WORKING PAPER 220

The palm oil global value chain

Implications for economic growth and social and environmental sustainability

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CIFOR
CGIAR
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Forests, Trees and Agroforestry

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List of abbreviations

ASLI	Aliansi Sawit Lestari Indonesia
BEI	Banking Environment Initiative
BRG	Peatland Restoration Agency
CGF	Consumer Goods Forum
GM	Consumer Goods Manufacturers
CPO	Crude Palm Oil
CPOPC	Council of Palm Oil Producing Countries
ESPO	European Sustainable Palm Oil
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FELCRA	Federal Land Consolidation and Rehabilitation Authority
FELDA	Federal Land Development Authority
FFB	Fresh Fruit Bunch
GAR	Golden Agri-Resources
GDP	Gross Domestic Product
GHG	Greenhouse gasses
HCV	High Conservation Value
HCS	High Carbon Stock
INDC	Intended Nationally Determined Contributions
IPOP	Indonesian Palm Oil Pledge
ISPO	Indonesian Sustainable Palm Oil
ISCC	International Sustainability and Carbon Certification
ITC	International Trade Center
MPOB	Malaysian Palm Oil Board
MSPO	Malaysian Sustainable Palm Oil
NGO	Nongovernmental Organization
NES	Nucleus estate smallholder
IDH	Sustainable Trade Initiative
IFC	International Finance Corporation
OJK	Indonesia Financial Service Authority
PKO	Palm Kernel Oil
POIG	Palm Oil Innovation Group
RPO	Refined Palm Oil
RED	Renewable Energy Directive
RISDA	Rubber Industry Smallholders Development Authority
RSPO	Roundtable on Sustainable Oil Palm
SME	Small and medium-scale enterprises
SNV	Netherlands Development Organization
SPOM	Sustainable Palm Oil Manifesto
TFT	The Forest Trust

Acknowledgements

This document is part of a broader effort to understand the challenges facing the different players involved in some key global commodity value chains to make progress toward achieving sustainability and inclusivity along the supply chain. This specific piece was motivated by discussions with the FAO Trade and Markets Division on the need for a document that takes a comprehensive look at the development of the global palm oil sector, and examines its implications for economic growth and for social and environmental sustainability in some key producing countries. Research was carried out by CIFOR as part of the CGIAR Research Program on Forests, Trees and Agroforestry (CRP-FTA). This collaborative program aims to enhance the management and use of forests, agroforestry and tree genetic resources across the landscape from forests to farms. CIFOR leads CRP-FTA in partnership with Bioversity International, CATIE, CIRAD, the International Center for Tropical Agriculture and the World Agroforestry Centre.

Executive summary

There is abundant literature focusing on the palm oil sector, which has grown into a vigorous sector with production originating mainly from Malaysia and Indonesia, and on increasing consumption in many countries around the globe, particularly those in the European Union, China and India. This sector expansion has become quite controversial, because while it has negative social and environmental impacts, it also leads to positive benefits in generating fiscal earnings for producing countries and regular income streams for a large number of large- and small-scale growers involved in palm oil production. The global palm oil value chain has grown in complexity over time. A large number of consumer goods companies use palm oil and derivatives, yet the processing and refining is concentrated in a handful of corporate groups and traders, which in turn source their supply from their own concessions, a large number of third-party suppliers, and tied and independent smallholders connected through extended intermediation networks. While the expansion of the sector was facilitated by public and private sector policies and institutional structures that encouraged investment in Malaysia and Indonesia, in both upstream production and downstream processing, the current sector transformation driven by sustainability concerns is influenced by pressures from consumer companies and NGOs.

This document undertakes the challenge of reviewing the current global trends of the sector development while assessing its implications from multiple angles, including an examination of the main trends of oil palm expansion linked to an analysis of drivers and the decisive influence on the sector of political and institutional factors. This work also revisits the geographies of production, consumption and trade of palm oil and derivatives, and describes the structure of the global palm oil value chain, with special emphasis on Malaysia and Indonesia. In addition, this work reviews the main socioenvironmental impacts and trade-offs associated with the palm oil sector's expansion, with a primary focus on Indonesia. Main interest is on the social impacts in local populations, smallholders and workers, as well as the environmental impacts on deforestation and their associated effects on carbon emissions and biodiversity loss. Finally, the growing complexity of the global oil palm value chain has also driven a more complex oil palm policy regime change to govern the sector expansion. This work also assesses the main features of this emerging policy regime, with emphasis on Indonesia.

There are multiple efforts to support the transition to more sustainable palm oil production. Nonetheless, on the public sector side, the lack of a coordinated public policy, effective incentives and consistent enforcement is still evident, despite efforts that are emerging for more coordinated policy with clearer regulatory frameworks and targets. On the private sector side, the subsequent emergence of numerous privately driven initiatives with greater involvement of civil society organizations brings new opportunities and challenges for the governance of the palm oil supply chain; yet the uptake of voluntary standards remains slow, and any push for the adoption of more stringent standards may only widen the gap between large corporations and medium- and small-scale growers. While harmonization between voluntary and mandatory standards is required, it is unlikely that this will happen anytime soon. Emerging company commitments to deforestation-free supply chains have the potential to reduce undesired environmental impacts from oil palm expansion, and while this risks excluding smallholders from the supply chains, such commitments may function to leverage the upgrading of smallholder production systems. Their success will require significant support from the state, in particular regarding critical issues and challenges associated with land use planning and tenure. Improved stability and certainty over government policies will support and incentivize investments in upgrading smallholder production and their continued inclusion into global supply chains.

1 Introduction

Oil palm is one of the most profitable commercial high-tree crops, and has undergone one of the highest rates of expansion in comparison with other crops in the tropical world. Nevertheless, the conditions under which oil palm plantations expand as well as their social and environmental implications are ambiguous, which makes palm oil one of the most controversial globally traded commodities. On one hand, oil palm expansion has delivered important economic development for its host countries, including indirect benefits for local infrastructure development and rural poverty reduction. On the other hand, its development has often come at the expense of basic human rights and of biodiverse, carbon-rich tropical forests, as local communities have been evicted from their lands and precious primary forest and peatland ecosystems have been destroyed by fire (see Sheil et al. 2009; Sayer et al. 2012).

