards related to use of chemical inputs and harvesting tasks. Likewise, in well-functioning input markets, input distributors and retailers can be expected and relied upon to provide information and advice on proper handling of chemical inputs, tools, and equipment to reduce risk of work-related injuries and accidents. Lastly, during interviews, it seemed that smallholders did not have access to recycling services for empty agro-chemical tanks, and consequently reused them at work and sometimes at home.

- **Oil Palm Growers**

Oil palm is cultivated in 24 provinces. The largest oil palm producing island in the country is Sumatra which accounted for about 68 per cent of the total national output. At the provincial level, top producers in 2015 were North Sumatra, Riau, and Central Kalimantan.

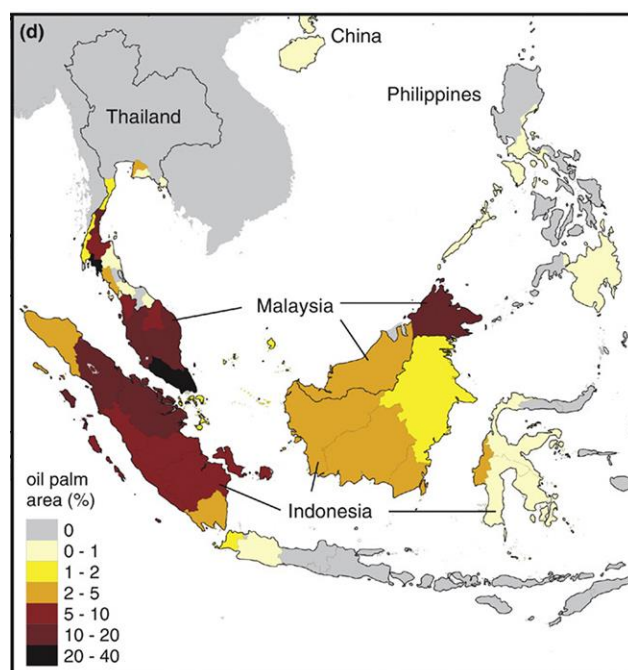
Figure 2. Location of palm oil plantations in Indonesia

¹⁸ Growers who have already banned Paraquat include Agropalma, DAABON, Hap Seng Plantations, IOI, Olam, Musim Mas, United Plantations, REA Holdings, SIAT, Sime Darby (including NBPOL) and Wilmar. Other companies, such as Bumitama, Indofood Agri have committed to a phase-out over the coming years. (RSPO Impact Update. 2015)

¹⁹ Monsanto, one of the manufacturers of glyphosate, claims it is a highly effective weed-killer, safe to users and harmless to the environment. However, anti-pesticide campaigners reveal that there is evidence of toxic effects on humans as well as on the environment, indirect environmental damage and resistance in some target weed species.

²⁰ Manufacturers claim that both chemicals are harmless to people and wildlife after spraying as they are rapidly absorbed by plants and inactivated by contact with the soil. However, in parts of Indonesia where the rainfall is often very high, herbicides can be washed into streams and rivers which provide the only source of water for all household needs - including drinking - for villages around the plantations. Furthermore, the herbicides do not bind to sandy soils.

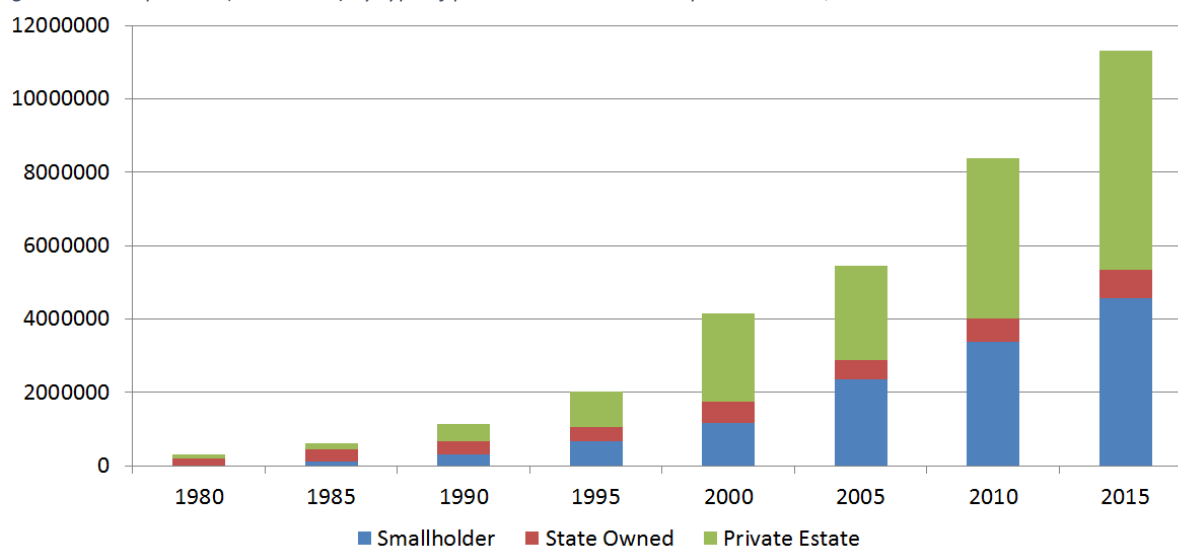
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Source: UNEP, 2011.

In 2015, oil palm plantations covered about 11,300,370 hectares, representing about 40 per cent of total arable land within Indonesia. Areas planted to palm oil is steadily expanding at an average, yearly rate of 420,000 hectares per year.

Figure 3. Areas planted (in hectares) by type of plantation and ownership in Indonesia, 1980 to 2015



Source: Authors on the basis of Direktorat General of Estate Crops Ministry of Agriculture (2015) Statistik Perkebunan Indonesia 2014 – 2016: Kelapa Sawit.

Palm oil growers can be subdivided into two main categories: smallholders and plantations. Estate plantations can be further classified based on ownership, namely: private estates and state-owned enterprises. About 53 per cent of the total hectareage is owned by private estates while 40 per cent is

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managed by smallholders. The remaining 7 per cent is under the ownership of state-owned enterprises. Between 1980 and 2015, land cultivated by smallholders posted the highest growth rate at 21 per cent.

Based on data from the Ministry of Agriculture, there were around 3,362,640 workers employed in oil palm plantation while 2,140,774 farmers toiled on smallholder owned plantations and/or worked as labourers in nucleus estates (data disaggregated by region available in annex 4). On average, one hectare of land planted to oil palm provided employment to 0.49 workers.

In mature plantations, labour is the major cost point accounting for about a third of total production costs. Plantations, whether big or small, incur the highest labour costs in harvesting. In oil palm plantations, harvesting always takes priority over other work as any delay can result in quality deterioration. Late and incomplete harvesting contributes to a minimum of 10 per cent reduction in yield.

a) Plantations

State Owned Plantations. State owned plantation companies or *Perseroan Terbatas Perkebunan* (PTP) were established during the New Order scheme which started in 1967 and supported by the World Bank and the Asian Development Bank. These companies were usually established on excellent agricultural land previously developed by Dutch planters and nationalized after Indonesia gained independence. The Indonesian government established a scheme called Nucleus Estate Scheme (Perkebunan Inti Rakyat; PIR), whereby state-owned plantation companies (the ‘nucleus’) helped farmers (namely plasma farmers) to grow oil palm by providing the latter with seedlings and technical assistance from the plantations under a buy back scheme agreement.²¹ Many of the state owned plantations were located in the North Sumatera Province. In the 1980s, the government began to expand the plantations in other islands of Kalimantan and Papua. There are 10 state owned palm oil companies with an aggregate of 755,787 hectares planted to oil palm as of 2016. The state owned palm companies also have their own mills and are working towards building refining capacities.