Blended palm oil and palm kernel oil forms an important share of the global vegetable oil market, competing with other oils such as soybean. Its main use is as cooking oil and an ingredient in domestic products (e.g. processed foods, detergents, cosmetics), as well as biodiesel. As such, global demand for palm oil is growing rapidly. While the crop originated in West Africa, much of its industrial expansion under monocrop plantation systems has occurred in Southeast Asia (Malaysia and Indonesia). Governments in palm-oil-producing countries have seen its rural development potential and therefore supported its expansion. But consumer markets in developed economies are increasingly concerned about the associated social and environmental trade-offs. As a result, there have been intense debates around the pros and cons of oil palm agriculture, and numerous market-based and voluntary sustainability standards have emerged as a way to ameliorate some of these negative impacts.

The palm oil value chain has increased in complexity over time, and while the main producer countries are Malaysia and Indonesia, it fulfils markets all around the globe. The palm oil global value chain is made up of a wide range of stakeholders, from producers of all sizes, to processors, traders, consumer goods manufacturers (CGMs) and retailers. Despite being dominated by a handful of companies at the refining and international trading stages, production involves a wide range of suppliers from companies to smallholders, and manufacturing involves a wide range of CGMs in a market that is diversifying. This makes the palm oil value chain hard to govern for environmental outcomes, but given that the refinement and refined palm oil trade stages are concentrated in the hands of just a few corporate groups, these groups have often been the main target of international NGOs and environmental groups' campaigns.

Several public and private efforts, in both consumer and producer countries, have emerged to improve the governance of palm oil production, and reduce its negative social and environmental impacts. Governments in producer countries, notably Indonesia, have implemented policies to regulate the expansion of oil palm, with different degrees of effectiveness (Brockhaus et al. 2012; Busch et al. 2015). Some consumer countries have introduced procurement policies linked to compliance with private sustainability standards, particularly in renewable energy markets (Dixon et al. 2016). Voluntary certification standards have been developed through multistakeholder processes (Morley 2015), while similar third-party auditing approaches have been adopted by the Malaysian and Indonesian governments to ensure compliance to national laws and regulations (Hospes 2014). More recently, major CGMs and retailers have pushed for the adoption of 'No deforestation, no peat and no exploitation' commitments among traders and producers. On the ground, implementation of all the above standards remains questionable (Climate Focus 2015) and there is increasing concern surrounding the equitable inclusion of smallholders in global value chains. The debate about what is sustainable palm oil and how to achieve it is still ongoing.

However, in spite of the emergence of oil palm sustainability standard systems, mainly driven by European markets, a significant proportion of the palm oil produced is still absorbed by emerging markets (e.g. China and India) that are less concerned with sustainability than price. This makes gives greater importance to the debate about how effective the measures imposing constraints in consumer markets are versus others trying to regulate the production expansion in producer countries. In addition, while some main corporate groups are able to undertake the necessary steps to embrace more sustainable production practices, that is often a challenge for smallholders. Therefore, the policy approaches and frameworks to support sustainable palm oil have to balance sustainability targets with those of social and economic development.

The palm oil sector provides an interesting example of the challenges and obstacles for advancing toward more sustainable supply in a context dominated by multiple stakeholder interests. While there are differences across countries, this sector shows the importance of moving toward greater policy harmonization and coordination between the public and private actors to progress sustainability without affecting social and economic goals. This paper assesses the expansion of oil palm, the dynamics of palm oil markets and their social and environmental implications, and highlights the main sustainability challenges. It sheds light on the debate on sustainable palm oil while characterizing the sector in ways that contribute to understanding their complex social, political and economic dimensions.

This document is organized into five sections, including this introduction. The second section provides the background to oil palm development and the current context, with emphasis on the main drivers of development, dominant production models, trade flows and characteristics of the global value chain. The third section explores the social and economic dimensions of oil palm expansion, and their environmental impacts, and provides a balance on the trade-offs. This section focuses on oil palm development in Indonesia and Malaysia, the two main producer countries, while referring to other countries when necessary. The fourth section describes the main public and private sector interventions that have emerged in response to these challenges. This section also analyses these interventions from several perspectives and leverage points, assessing their effectiveness in achieving their desired outcomes, and the main limitations and opportunities. The final section draws out the chapter's conclusions, and provides some critical reflections on ways to move ahead.

2 Trends of oil palm development

2.1 The context of oil palm expansion in the tropics

2.1.1 Ecological suitability for oil palm expansion

The oil palm, *Elaeis guineensis* Jacq., is a monocotyledon which belongs to the Arecaceae family (also known as Palmaceae). The crop has an economic life-span of around 25–30 years, producing fruits throughout the year (Barcelos et al. 2015). It produces roughly 3.8 tons per hectare (tons/ha) per year as a global average, 6 tons/ha in the best plantations in Southeast Asia and 10 tons/ha in genetic field trials (Rival and Levang 2014). Oil palm has been labeled as a "natural oil machine" (Rival and Levang 2014) due to its comparatively high productivity in relation to other oleaginous crops (e.g. soybean, sunflower and rapeseed) (Barcelos et al. 2015). Oil palm has the lowest production costs of all vegetable oils in the global commodity market, and could meet growing global demand that is estimated to reach 240 million tons by 2050 (Corley 2009). Two types of vegetable oil are extracted from the palm fruit: crude palm oil (CPO) and palm kernel oil (PKO). These oils have different fatty acid profiles, which increases the crop's versatility in several industrial applications (Barcelos et al. 2015).

The oil palm requires warm and wet conditions to grow. Optimal temperatures are in the range of 24–28 °C, and the average temperature during the coldest month of the year should not fall below 15 °C (Corley and Tinker 2015). It is estimated that 2000–2500 mm of rainfall per year are required for optimal growth, with a minimum of 100 mm per month. The palm's growth may be constrained by chemical (e.g. nutrient) or physical (e.g. water) soil deficiencies, but these can be overcome by irrigation and fertilizer application. In this regard, climatic conditions constitute the main factors determining land suitability for oil palm.

According to Pirker and Mosnier (2015) and Pirker et al. (2016), only a small proportion of the total land that is biophysically appropriate for oil palm production can be classified as suitable to perfectly suitable, while significant tracts are marginally or moderately suitable. The most suitable lands are located in the Amazon region, although soil drainage and acidity may present limitations. In Central Africa, the Congo Basin and coastal region of Western Africa – mainly Sierra Leone and Liberia – are most suitable, with limitations dictated by the local dry season and sand- and stone-rich soils. In Southeast Asia, the most suitable lands are found in Indonesia and Malaysia, where extensive oil palm development is taking place. This expansion occurs in mineral soil and peatlands with diverse economic and environmental implications (Khasanah et al. 2015).

2.1.2 Economic drivers for oil palm expansion

Oil palm originates in West Africa, where this crop is still an important component in local farmers' livelihoods. While some industrial plantations have been established, West Africa has not experienced as significant an expansion of large-scale commercial plantations as have other parts of the world (Carrere 2010). At the beginning of the 20th century, much of the demand for palm oil from European markets was supplied by African countries. This stimulated the development of some commercial plantations, with mostly foreign investment. These investors also introduced hybrid seeds and new processing techniques, including new presses and forms of treatment (Rival and Levang 2014). Despite these developments, plantation expansion was limited, and Malaysia and Indonesia began to dominate the global market. The first four oil palms to arrive in Southeast Asia were introduced into the Bogor Botanical Gardens in Indonesia, in 1848 (Hartley 1988 *in* Rival and Levang 2014). These four palms were well adapted to conditions in Sumatra (fertile soil, regular rainfall and high levels of sunshine).

A lower incidence of pests and diseases, in comparison with its region of origin, stimulated the development of the sector (Rival and Levang 2014).

The West African countries continued to act as the dominant palm oil producers, fulfilling the needs of domestic, regional and European markets until the 1930s. The global palm oil sector stagnated during the postwar period, due to the decolonization of Africa and the political changes in Indonesia that lasted until the 1970s. Malaysia, however, was more stable during this period and in the 1950s the government and the private sector launched collaborative programs to breed hybrid varieties that had higher yields and were better adapted to the new screw presses developed in the Belgian Congo and later adopted by Malaysian factories in the mid-1960s. Around the same time, the Malaysian Government began to convert old rubber plantations into oil palm plantations, via the Federal Land Development Agency (FELDA). These projects were designed to improve village plantations and boost rural development. They were successful, and in 1966, Southeast Asia overtook Africa in terms of palm oil production, a lead it still maintains today (Rival and Levang 2014).

Today in Africa, oil palm remains part of traditional agroforestry systems, and forms a staple part of diversified smallholder-farmer production systems. The produce, which is used primarily as cooking oil, contributes to local food systems (Potter 2015). Much of the processing still takes place via local artisanal systems, which process small volumes at a time through a relatively large number of artisanal mills. This generates labor opportunities and contributes to diversified local income streams (Nkongho et al. 2014). The artisanal production co-exists with medium- and large-scale plantations, which are important suppliers of the domestic market. Both small- and large-scale producers, however, are not able to fulfil the total domestic demand. The deficit in West Africa is met with cheaper palm oil produced and imported from more competitive markets in Malaysia and Indonesia.

Although oil palm plantations began to expand in peninsular Malaysia from the 1960s thanks to strong state participation, it was only in the 1970s that the crop began to develop in Indonesia. Expansion in Indonesia began through state-owned companies (Basiron 2007), but in the late 1980s, economic liberalization and structural adjustment meant that oil palm began to attract the attention of the private sector, which saw it as a profitable option for agricultural development. This was also stimulated by the government, which offered attractive incentives, including cheap land and fiscal benefits, for plantation development, bringing with it a promising new source of fiscal revenue (Sunderlin and Resosudarmo 1996).

Indeed, the palm oil sector is now one of the most dynamic and profitable for Indonesia, with important effects not only on economic growth and rural poverty alleviation, but also in landscape transformation and deforestation. Over the past few years, some Malaysian and Singaporean corporate groups have sought to expand their business operations into Central and West African countries, but have faced challenges relating to the availability of land, skilled labor and adequate infrastructure (Rival and Levang 2014).

The expansion of oil palm plantations has also been modest in Latin America, with the exception of Colombia. The sector only really began to develop in the 2000s and drivers of expansion differ across countries. In Colombia, the sector began to grow as a result of import substitution programs supported by the state, which wanted to move away from traditional sources of vegetable oils. Development started off slowly, but accelerated in the 1990s due to expanding demand. It has stagnated in recent years due to disease outbreaks that have affected its competitiveness (Rueda-Zárate and Pacheco 2015). The boom in biofuels in the late 2000s stimulated expansion of oil palm in other Latin American countries, such as Brazil (de Andrade and Miccolis 2011). Governments from other countries (e.g. Mexico, Guatemala and Honduras) experimented with oil palm as an option for agribusiness investment, while some national and local elites used this crop to justify illegal appropriation of lands (Potter 2015).

2.1.3 Influence of political and institutional factors

The expansion of oil palm is strongly intertwined with national politics. This is because national and subnational governments have, as with other sectors, seen its potential for rural and fiscal development, and as such have used incentives, land use permits, and agricultural and trade policies to encourage the development of plantations. In Indonesia, corporate groups from Malaysia and Singapore benefited from the privatization of previously state-run plantations, and from the allocation of large tracts of land in the forest frontiers of Sumatra and Kalimantan (Cramb and McCarthy 2016). These large-scale land allocations often affected the customary tenure rights of local communities and indigenous groups, who were ignored by their government representatives and national regulations (Potter 2009). Much of Indonesia's success in expanding oil palm plantations was due to the fact that it opened the national economy to foreign investment, and attracted established international corporate groups. Through single investments and joint ventures with local companies, Malaysian and Singaporean groups would control more than two-thirds of the total production of Indonesia's palm oil.

Varkkey (2012) argues that an extended patronage system underpins the palm oil sector in Indonesia, and facilitates the investments and business operations of major corporate groups through extended networks of subsidiary companies and third-party suppliers. Influential individuals form palm oil consortiums that control oil palm production, marketing and distribution. These consortiums involve political elites, senior bureaucrats and businessmen ranging from the district to the national levels, thus connecting private and public actors in complex and opaque processes of decision-making. The system of political patronage under which oil palm has expanded in Indonesia explains how many companies benefited from weak policies and corrupted processes of land allocation. This has made vast swathes of forested land available for plantations at low cost (Bakker and Moniaga 2010) and often to the detriment of local people. With growing political democratization, there have been efforts to increase the transparency of decision-making processes and the granting of land and business permits for plantations. This process faces many obstacles as it is challenged by private interests and strong political legacies (see Poczter and Pepinsky 2016).