Plantation firms that are financially weak are currently being restructured.²² Of the ten state owned palm companies, PTPN III and PTPN IV have estates with RPSO certification.²³

State owned enterprises with high productivity and, consequently, healthy financial conditions have OSH management systems and accumulate various certifications (ISPO, RSPO but also ISO, SA 8000 and others). Likewise, these companies integrate promotion of good working conditions with the streamlining of work processes. In one of the state-owned enterprises that the team has visited, for example, the plantation has been designed so as to reduce the maximum distance between collection and harvest, with improved productivity results among collectors and, at the same time, reduced intensity of manual lifting

²¹ Aside from the objective of promoting plantation development, the nucleus estate scheme was also linked with other policy objectives such as population redistribution through resettlement scheme or transmigration, regional/provincial socio-economic development with a focus on increased agricultural production and employment generation, and political consolidation.

²² As per interviews, losses are attributed to low productivity and inefficiencies due to outdated technology and facilities. To avert its losses, PTPN II has formed a joint venture company with Kuala Lumpur Kepong Bhd (KLK) via its wholly owned subsidiary KL-Kepong Plantation Holdings Sdn Bhd in 2009. KLK is Malaysia’s third-largest palm oil producer.

²³ Eighteen of the thirty four estates of PTPN III are certified. For PTPN IV, three out of the twenty-four estates have achieved certification. PTPN II and KLK joint venture is in the process of applying for certification. PTPN III is also currently working with IDH, Unilever, and RSPO in assisting independent smallholders to achieve RSPO certification. About 50 per cent of the palm oil production of PTPN III is exported and the remainder is sold in the domestic market.

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and pushing of wheelbarrows. This example illustrates the possible link between improved productivity and improved OSH, which can be achieved through reorganization of work processes.

Private Estates/Plantations. There are about 1,600 large and medium companies with CPO mills and their own plantations. A number of these companies also operate refineries. The large estates are mostly part of larger agribusiness holdings. These holdings, in turn, usually belong to business conglomerates that are active in sectors such as agriculture, telecommunications, banking, and construction. The below table presents the top 20 companies in terms of hectareage of area planted to oil palm.

Figure 4. Top 20 Palm Oil Companies in terms of Hectareage Planted to Oil Palm

Company	Net Income (US\$M)	% Indo Planted Area	RSPO	ISPO	ISCC	SPOTT	Green Tigers Rating
Golden Agri Resources (GAR)	383.7	4.50%	Y	Y	Y	63.60%	Good
Salim Ivomas Pratama Terbuka PT **	53.4	3.20%	Y	Y	X	46.00%	Poor
Astra Agro Lestari Terbuka PT	116.3	2.70%	X	Y	X	14.50%	Poor
Sime Darby Plantation	669.1	2.70%	Y	Y	Y	63.60%	Unclear
IndoAgri	48.8	2.40%	Y	Y	X	NA	Poor
First Resources Limited	141.6	1.90%	Y	Y	Y	20.00%	Poor
Genting Plantations Berhad	61.8	1.70%	X	Y	X	29.10%	NA
Wilmar Group	893	1.60%	Y	Y	Y	45.50%	Good
Bumitama Agri Limited	45.4	1.40%	Y	Y	X	30.90%	Unclear
Austindo Nusantara Jaya	32.2	1.30%	Y	Y	Y	NA	NA
Si nar Mas (SMART)**	62.8	1.30%	Y	Y	Y	63.60%	Good
PP London Sumatra Terbuka PT (Lonsum)	57.4	1.20%	Y	Y	X	43.60%	NA
Kuala Lumpur Kepong Berhad	211.1	1.00%	Y	Y	Y	41.80%	Poor
REA Holdings PLC	53.5	1.00%	Y	Y	Y	NA	NA
IOI Corporation Berhad	421.2	0.50%	Y	X	Y	54.00%	Unclear
SIPEF	46.1	0.40%	Y	Y	Y	56.00%	NA
Kulim (Malaysia) Berhad	62.3	0.40%	Y	X	X	NA	NA
FELDA	154.9	0.40%	Y	X	X	NA	Unclear
Socfin Group S.A.	67.9	0.40%	Y	X	X	33.60%	NA
United Plantations Berhad	56.1	0.20%	X	X	X	60.00%	NA

Source: Smith School of Enterprise and the Environment, 2016
 ** Salim Ivomas is a subsidiary of IndoAgri; SMART is a subsidiary of GAR
 RSPO: Roundtable on Sustainable Palm Oil
 ISPO: Indonesian Sustainable Palm Oil
 ISCC: International Sustainability and Carbon Certification
 SPOTT: Sustainable Palm Oil Transparency Toolkit; figures represent their rating
 Green Tigers Rating: company's behaviour around protection of forest/high conservation value area, high carbon stock land, peatlands, and human rights.

LEGEND
 Y: Certification
 X :No certification
 NA: data not available

Of the top 20 companies, 17 are RSPO certified. It can be seen though that certification does not necessarily translate to a "Good" rating from Green Tigers (see figure above). Large integrated company estates though usually have better plantation management and agronomic practices and a stronger incentives to increase oil yields vis-à-vis smallholders. The spread of the locations and landscapes of oil palm plantations creates a challenge for plantation estates as well as enforcement institutions, such as the labour inspection for the monitoring of compliance and good to safe practices.

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Volatile price fluctuation of crude palm oil has been a major challenge faced by planters, plantation companies, investors, and even downstream industry. The volatile price fluctuations have more pronounced impact on profitability of less efficient producers and plantations that have high percentage of immature and senile trees. Plantations generally cope with price volatility by taking out costs in the production process. Since fertilizer and labour are the major cost centres, these are usually the items that are frequently “sacrificed” to maintain profitability. In most cases, plantations reduce labour expenses by expanding the ratio of cultivated hectare per worker or expanding ratio of cultivated hectare per unit labour cost.

There are three main phases in oil palm cultivation. The first phase involves farm establishment activities such as land clearing, drainage construction, seedling preparation, and planting. Activities in the second phase span from farm maintenance to harvesting. The third phase involves replanting to maintain farm productivity. All of the phases rely primarily on manual labour. Phases one and three generally generate casual jobs while Phase two provides regular and ongoing jobs. Harvesting accounts for the highest number of workers in a plantation.

A plantation is divided in smaller geographical units referred to in Indonesia as divisions (*divisi*) or compartment (*afdeling*) according to the Dutch colonial heritage. To maximize the efficiency and control of labour deployment, any division which stretches over 700 to 1000 hectares is further divided in blocks of up of 30 to 150 hectares. Each division, depending on its size, employs from 100 to 150 workers for manual and supervision tasks on the plantation (Bissonnette, 2012).

A typical plantation structure includes a general manager, assistant manager, supervisors, clerks, and overseers. Each territorial division is under the responsibility of an assistant manager. The assistant manager is in charge of supervisors (*mandor*) who govern teams of 10 to 20 workers on the ground and specialized clerks (*krani*) who record production, costs, and wages of workers according to standardized operations. Each type of operation, harvesting, spraying pesticides or applying fertilizers is administered by overseers.