There is increasing evidence of clashes between local and national interests around oil palm development, which derive from conflicting interests around land allocation and fiscal earnings (Sahide and Giessen 2015). In Indonesia, many of the government revenues from palm oil are channeled through the central government in Jakarta, so they can be redistributed among provinces. In addition, many of the national earnings from oil palm are captured through export taxes, which are collected centrally, and only a small fraction flows back to production provinces (Falconer et al. 2015). Other resources or benefits are transferred through social programs. It is often the case that local politicians and elites find ways to retain institutional rents at the district or province level. Much of these rents are generated through land allocation. There is a strong argument to see more of the fiscal revenues from palm oil retained in the areas in which it is produced, to support mitigation of environmental impacts as well as local infrastructure development. But the retention of profits is often distorted and corrupted by local political economies and self-interest, in scenarios where local communities rarely benefit (McCarthy et al. 2012).

2.2 Geographies of production, consumption and trade

2.2.1 Production dynamics and yields

According to the FAO (2016a), there were roughly 18 million ha planted with oil palm in 2013, generating a total production volume of 55 million tons of CPO during that same year. According to IndexMundi (2016), production increased to 62 million tons in 2015, 73% of which was used for

food consumption and 27% for industrial purposes. Oil palm underwent rapid growth in Malaysia, and has been increasing exponentially in comparison with Indonesia (Figure 1). About 12.5 million ha (or 69% of the total planted area) is located in Southeast Asia, out of which 93% of that land is located in Malaysia and Indonesia alone; 4.4 million ha (25% of the total) is in Central and Western Africa, and 1 million ha (6% of the total) in Latin America. Malaysia and Indonesia produce a higher proportion of the total CPO supply (85% of the total) (Table 1). This not only results from a larger planted area, but also comparatively higher yields. When considering all regions, Southeast Asia represents 89% of total production, while Africa holds 5% and Latin America 6%.

Table 1. Production and consumption of palm oil in 2015 (thousand tons).

	Production	Beginning stocks	Consumption	Exports	Imports	Ending stocks
Predominantly exporter countries						
Indonesia	33,000	1,626	8,620	24,500	-	1,506
Malaysia	20,500	2,642	3,280	18,150	400	2,112
Thailand	2,200	53	1,990	150	20	133
Colombia	1,130	69	945	310	130	74
Nigeria	970	82	1,540	18	570	64
Papua New Guinea	580	50	13	590	50	77
Ecuador	510	67	290	245	-	42
Ghana	500	5	700	100	300	5
Honduras	490	141	205	320	10	116
Guatemala	470	31	70	400	20	51
Ivory Coast	415	54	265	260	115	59
Brazil	340	90	475	110	225	70
Cameroon	270	41	325	5	50	31
Costa Rica	250	13	100	160	25	28
Democratic Republic of Congo	215	24	295	1	80	23
Predominantly importer countries						
Africa	245	603	4,778	745	5,072	397
Americas	265	247	2,385	78	2,165	214
Asia	325	1,841	24,764	145	24,234	1,491
Europe	-	569	8,475	163	8,490	421
Middle East	-	144	1,215	361	1,505	73
Oceania	-	-	20	-	20	-
Total	**62,675**	**8,392**	**60,750**	**46,811**	**43,481**	**6,987**

Source: Author elaboration based on IndexMundi (2016) .

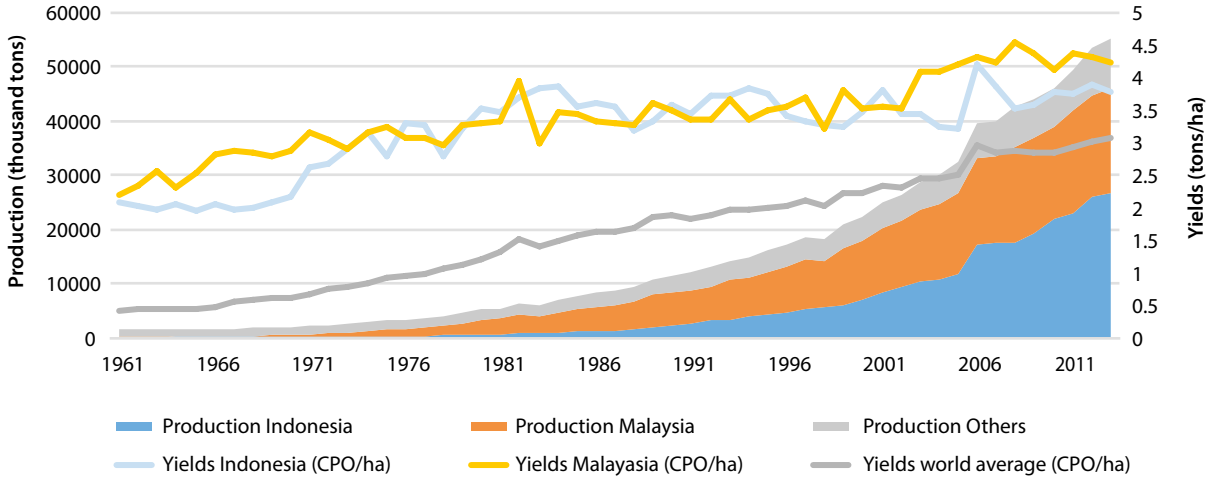


Figure 1. Global production trends and yields based on information from FAO (2016a).

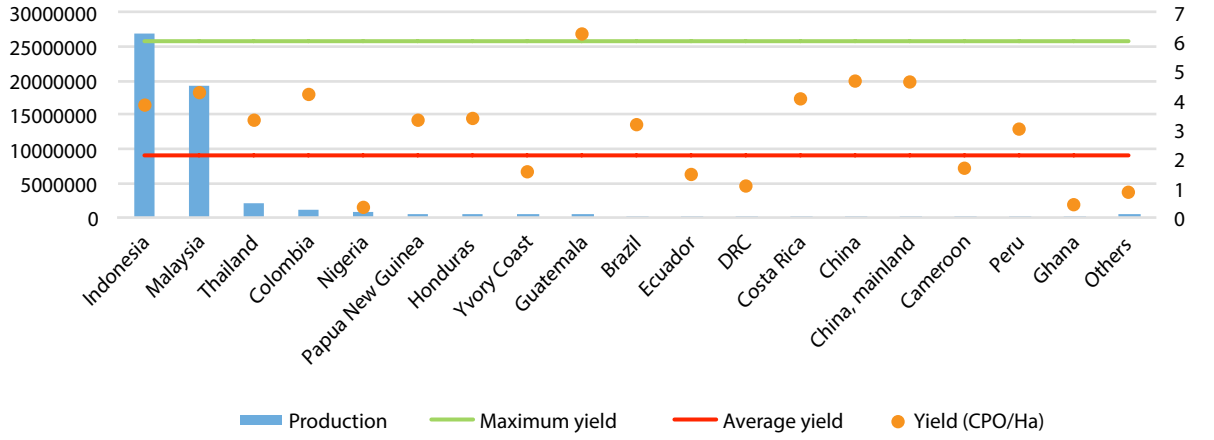


Figure 2. Production areas and yields by main producer countries in 2015 based on information from IndexMundi (2016).

Indonesia and Malaysia, the two largest palm oil producers, have increased their yields per hectare over time. According to FAO (2016 a), oil palm yields were roughly 2 tons/ha in the 1960s but yields have shown continuous improvement due to investments in plant breeding and genetics. Average yields have more than doubled in Malaysia, reaching 4.3 tons/ha, while they remain slightly lower in Indonesia. The major producer countries all sit above the global average of 2.4 tons/ha, while in some African countries, yields have stagnated below this (Figure 2). Considering that experimental trials have achieved 6 tons/ha, the yield gap is still significant and can be attributed to three factors: inefficiencies during the development of plantations, inaccurate assessment of nutrient requirements, and inappropriate management of mature stands (Donough et al. 2009). Closing the yield gap between existing yields and the maximum potential yield within the current planted area, could double the total annual production of palm oil and an additional 22 million tons could be produced if all yields were equal to those obtained in Malaysia. Currently, there is an intense debate over the options for intensification as compared with expansion.

2.2.2 Trade flows and international prices

The global trade of CPO and derivatives is growing rapidly, and is likely one of the most dynamic commodity crop markets because of increasing global demand. Some countries are established palm oil producers, which allows them to both export and meet the needs of their domestic markets (e.g. Malaysia and Indonesia). Others (e.g. Thailand and Colombia) target their production almost exclusively to their domestic markets (Table 2).

Table 2. Palm oil and its fractions: Exports by country and imports by region for 2004 and 2014.

	Volume (million TM)		Change (% annual)	Value (million USD)		Change (% annual)
	2004	2014		2004	2014	
Exports from producer countries						
Indonesia	8.7	22.9	9.7	3,441.8	17,464.9	16.2
Malaysia	10.0	15.1	4.1	4,760.0	11,994.8	9.2
Netherlands	0.6	1.3	7.7	380.6	1,300.0	12.3
Papua New Guinea	0.0	0.6	101.4	113.2	505.6	15.0
Guatemala	0.1	0.4	17.9	36.0	288.2	20.8
Germany	0.2	0.4	7.5	114.1	384.0	12.1
Honduras	0.1	0.3	9.2	53.1	230.1	14.7
Ivory Coast	0.1	0.2	8.1	70.8	209.4	10.9
Colombia	0.2	0.2	1.4	98.6	232.5	8.6
Ecuador	0.1	0.2	13.2	35.2	225.0	18.6
Thailand	0.1	0.2	6.1	75.1	201.1	9.8
Costa Rica	0.2	0.2	(1.5)	91.5	132.6	3.7
Tanzania, United Republic of	0.0	0.2	41.9	1.9	204.0	46.5
Brazil	0.0	0.1	20.3	6.8	86.6	25.5
Others	0.6	1.0	4.2	455.3	1,108.5	8.9
Total	**21.0**	**43.3**	**7.2**	**9,733.9**	**34,567.4**	**12.7**
Imports according to region						
Africa	3.2	4.8	4.2	888.5	4,326.4	15.8
Americas	1.5	2.7	6.0	475.2	2,463.6	16.5
Asia	7.9	20.8	9.6	6,030.1	17,247.1	10.5
Europe	4.6	10.6	8.3	2,937.1	9,630.8	11.9
Middle East	1.0	1.7	5.2	512.6	1,562.0	11.1
Oceania	0.0	0.1	22.8	72.4	146.3	7.0
Others	0.0	0.0	35.9	0.6	32.1	40.0
Total	**18.2**	**40.7**	**8.0**	**10,916.5**	**35,408.3**	**11.8**

Source: Authors' elaboration based on International Trade Center (2016).

Figure 3 shows the production and market dynamics of the most important producer countries. Thanks to its large and growing population, the domestic market consumes a quarter of the palm oil produced by Indonesia. A seventh of Malaysia's production is consumed domestically due to its large oleochemical industry. In Indonesia and Colombia, the government is actively channeling a proportion of the palm oil produced domestically into the national biodiesel markets, to counteract a stagnation of the global market price and increasing constraints in the international market. In Colombia, the decision to increase the biodiesel blending target was related to difficulties in competing with cheaper CPO from Southeast Asia (Rueda-Zárate and Pacheco 2015), and in Indonesia due to the slowdown in the Asian market (USDA 2015).