The following are the typologies of workers in oil palm plantation estates based on contractual relationships:

Permanent Workers. Workers under this category consist of office/administrative staff, plantation supervisors/foremen, and core group of plantation workers (generally harvesters). Permanent workers in Sumatra are usually descendants of the first generation of workers who migrated from Java Island in the early 19th century.²⁴ In Kalimantan, plantation workers consist of domestic migrants from Java and Nusa Tenggara Timur. Establishment of plantations in Kalimantan started in 1990s which also drew in migrant workers.

Permanent workers in oil palm plantations are mostly male harvesters. The number of female workers who have achieved permanent status is higher in Kalimantan than in Sumatra. In plantations interviewed by the team in Kalimantan, a new worker with satisfactory performance is given a permanent status after three months. In Sumatra, the team came across workers who have been with the plantation for more than ten years, but are still employed as casual daily workers.

²⁴ The permanent workers have stayed inside the plantation from generation to generation. Most permanent workers interviewed grew up on plantations.

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There are two categories of permanent workers: i) permanent workers paid on a monthly basis comprised mainly of managerial and administrative staff; and ii) permanent workers consisting of harvesters and core farm maintenance workers, whose pay is composed of a fixed and a variable component determined as a function of daily volumes. In the areas visited: in Kalimantan, the latter permanent workers comprise about 50 to 65 per cent of the labour force while the former, permanent workers, based on field interviews, account for about 20 to 25 per cent.

Permanent workers, whether paid on a daily or monthly basis, generally have contracts and receive pay slips. They are commonly paid at least the minimum wage as set by the respective districts. Oftentimes, mill workers receive higher wages than plantation workers because of the technical nature of their tasks (a number of them are certified). Harvesters are usually paid the minimum wage. Additionally, workers have targets that they need to meet and go beyond in order to get a bonus or *premi*.²⁵ Permanent workers, mainly for those able to meet and go beyond the target, reported that they perceive their position as quite attractive in comparison to industrial workers.

Plantation workers with permanent status stated receiving training on good agricultural practices and occupational safety and health, and being provided with personal protective equipment and training on how to best use them.²⁶ Permanent workers have access to trade unions, and unionized workers were knowledgeable about the occupational risks they faced at the workplace, existence of safety and health committees, and entitlements to protective equipment and safety training as defined by existing collective bargaining agreements.

Permanent employees were affiliated to National Employee Social Security managed by the Badan Penyelenggara Jaminan Sosial (BPJS), under which the following contingencies are covered: employment injury, death and old age for BPJS-Ketenagakerjaan and health for BPJS Kesehatan. A number of companies provide additional benefits, in particular free medical care at the plantation's medical facilities (whether occupational or not) and pension fund entitlements. Maternity and sickness are the employer's liability in Indonesia and are not covered through the social security system. This makes effective access to this right largely contingent on formal long-term employment relationships and on employers' efforts. It may also act as a disincentive for employers to select women for permanent positions. Children of employees have access to free schooling in some of the plantations.

Permanent workers also are provided with housing. Houses for workers are located within the plantation. In the plantations that the team visited in North Sumatra, the state of housing facilities varied greatly from one plantation to the other, with a visible link between the firms' economic performance and the state of the facilities they provided to their workers.²⁷ Usually, only permanent workers are entitled to housing facilities. Some plantations have schools for children of workers and other facilities.²⁸

²⁵ Some companies give rice allowance to their employees.

²⁶ There were conflicting reports between management and workers on the frequency to which PPEs were provided and the degree of training.

²⁷ Some houses were old and needed repair. Nevertheless, if compared to houses within the vicinity of the plantations, the plantation housing facilities appear to be better or at, minimum, on par. Some workers have extended their houses or made the repairs themselves. In some cases, houses were inherited by workers from their parents who were also workers in the plantation. This creates an incentive for children of plantation workers to stay and work in the plantation as well.

²⁸ One of the legacies of the Suharto period was the introduction of the retirement and public health agency in 1979 which operates a mandatory pension scheme and a provident fund. When workers reach the legal retirement age, they receive a lump sum equal to the total amount of money they have saved plus interest. A downside of the system according to an article by Barral (2014), is that plantation workers have to move out of the company owned housing facility as a condition for receiving the lump

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There were several studies (UNICEF 2016; Murray, 2014; Elmhirst et al, 2017) that indicated water was a problem in the housing facilities offered by plantation companies, especially when the plantations are located in remote areas.²⁹ Difficult access to water at home can further aggravate chemical exposure for sprayers.

Casual/Temporary workers (*Buruh Harian Lepas*) hired directly by the plantation. These are primarily comprised of family members of permanent workers (harvesters) and the landless living around the plantation area. Family members of smallholders cultivating palm oil and selling it to the nearby plantation mills also provide casual labour. Casual workers were more visible in Sumatra than in Kalimantan.

Casual workers generally work for 15 to 19 days per month. Under Indonesian labour law, casual workers cannot work for more than 21 days a month; otherwise they must be fully employed as permanent workers. As per companies interviewed, casual workers are hired for tasks that are seasonal in nature. Fertilizer application, for example, is on the average done only twice a year. Spraying of pesticide is usually carried out once every four months. Some companies also said that the hiring of casual workers is in line with community expectations that the plantation provide jobs for the households. The companies, however, cannot absorb all of those applying for jobs as permanent workers.

Male casual workers consist primarily of harvesters and loaders. When FFB yield is low, permanent plantation workers can perform the harvesting tasks. Likewise, during the low-yield season, harvesters have to cover a larger area in order to reach their daily quota.

Most of female workers in oil palm plantations, especially in Sumatra, were casual workers assigned to tasks such as application of fertilizer, spraying of herbicide and pesticides, and maintenance tasks. Female labourers are often assigned tasks which are seasonal and perceived to be less physically strenuous, but require meticulous attention.

Casual workers are usually paid based on accomplishment of a given target.³⁰ Workers assigned to clear the undergrowth around the palm are paid on a piece rate basis. Harvesters are paid based on volume of FFB harvested or a fixed daily rate for a quota of 700 to 1,500 kilograms FFB plus incentive for excess volume harvested. Quota for harvesting is usually set based on the age of the tree. At times, harvesters work beyond eight hours per day to meet their targets and earn bonus/incentives or “premi”.³¹ Targets for drivers and loaders are set with reference to the weight of the FFBs they have to load and transport.

One of the concerns of daily workers is the underpayment of premis when they are unable to meet quotas due to rain and other weather disturbances. Some companies adopted the policy that daily workers will be paid in full if the reason a quota is not achieved is due to rain, which is in compliance to Indonesian

sum at retirement. Prior to the system, retired workers could live in the housing facility and receive monthly subsidy until their deaths. Access to housing becomes a problem for workers who are not able to spend some of their income to buy a piece of land and build a house. With the wages they earn, most families have to work in multiple jobs and longer hours to meet daily needs and, at least, secure a home when they retire. In some instances, families are able to keep their houses by ensuring that the next generation finds employment within the plantation. Many of the workers that were interviewed by the team had parents and grandparents who used to work in the plantation.

²⁹ According to the studies, some of the housing facilities are supplied only with unfiltered water from the rivers pumped up or delivered by trucks into barrels or drums.

³⁰ A female fertilizer worker, for example, has to apply two kilograms of fertilizer to 175 trees in one day for a fixed daily rate of IDR 40,000 to 60,000.

³¹ As per feedback from harvesters, the quota is beyond what an individual worker can achieve within an 8-hour work day.