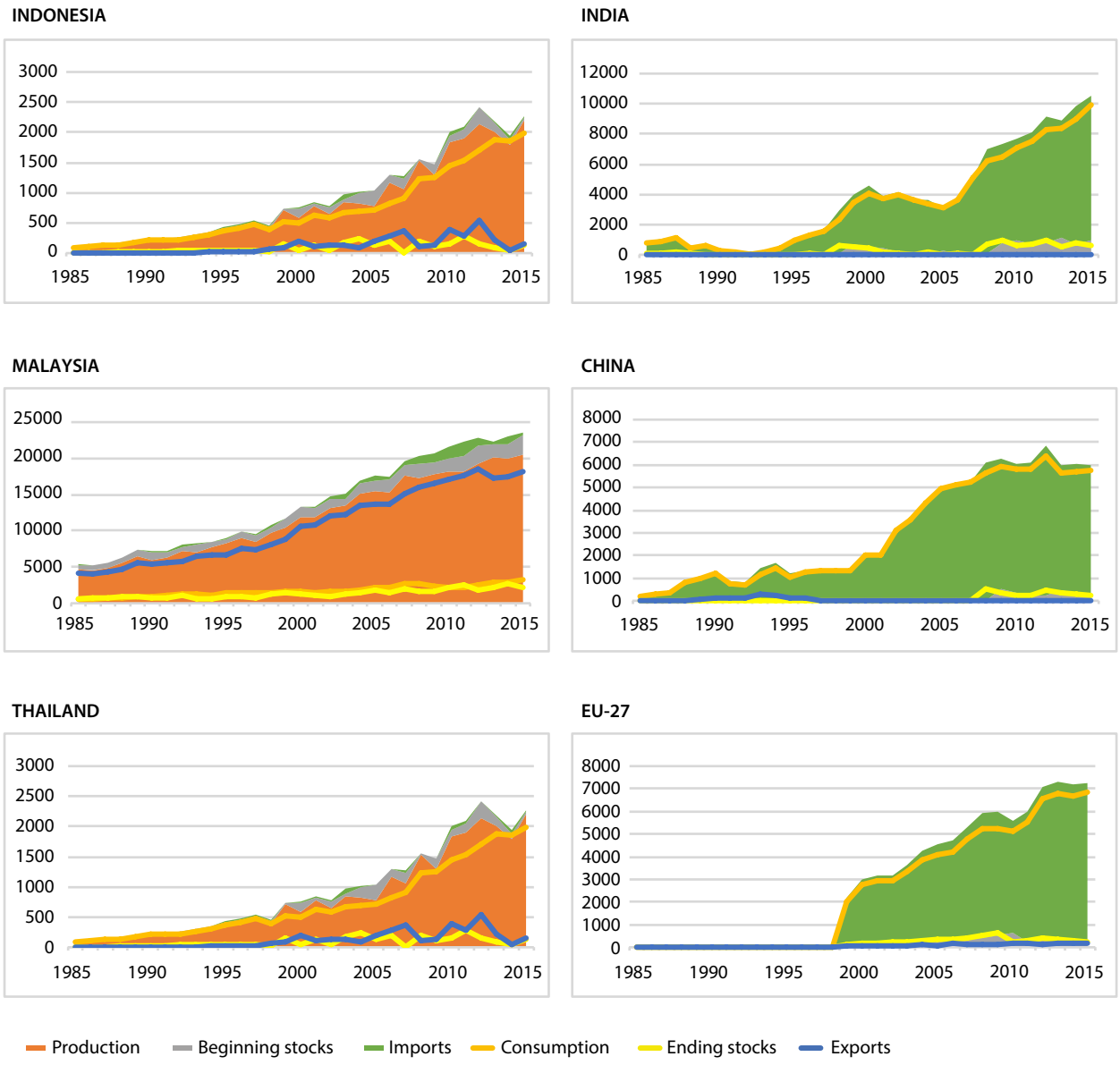
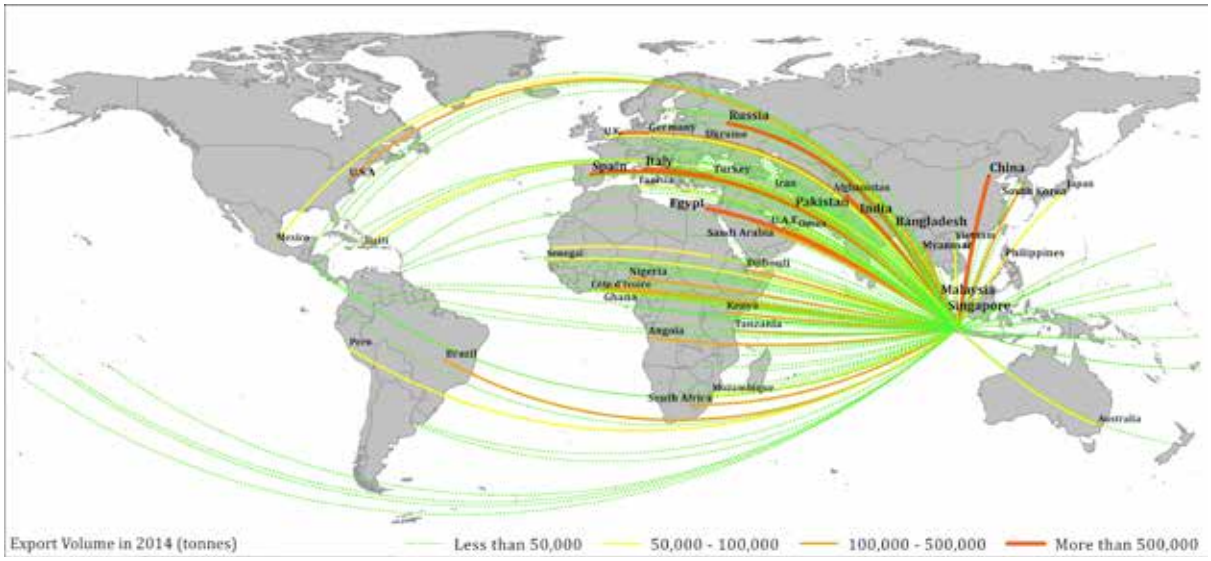
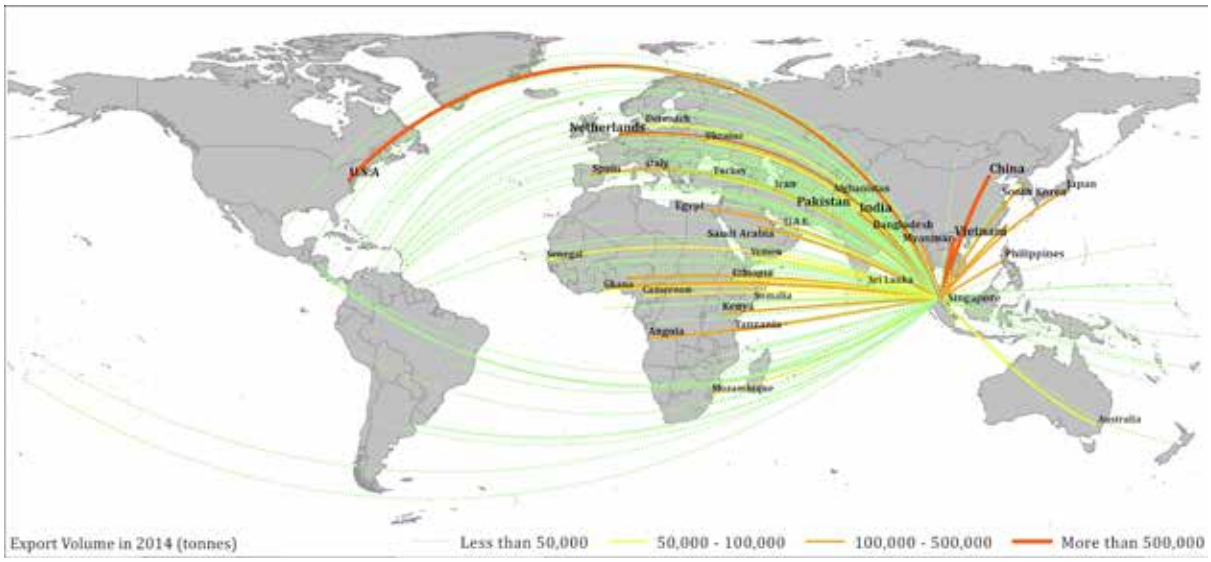