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law UU No 13 Year 2003. As per the company's work rules, workers are required to report for duty at the start of the work day to ensure full payment. According to Amnesty International (2016) and Muthmainnah (2017), some companies were reported to impose sanctions to both permanent and casual workers for mistakes committed (e.g., harvesting unripe fruits, leaving ripe fruit unharvested, palm fronds not arranged properly, etc.).³²

Some companies award permanent status to their casual workers after three months. However, in most cases, workers indicated that they have been working as casual workers for many years and are most likely to remain in such status for the years to come. The fact that in most cases a number of workers are casually employed in a first instance (sometimes for years) before a permanent position opens means that young workers are overly represented among casual workers (in particular young men as casual harvesters).

Among the large companies visited by the team and especially those who have already been certified, temporary workers were integrated in the safety and health management system of the company (i.e. access to safety training, access to equipment, etc.) and had access to company facilities (i.e. washing facilities and changing rooms, medical services, etc.). In most cases though, training was only a one-off activity and companies relied on supervisors to regularly issue reminders and to continuously monitor staff performance. It is sometimes difficult for companies to fully instil safety practices as workers move from one plantation to another which might have different practices and policies.

In some of the companies visited, all casual workers were registered to BPJS and thus were able to enjoy social security benefits including health coverage. It was reported that the registration process was easy and fast, as the administering institution has a special desk for companies and seems proactive in the registration process. This practice was not necessarily replicated from one company to the other, however, and without a clear indication as to why. It may also be possible for casual workers especially harvesters to be provided with housing. However, priority for the housing benefit is given to permanent workers.

It was noted though across the different regions covered by the research team that women workers often manifest high job satisfaction despite the fact that they enjoy less job security and often lower pay than men. The empowerment dimension of controlling one's income for women is of high importance in a rural setting. Likewise, many of the women workers especially those with young children prefer to be casual workers due to the flexible working hours which will allow them to also attend to their households and to social obligations. Flexible working hours are not possible with permanent work contracts and child care services are not always readily accessible. This highly relates to the issue of maternity protection and the need for childcare options. Since those options are not available, women support most of the burden of care work at home and cannot partake fully in the labour market to get permanent job opportunities.

Sub-contracted labour - temporary workers hired by contractors / labour brokers. As offered in the interviews conducted, plantations increasingly outsource tasks such as pruning, drainage construction, weeding, spreading of agro-chemical, among others.³³ According to interviews with casual workers hired by contractors as well as with labour unions, there is little or no unionization at this stage of the chain.

³² Fines could range from IDR 2,000 to 2,500.

³³ For example a labour broker or agent had a contract with various plantations to provide services ranging from farm maintenance, harvesting, and transport of FFB. To carry out these tasks, the contractor deploys 300 workers daily to the plantation. Harvesters are paid daily wage of IDR 80,000 provided that he is able to harvest FFB from 150 trees. For pruning, workers are paid IDR 1,200 per tree.

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The research team received varying responses on who has the responsibility to provide personal protective equipment, safety training, and social security in this set up, indicating unclear perception of roles and responsibilities as they relate to OSH. According to some plantations, particularly the large ones, they automatically deduct the amount required for social security contributions of casual workers from payment to the contractors and pay the contributions directly to the relevant authority to ensure that all contracted workers are covered. Others said that it is the responsibility of the contractor to ensure contracted workers are enrolled in the social security program. One labour broker interviewed also said that his pool of workers has access to social security. Some of the plantation interviewed said that they provide the PPEs for sub-contracted workers. Conversely, a few of the contracted workers interviewed by the team indicated that they received their PPEs from the contractor or were procured by the workers themselves. It would also appear that there is no clear agreement on who is responsible for training workers on safety practices. Some large plantations though indicated that training on safety practices forms part of the capacity building package provided to workers regardless of their status, and so was access to the company facilities (i.e. changing and cleaning facilities, water, medical facilities, etc.).

It is also not clear whether workers hired by contractors receive the same level of pay as casual workers directly hired by the companies. The general impression gathered from the interviews is that the net take home pay of workers hired by contractors is lower than the one of permanent and temporary workers hired directly by the plantation, since the sub-contracting agency takes a percentage.

Assistants hired by permanent or casual workers of plantations and family workers. To meet the quota and benefit from the premiums for FFB harvested in excess of the target, harvesters bring “assistants” or “kernets” to assist them (e.g., collection of loose fruits, carrying of fruits to collection points, etc.). The harvesters pay for the assistants that they bring in out of their wages or enlist family members (e.g., wife) as “free” labour. Kernets are in essence “invisible” workers as they are not on the company’s books and the company management may not even be aware that they work on the premises. They have no legal protection and are not integrated in the occupational safety and health management system of the company. They do not have access to its washing and changing facilities and are ineligible for health care and work-related injury and diseases compensation under the contributory BPJS scheme.

b) Smallholders

There are about 2,140,774 smallholders involved in oil palm cultivation.³⁴ Smallholders can be broadly classified as either “independent” or “tied/supported” organized in plasma- nucleus (inti) schemes around oil mills operated by plantation estates. The majority of the total area managed by smallholders in Indonesia is located in Sumatra. This is in contrast to frontier regions such as East Kalimantan and Central Kalimantan, where large scale plantations dominate.

Tied/Supported Smallholders. These are smallholders organized in plasma schemes receiving technical and financial support from nucleus plantations. They comprise about 20 per cent of the total number of smallholders.

³⁴ The government of Indonesia defines any producer not required to get a business license for the rights to use state lands as a smallholder farmer. To qualify as a ‘smallholder farmer’ in Indonesia, farmer plantations must be less than 25 hectares (Ministry of Agriculture Decree No. 98/2013, see also Glenday and Paoli, 2015). Smallholders as defined by the RSPO are plantations of less than 50 hectares.

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The cost of the development of the plasma-nucleus scheme is usually transferred to a loan provided to smallholders through a participating bank with the nucleus estate as the guarantor. Tied smallholders supply their produce to the nucleus plantation company's palm oil mill which deducts the debt and cost of other services like transportation from the FFB sales. Their relationship is based on a contract. In many of the plasma schemes, the prescribed hectareage to be allotted per smallholder is two hectares.³⁵

Annex 5 presents the percentage of plasma hectares to the total area planted by large companies in Indonesia. The ratio between nucleus estates and smallholder schemes has shifted from 20:80 in its original design to 80:20 in more recent schemes and government regulations. To a significant extent, this has reduced the dependency of mills with large estates and land banks on smallholders and, consequently, may have reduced the incentive to invest in smallholders. Estate plantations argue that by reducing dependence on smallholders and/or increasing direct control of the largest area of production possible, they can boost profits by maximizing and stabilizing the daily input of high quality FFB to their mills. Vertically integrated companies can maximize their profits by reducing volume of poorer quality FFB from smallholders. Reduced dependence on plasmas for FFB supply also makes it easier for them to control compliance with private and public standards. Likewise, nucleus plantations can optimize use of land through yield intensification which poses a significant challenge among smallholders.

Given the limited resources of tied smallholders, they are able to achieve certification primarily through the assistance of nucleus company and/or development organizations. Certification of supported smallholders is less challenging vis-à-vis independent growers. Most of the supported smallholders are already organized and have better opportunities of receiving technical support and guidance from the mills with which they are connected.