Figure 3. Production and consumption trends in select countries/regions in metric tons based on information from IndexMundi (2016).

The majority of palm oil from Malaysia and Indonesia is exported (Maps 1 and 2). Key export markets include the European countries, India and China. According to the ITC (2016), about 40 million tons of CPO, and its derivatives, were traded on the international market in 2014. About 53% of that total originated in Indonesia and 35% in Malaysia. Regardless of origin, the main importing countries are India (19.4%), China (13.0%), Netherlands (6.1%), Pakistan (5.8%) and Italy (4.3%). This makes Asia the main market, absorbing 51% of total imported CPO and its derivatives, followed by Europe (26%), Africa (12%), the Middle East (4%), and Latin and North America (7%). About 45% of total European imports of palm oil in 2014 were consumed in biodiesel for the transportation sector (Transport and Environment 2016). Interestingly, due to the slowdown of the Chinese and Indian markets, the Malaysian and Indonesian industries are trying to diversify their markets to the Middle East and Africa, as well as boosting the domestic markets.



Map 1. Exports of palm oil and its fractions, originating from Malaysia based on information from the International Trade Center (2016).



Map 2. Exports of palm oil and its fractions originating from Indonesia based on information from the International Trade Center (2016).

Palm oil is a buyer-driven commodity. The expansion of production has to a large extent mirrored the significant growth in demand for palm oil from the global markets. Palm oil competes globally with other vegetable oils, but predominantly soybean. Unsurprisingly, CPO and PKO have followed the international market cycles of other food commodity crops, with price peaks in 2008 and 2011, followed by a gradual decline in prices (Figure 4). In recent years, following the slowdown of Asian market imports, there has been a growth in palm oil stocks in Malaysia and Indonesia, which has also contributed to a decline in prices. Prices are slowly recovering following a reduction in the available global supply as palm oil stocks have diminished, as biodiesel markets have expanded since 2015 and annual yields have dropped due to climatic events (FAO 2016b).

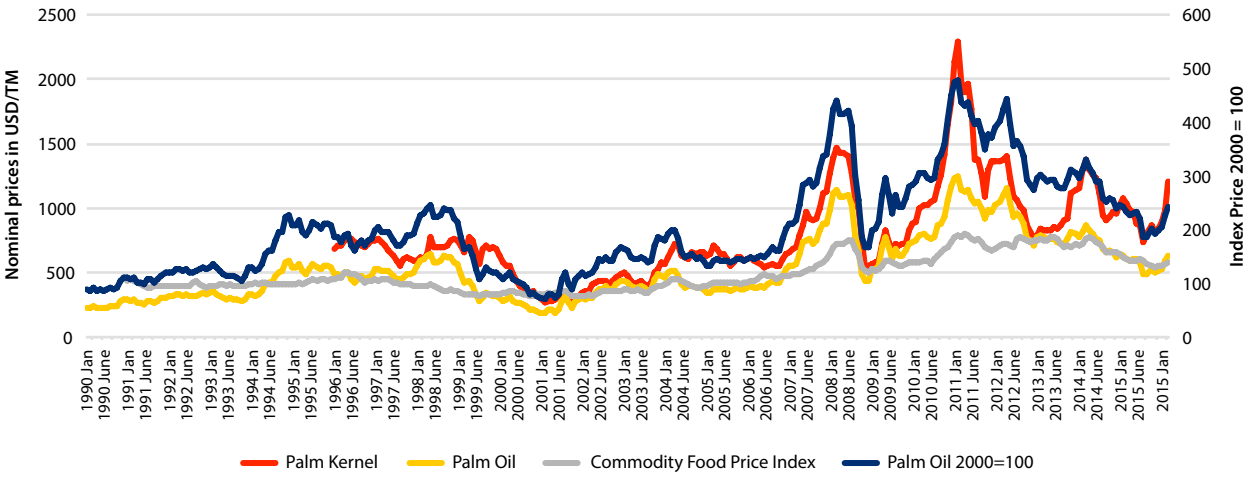


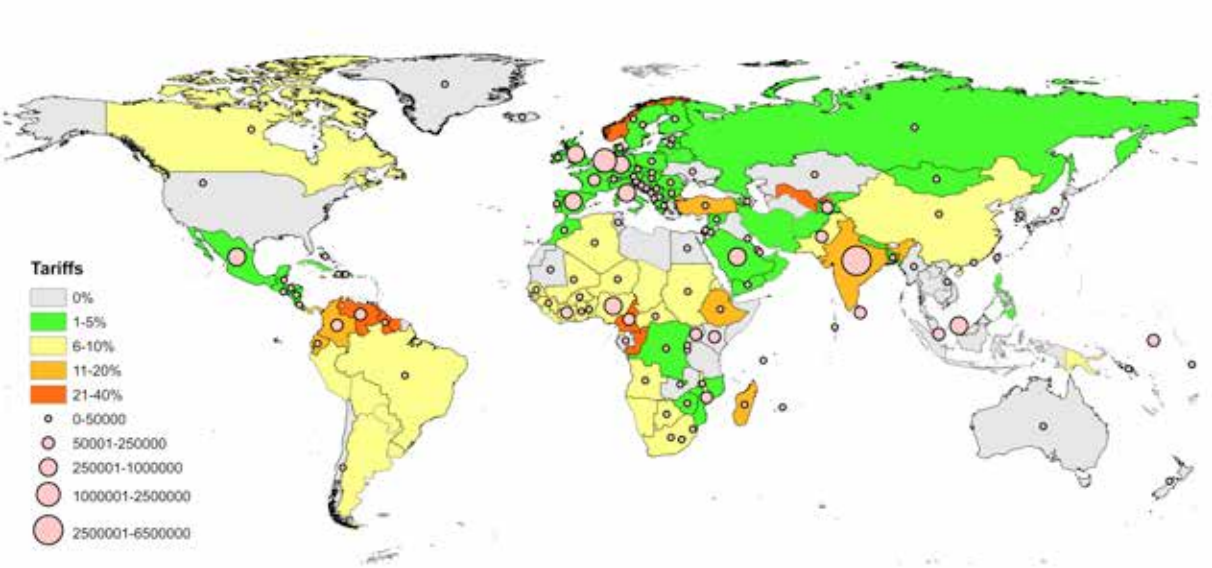
Figure 4. Trends of international prices of palm kernel oil and palm oil (USD/TM) based on information from IndexMundi (2016).