A case study (Lisnawati, 2016) showed that the engagement of smallholders in RSPO certification scheme contributed to positive changes in the daily practices of spraying and harvesting. The study, however, cautioned that knowledge diffusion processes to enhance individual comprehension and to continuously build worker awareness and self-motivation needed to be boosted. Smallholders, it was suggested, also needed to simultaneously implement more sustainable practices.³⁶

Independent Smallholders. Independent smallholders are not tied or contractually bound to an estate or CPO mill. They are free to sell to any buyer. In practice, they sell either directly to a mill or to local agents (middlemen). If independent smallholders do not have their own means of transport, they may rely exclusively on one particular trader or on the closest mill. The development of independent smallholders was facilitated by the emergence of independent mills that offer new market channels outside tied arrangements, which had formerly bound smallholders to estate mills. Tied smallholders may also have independent plots.

Generally, independent smallholders may be characterized as follows:

- a) From the various studies reviewed, average yield of independent smallholders was 20 to 50 per cent lower than supported smallholders. The oil recovery rate of FFB from independent smallholders is

³⁵ In earlier schemes, smallholders were also allocated plots for garden and food production which helped in promoting food security. Recent schemes, however, no longer mandate nucleus estates to provide garden plots for smallholders. The prescribed two hectares may also be too small to allow smallholders to rise above survival income.

³⁶ It was also recommended that the practice of giving advice and motivations need to be supported by a multilevel supervision to expect better performances of spraying and harvesting groups in the short term.

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also generally lower than those coming from nucleus and plasma plantations. The low yield and oil recovery have been attributed to use of inferior quality seedlings, poor agronomic practices/lack of capacity to mitigate climate change impact, improper fertilizer management, and land degradation/flooding (especially plantations in peatland).

- b) Dependency on intermediaries for supply of fertilizer and seedlings which oftentimes are of dubious or inconsistent quality. They also generally pay much higher costs for these inputs, which increases their operating costs and reduces profits.
- c) Limited access to financial services as most banks generally require guarantors or proof of a marketing agreement. Limited access to finance also contributes to low quality of inputs used particularly seedlings and fertilizers.
- d) They work individually as their plantation locations are scattered and they are seldom organized (i.e. only a few cooperatives that would provide a channel for input provision and training). Marketing is done individually or through intermediaries. Low volume and individual transactions significantly weaken their bargaining position, particularly given that farmers did not seem to be organized in cooperatives. Producers' organizations can be a powerful force to structure supply chains (i.e. secure sourcing of inputs, share good agricultural practices, provide training, act as a market force to increase the negotiation power of producers, etc.). This lack of organization also creates an additional transaction cost /difficulty for supply chain engagement and traceability at the smallholder level beside recent traceability initiatives. Likewise, smallholders cannot directly access certification individually.³⁷
- e) Independent smallholders sell FFB on the open market and, thus, are highly exposed to the fluctuating price of FFB. Given that quality of FFB deteriorates 24 hours after harvest, independent smallholders are often price takers.
- f) Similar to supported smallholders, independent smallholders practice mono-cropping. There are a few smallholders who raise livestock. There are some areas though in North Sumatra where intercropping is practiced by smallholders during the three first years as the trees mature.

Tracking palm oil supplies back to the original plantations remains a formidable challenge especially if the FFBs came from independent smallholders. There is now significant traceability to mill level, but very few companies have fully tracked their supplies further back to the plantations. Traceability is an important prerequisite for mobilizing interest and resources down the supply chain. Indeed, lead firms who would like to engage are faced with scattered and geographically dispersed actors which make supply chain engagement more difficult and loosen the linkages between producer and end buyer. This potentially hinders knowledge transfer and the transfer of good OSH management practices from lead firms down their supply chain.

³⁷ A small number of independent smallholders have achieved RSPO certification with the assistance of development organization and third parties, as funding is an issue for smallholders to get certified despite some initiatives to overcome this constraint. The first step taken by these smallholders was to organize themselves into a cooperative or association. The cooperative provided the platform for the delivery of technical assistance and for collective marketing. In some cases, certification and the formation of cooperatives also facilitated the organization of shared labour for farm maintenance and harvesting, which to a certain extent improved the adoption of safety practices since workers have undergone some training.

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Smallholders are independent workers, whether plasma or independent, and mostly operate in the informal economy. About 60 to 80 per cent of the labour requirements are provided by the farmers themselves and their household members. As such, the research team did not come across smallholders who benefited from support for workplace risk assessment, professional advice on control measures, or access to occupational health surveillance. Also, the researchers did not hear of those registered to contributory social security or who benefited from compensation and rehabilitation in case of an occupational accident or disease.

A common practice among smallholders is to hire casual workers to work with them during harvest. These workers are usually casual plantation workers who seek to get an additional income. This work is generally not formalized, declared or subject to social security affiliation. Smallholders normally do not closely monitor the performance of their hired workers especially so if these are “trusted” workers or people with whom they have worked with for many years.³⁸ Appropriate PPEs are not necessarily provided. The pay though is generally better than on the plantation and workers report higher work satisfaction, which may be related to a smaller work place and in an environment where human relations play an important role.

As per interviews, smallholders and their casual workers acquired their knowledge and skills on oil palm cultivation through observations and learning from peers and experience. Supported smallholders receive training from the nucleus plantations/mills with which they are affiliated. Independent smallholders with close relationships with mills (either in the form of an agreement or informal preferred supplier – mill relationship) have also been provided with some forms of training. In many cases though, capacity building activities consist of a one-off training which is often not sufficient to create a culture of prevention and adoption of sustainable, good practices. Government agencies such as the provincial government and the Ministry of Agriculture as well as development programs also provide training, but these are on an intermittent basis given resource limitations.

According to Lisnawati (2016), casual work in smallholder plantations are paid either based on daily wage or a target-based/ performance-based system.³⁹ Productivity varies greatly between plantations depending on culture, management and practices, site suitability, age of trees, and quality of seedlings. Average yield per hectare in 2015 was 2.77 MT in CPO terms. Private estates had the highest average yield at 3.07 MT CPO equivalent followed by state owned enterprises. Although yield of smallholder grew at an average rate of 9 per cent annually between 1980 and 2015, this was still about 32 per cent lower than that of the private estates.

- **FFB Traders**

FFB agents and collectors cater mainly to independent smallholders and supported smallholders with independent plots. Agents located or based within the proximity of these plantations collect the FFB at the farm gate. The agents then deliver to a dealer or collector who holds a delivery contract (or letter)

³⁸ Hiring of casual workers among smallholders is generally based on friendship, kinship, and peer referral rather than competencies and skills. Smallholders usually prefer to work with relatives and people that they have known to be trustworthy. Trust it seems plays a very important role in the selection process. Another variable that influences decision making is social need. Smallholders give priority to relatives or neighbours who are in immediate need of cash.

³⁹ Casual workers doing herbicide/spraying service in smallholder farms are paid a daily wage ranging from IDR 60,000 to 80,000. Under a target-based system, a female sprayer is paid IDR 300,000-400,000 per two hectare lot (kapling) if is near water sources and IDR 600,000 per kapling if far from water sources. Harvesters are usually paid based on targets at IDR 100,000 to 150,000 per ton of FFB.

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with oil mills to bring in a pre-arranged volume of FFB. Local agents with delivery contracts may also deliver directly to the mills. The local agents are responsible for transporting the FFB from the farm to the warehouse of the collector at the shortest time possible to ensure that these reach the mills within 24 to 48 hours after harvest.

Margin of FFB agents is only about IDR 100 to 120 per kilogram and, as such, volume is a critical factor to business viability. In many cases, local agents pay their suppliers upfront although at a slightly lower price vis-à-vis the prevailing buying price in the mills and with the transportation cost factored into the amount. Immediate payment for FFB appears to be an important incentive as mills are reported to pay their suppliers two to four weeks after delivery. Likewise, independent smallholders would generally prefer to offload their harvest and receive immediate payment before spoilage occurs. Some local agents also provide loans and advances to independent smallholders for purchase of inputs and other plantation costs such as wages as a means of securing loyalty of the latter and, consequently, their supply of FFB.

FFB traders are not a homogeneous category of actors. It comprises a wide range of businesses, from formalized medium sized companies with salaried workers to small or individual businesses operating in the informal economy. Employment patterns follow, with a variety of categories from informal or partially formal independent workers to formalized salaried workers on permanent employment. Employment at this stage of the supply chain was reported to be mostly male.

These intermediaries, when operating in the informal economy, do not operate under an OSH management system nor are conscious about environmental and social standards. Traceability is lost or weakened in the supply chain with the involvement of multilevel FFB agents. However, given that the existence of FFB intermediaries is vital as they address major logistical issue of transporting a steady supply of FFBs from independent smallholders to the mills, improving their understanding of traceability, environmental and social standards, and product quality would be beneficial for all parties concerned. Likewise, given their influence on smallholders, they can be active partners of oil mills in promoting compliance to good and safe practices as well as important to establishing supply chain traceability.

- **Palm Oil Mills**

There are about 600 palm oil mills in Indonesia. Large companies (private and state owned) that operate milling facilities as part of an integrated plantation business model dominate the crude palm oil production. Large-scale plants are generally handling from 30 to 60 MT of FFB per hour. These companies have mechanical handling systems and operate in two to three shifts depending on the availability of FFB. Most processing operations are automatically controlled and routine sampling and analysis by process control laboratories ensure a smooth, efficient operation. Production volume and number of mills of major palm oil companies are presented in the below table.

Figure 5. CPO Production Indicators of Major Palm Oil Companies, 2015

Company		No. of Oil Mills/ % certified	CPO Production Volume (in MT)	Oil Extraction Ratio	RSPO Supply Chain Used
Golden Resource	Agri	44 66% certified	2,380,047	22.93%	Book and Claim Mass Balance Segregated
Salim (IndoFood)	Ivomas	24 38% certified	1,002,000	22.40%	Book and Claim

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Company	No. of Oil Mills/ % certified	CPO Production Volume (in MT)	Oil Extraction Ratio	RSPO Supply Chain Used
London Sumatra (IndoFood)	11 55% certified	475,708	23.20%	Book and Claim
Sime Darby	Indonesia – 24 Malaysia – 35 98% certified	2,180,000		Book and Claim Mass Balance Segregated Identity Preserved
Inti Indosawit Subur (Asian Agri)	19 95% certified	1,000,000		Book and Claim Mass Balance Identity Preserved
PTPN III	12 50% certified	596,665	21%	Mass Balance
KLK Berhad	Indonesia – 12 Malaysia – 14	1,060,442	22%	Mass Balance Segregated Identity Preserved
Source: Hawkins, D.2016. <i>RSPO reports</i> . Hardman Agribusiness				

Mills with own plantations can augment their supply of FFBs from supported and independent smallholders. FFB supply from independent smallholders comprised from 5 to 20 per cent of total FFB processed. The Ministry of Agriculture Regulation 98/2013 requires mills to source at least 20 per cent FFB from their own linked plantations. During the interviews conducted by the research team, mill management almost systematically reported under-utilization of their installed capacity, which suggests that there is room for further streamlining of production (i.e. address productivity and work organization at plantation /smallholder levels in order to guarantee input provision to the mills in a more consistent manner).

In 1995, the government of Indonesia allowed the establishment of independent oil mills (not required to own a plantation) but only with a processing capacity of 5 MT FFB per hour or less. These mills are dependent on third parties particularly independent smallholders for their supply of FFB. Corporate purchasing policies of independent mills are primarily focused on the quality of FFB.

Mills generally have advanced control and management of their milling operations but reported challenges in exercising due diligence with their suppliers due to limited visibility of their supply chains. Sustainability certification has pushed the oil mills to map and identify their networks of suppliers and intermediaries. However, given the complexity of their chains, large companies have set the target for full traceability by 2020. The pressure for full traceability is higher among companies serving buyers from the European Union and United States than those selling to countries in Asia, Middle East, and Africa. As per discussions with oil mills, improved visibility of their chains is also paving the way for the development of more supportive relationships with their suppliers particularly in the area of promoting good agricultural practices, environment protection and OSH. As the gatekeepers in the upstream level of the supply chains, mills can play a crucial role in shaping safety behaviour and practices of their suppliers. From this perspective, knowing the sources of the FFBs is essential in identifying or reforming working conditions. The length and stability of commercial relationships between mills and their clients seem to play a role in their uptake of sustainability standards.⁴⁰

⁴⁰ Large scale mills generally have at minimum one year contract with refineries. In many cases, the refineries are also part of the holding of their mother companies. In comparison, small and medium scale mills prefer short term contracts (3 months delivery

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An oil mill employs from 70 to 150 workers depending on their capacity. Workers in the mills generally have higher educational attainment than plantation workers. Oftentimes, mill workers receive higher wages than plantation workers because of the technical nature of their task (a number of them are certified under the Ministry of Manpower requirements). The required competencies for workers in the mills, particularly operators of machinery (boilers, engine room), are stipulated in the Ministry of Manpower Regulation No. 313 of 2013. Tasks in the mills are divided into the following work sections: Grading Area, Loading Ramp, Sterilizer Area, Press Area, Oil Room, Boiler Area, and Workshop. Except for administrative staff, workers in the interviewed mills were male.

All of the mills interviewed indicated that workers have permanent status. From time to time, the mills outsource the cleaning of the premises and equipment to a labour contractor. Mill workers generally operate in two shifts to ensure immediate processing of FFBs. Workers are assigned to specific work sections in the mill based on their competencies and expertise. Many of the workers interviewed by the team have worked in their respective palm oil mills for more than 10 years.

In the visited mills, safety training and PPEs were provided to all workers and an OSH management system was documented. OSH Management system is often focused strongly on catastrophic risks such as fires. The mills visited and interviewed that were certified under ISPO and RSPO usually also held workplace certifications such as ISO or SA 8000 and the required SMK3 certificate⁴¹. Most workers in the mills are also provided housing facilities and are enrolled in the social security system.

- **Refineries**

Refineries are the link between producers and users of palm oil. In refineries, palm oil is processed into various products for use in manufacturing, transport, and industry. Downstream refinery operations may include refining of crude palm oil and processing olein and stearin into specialty fats, cooking oil, oleochemical, and biodiesel.

Refining and fractionation plants were first established in Indonesia in the 1980s. In 2011, the Indonesian government restructured its trade tariffs to encourage Indonesian producers to focus on adding value to crude palm oil commodities. This resulted to a significant increase in installed refining capacity (Hawkins et al, 2016).⁴²

In Indonesia, there are about 120 refineries with most of them owned by vertically integrated companies. Large integrated firms are better able to cope with the market imbalance and price fluctuations as they have their own palm oil production and use better technology to get higher yields.⁴³ Since many of the refineries are vertically integrated, they have clearer visibility of their supply chains.

contract) with refineries that allow them to shop and select buyers based on price offers, which is closer to an on the spot transaction. Uptake of sustainability standards is oftentimes weak among companies engaged in spot transactions (Gnych et al., 2015).

⁴¹ Sistem Manajemen Keselamatan dan Kesehatan Kerja or “SMK3”; Government Regulation No. 50 of 2012).

⁴² It is estimated that installed refining capacity in 2014 reached 45 million MT vis-à-vis annual production of CPO ranging from 30 to 35 million MT.

⁴³ Commercial scale refineries in Asia (2,000 MT - 6,000 MT per day) should have controlled supply of about 600,000 MT of crude palm oil. Breaking even for a refinery business is often given as 60 per cent capacity utilization: for a company processing 4,000 MT CPO per day (1,040,000 MT annually), controlled supply of 60 per cent of requirement would entail a plantation with mature planted area of 110,000-120,000 hectares (Hawkins et al., 2016).

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Since mid-2015, palm oil exporters have been levied US\$50 per MT of CPO and US\$30 for processed palm oil products. In 2016, downstream products accounted for about 75.6 per cent of total palm oil exports from Indonesia with India, China, Pakistan, and the European Union as the main markets.

Some refineries are moving towards a supply shed approach as a means of promoting better governance in their supply chains. The supply shed approach requires that all plantation and mill operators supplying a major supply node in a region, such as a refinery, work collaboratively with the facility operator to ensure that all palm oil entering the facility is compliant to standards or at least moving towards that goal. A coordinated supply shed approach allows collaborating firms to lower compliance costs through economies of scale derived from joint policy commitments, shared assessment and monitoring, and combined supply chain audits. In principle, a refinery sourcing CPO from an upstream supply shed has the buying power to refuse oil from mills known to be problematic until such plantations can prove that they are compliant, creating market-based pressures for improvement throughout the supply shed. Once in place, the supply shed would make it easier for the participating suppliers to prove compliance with other market environmental or social demands.

- **Importers and end buyers**

As most of the exported palm oil is exported in CPO form and that a large number of companies are vertically integrated, in a number of instances the exporting and importing actors may be the same. There are then a number of businesses operating in business to business that intervene in the further transformation of the oil and its integration in various types of products.

Palm oil, palm kernel oil, and their derivatives are used widely as ingredients in the manufacture of a wide range of products ranging from cosmetics, personal care, cleaning, food products and carburant. There is a very large number of actors that are extremely diverse both in terms of the market they evolved within, geographical foothold and industry. This means that no single actor has enough market power to greatly influence the value chain. The fact that palm oil derivatives are somewhat invisible to the end consumer also creates a disincentive for consumer goods manufacturers to engage in costly full traceability and engagement processes.

- **Supporting functions**

The value chain benefits from a number of supporting functions that have more or less access to the various value chain actors depending on their role in the production process. Effective access to those functions is a driver for OSH improvement, as will be developed in the following section.

Government-led services involved in supporting the value chain include the Ministry of Trade, the Ministry of Agriculture (through both their regulatory role, but also their extension services at local level and more recently through the Indonesia Sustainable Palm Oil mandatory certification scheme), the Ministry of Manpower (on enforcement through labour inspectorates but also through decentralized services for training, certification and professional advisory on risk assessment and control), the Ministry of Health (occupational health division), the social security system, and the Ministry of Environment and Forestry. Local authorities are the direct contact on the ground for many actors of the value chain.

Private-sector services include input providers, auditing companies and a number of NGOs working with the Round Table on Sustainable Palm Oil (RSPO). Trade unions are also present, some of them part of

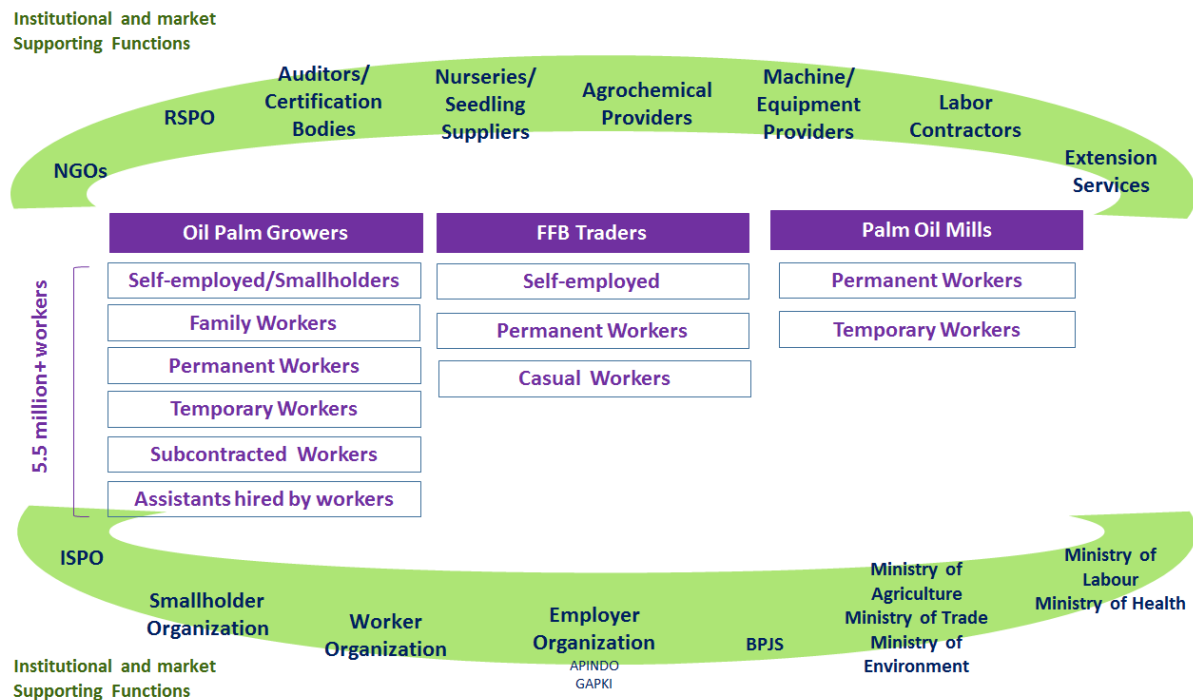
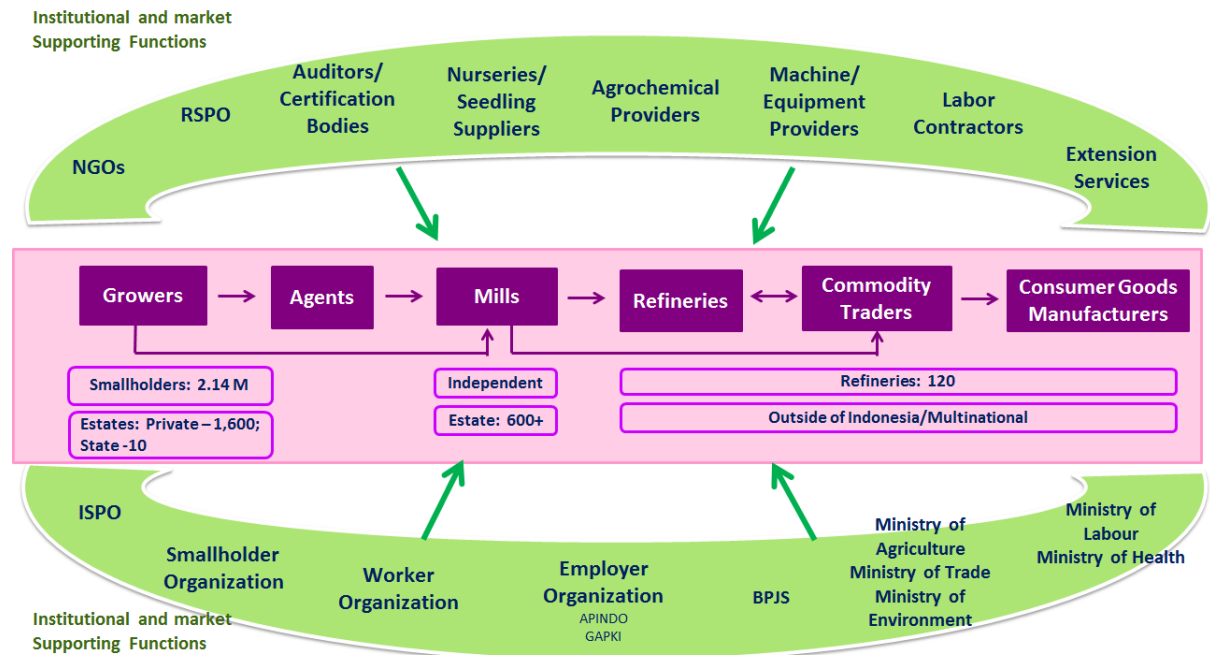
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larger national federation, as well as a dedicated association of palm oil producing companies (GAPKI) affiliated to the national federation of employers (APINDO).

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Correction

Examples of visualisation of the results



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Transformation process	PALM OIL GROWING / CULTIVATION	TRANSPORTING	MILLING	RAFINERY	GLOBAL BUYERS
Products	Palm oil fruit / Fresh Fruit Bunch (FFB)	Transport of FFB	Crude palm oil (CPO) Crude palm kernel oil (CPKO)	Refine palm oil Specialty fats Cooking oil Oleochemical Biodiesel	Most of the exported palm oil is exported in CPO form. Palm oil, palm kernel oil, and their derivatives are used widely as ingredients in the manufacture of a wide range of products ranging from cosmetics, personal care, cleaning, food products and carburant.
Size and types of actors	Two main categories: smallholders and plantations. About 53 per cent of the total hectares is owned by private estates while 40 per cent is managed by smallholders. The remaining 7 per cent is under the ownership of state-owned enterprises. Private Estates/Plantations: There are about 1,600 large and medium companies with CPO mills and their own plantations. A number of these companies also operate refineries. 2,140,774 smallholders involved in oil palm cultivation.	FFB traders : agents and collectors FFB traders are not a homogeneous category of actors. It comprises a wide range of businesses, from formalized medium sized companies with salaried workers to small or individual businesses operating in the informal economy.	About 600 palm oil mills in Indonesia. Large companies (private and state owned) that operate milling facilities as part of an integrated plantation business model dominate the crude palm oil production. Large-scale plants are generally handling from 30 to 60 MT of FFB per hour. There are about 1,600 large and medium companies with CPO mills and their own plantations. A number of these companies also operate refineries. In 2016, there were 10 state owned plantation/mills	In Indonesia, 120 refineries (most of them owned by vertically integrated companies). Refineries are the link between producers and users of palm.	As most of the exported palm oil is exported in CPO form and that a large number of companies are vertically integrated, in a number of instances the exporting and importing actors may be the same. There is a very large number of actors that are extremely diverse both in terms of the market they evolved within, geographical foothold and industry. Hundreds of thousands of companies across the globe buy palm oil or palm oil fractions to include in a wide variety of products. Six companies account for over 90 per cent of the global trade

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	Tied/Supported Smallholders: Smallholders organized in plasma schemes receiving technical and financial support from nucleus plantations. They comprise about 20 per cent of the total number of smallholders. Independent Smallholders: Independent smallholders are not tied or contractually bound to an estate or CPO mill. They are free to sell to any buyer. In practice, they sell either directly to a mill or to local agents (middlemen). If independent smallholders do not have their own means of transport, they may rely exclusively on one particular trader or on the closest mill. State Owned Plantations: There were 10 state owned palm oil companies with an aggregate of 755,787 hectares planted to oil palm as of 2016. The state owned palm companies also have their own mills and are working towards building refining capacities.				
Operations	1. Farm establishment activities such as land clearing, drainage construction, seedling preparation, and planting.	1. Agents located or based within the proximity of the plantations collect the FFB at the farm gate.	Tasks in the mills are divided into the following work sections: Grading Area, Loading Ramp, Sterilizer Area, Press Area, Oil Room, Boiler Area, and Workshop.	Downstream refinery operations may include refining of crude palm oil and processing olein and stearin into specialty fats, cooking oil, oleochemical, and biodiesel.	

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	2. Farm maintenance (spraying pesticides or applying fertilizers) and harvesting. 3. Replanting to maintain farm productivity.	2. Agents deliver to the warehouse of the dealer or collector who holds a delivery contract (or letter) with oil mills to bring in a pre-arranged volume of FFB. Local agents with delivery contracts may also deliver directly to the mills.			
Main risk factors	Carrying weight Ergonomics (postures) Workload and pace of work (piece rate pay for some workers) Length of the work day Pressure (quotas and sanctions for mistakes) Chemicals exposure Poor waste management Factors to take into consideration: Lack of information, training and knowledge on OSH Lack of job training Precarious employment and Informality Spread of the locations of oil palm plantations creates challenges for enforcement institutions, such as the labour inspection for the monitoring of compliance and good safe practices.	Pressure (FFB have to be transported at the shortest time possible to ensure that these reach the mills within 24 to 48 hours after harvest. Factors to take into consideration: Informality	Mechanical handling systems Catastrophic risks such as fires	Handling of industrial machine	

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Supporting industries	Input suppliers (Seeding suppliers and agrochemical suppliers) Some local agents provide loans and advances to independent smallholders for purchase of inputs and other plantation costs such as wages as a means of securing loyalty of the latter and, consequently, their supply of FFB.				
Supporting functions	Certifications: - Roundtable for sustainable (RSPO) - European sustainable palm oil (ESPO) initiated by biodiesel companies - Indonesian sustainable palm oil (ISPO) - ISO or SA 8000 Auditing companies NGOs International development agencies Government of Indonesia provides subsidized fertilizers Association of palm oil producing companies (GAPKI) affiliated to the national federation of employers (APINDO). Worker's organisation / trade unions	NGOs International development agencies Worker's organisation / trade unions Ministry of Health «Ministry of Manpower requirements» Social security system Ministry of Agriculture Ministry of Environment and Forestry	Certifications: - Roundtable for sustainable (RSPO) - European sustainable palm oil (ESPO) initiated by biodiesel companies - Indonesian sustainable palm oil (ISPO) - ISO or SA 8000 Auditing companies Labour contractor (outsource the cleaning of the premises and equipment) NGOs International development agencies Association of palm oil producing companies (GAPKI) affiliated to the national federation of employers (APINDO). Ministry of Health	Certifications: - Roundtable for sustainable (RSPO) - European sustainable palm oil (ESPO) initiated by biodiesel companies - Indonesian sustainable palm oil (ISPO) - ISO or SA 8000 (and the required SMK3 certificate) Auditing companies Labour contractor (outsource the cleaning of the premises and equipment) NGOs International development agencies Association of palm oil producing companies (GAPKI) affiliated to the national federation of employers (APINDO). Ministry of Health	Ministry of Trade

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	Labour contractors, sub-contracting agency and labour brokers Provincial government Ministry of Health «Ministry of Manpower requirements» Social security system Ministry of Agriculture Ministry of Environment and Forestry		«Ministry of Manpower requirements» Social security system Ministry of Agriculture Ministry of Environment and Forestry	«Ministry of Manpower requirements» Social security system Ministry of Agriculture Ministry of Environment and Forestry	
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