2.2.3 Tariffs and other trade instruments

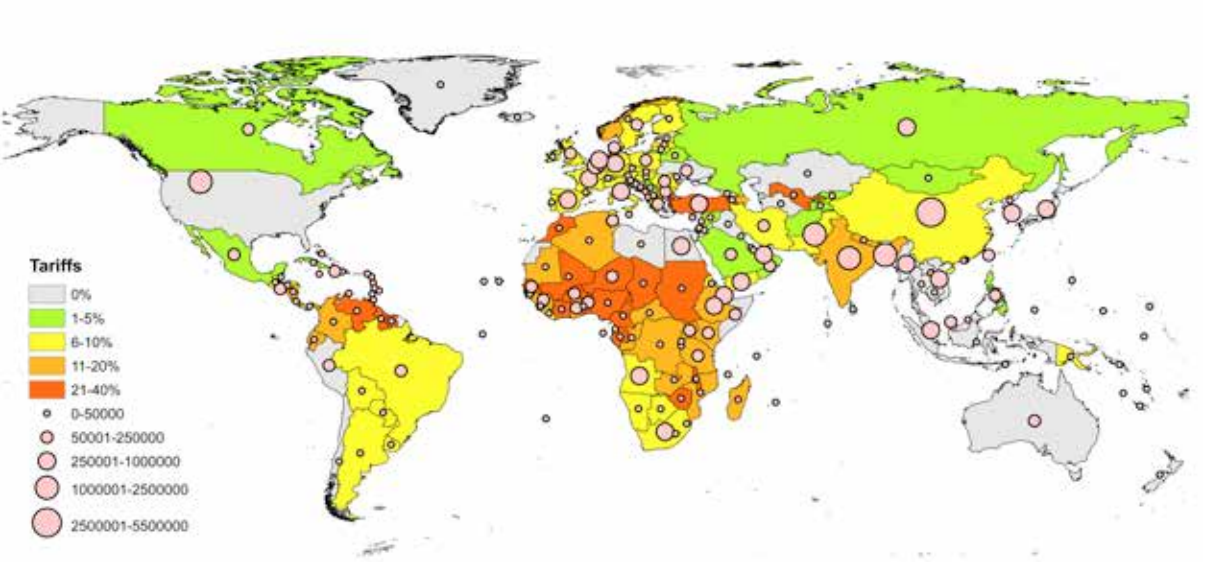
Most countries apply relatively low tariffs, measured as the *ad valorem* equivalent tariffs, to imported crude palm oil (CPO) and refined palm oil (RPO). European Union countries apply a tariff of 1.9% to CPO, and 9% to RPO, and China 9.0% and 8.5%, respectively (ITC 2016). India is an important CPO importer but gives little consideration to the sustainability of production (Das 2014). In an attempt to stem cheap palm oil imports and protect its domestic vegetable industry, India increased its import duties on palm oil in 2015, from 7.5% to 12.5% for CPO and from 15% to 20% for RPO (Abraham and Raghu 2015). This is one of the highest tariffs applied to palm oil originating from Malaysia and Indonesia. These tariffs have had a limited impact on Indonesian palm oil exports to India (Maps 3 and 4).

When exporting unrefined CPO, Indonesia gains little of the value added from processing. Therefore, the Indonesian Government applies no export tariffs to RPO, in order to encourage investment in palm oil processing facilities within Indonesia. Indonesia is also seeking to reinforce its position in the global market with regard to Malaysia, which processes a significant amount of Indonesian-produced CPO. As such, since late 2014, the Indonesia Government has stipulated that when the CPO price slips below USD 750 per metric ton (calculated using international and local CPO prices), a 0% export tariff is applied to unrefined CPO as well. Such duty-free palm oil exports aim to boost global demand and therefore prices (Indonesia Investments 2015).

However, in order to maintain state revenues from palm oil exports, the Indonesian Government introduced a USD 50 per metric ton charge on CPO shipments when the international prices are below the USD 750 per ton threshold. A government fund has been created with the resulting revenues, the so-called CPO fund. These revenues are to be channeled in part to the biofuel subsidy program, and in part to support oil palm replanting on smallholder lands to boost the palm oil sector's overall productivity. However, when CPO prices exceed the USD 750 per ton threshold, then a CPO export tax is reintroduced (ranging from 7.5% to 22.5%), and the per ton levy would be removed (USDA 2015).



Map 3. Total *ad valorem* equivalents tariff for crude palm oil from Malaysia and Indonesia based on information from the International Trade Center (2016).



Map 4. Total *ad valorem* equivalents tariff for refined palm oil from Malaysia and Indonesia based on information from the International Trade Center (2016)

An interesting development has been the additional demand for palm oil generated by the European biofuel market. This increased demand is a mixed blessing for growers, however, as it also comes with stringent production standards. The EU Renewable Energy Directive (RED) set ambitious targets to replace at least 20% of its total energy needs with renewables by 2020, including at least 10% of its transport fuels. A percentage of these renewables were supposed to originate from feedstocks such as palm oil for biodiesel, prompting an increase in exports to the EU. Concerns began to emerge, however, that demand for biofuel feedstocks, based on EU policies, was affecting people's access to food and driving forest conversion. This inevitably led to a revision of EU policy. In 2015, a revised policy made explicit that a maximum of 7% of biofuels used could be derived from crops grown on agricultural lands. Standards were also put in place for palm oil imported to the EU for biodiesel, particularly with regard to carbon savings and biodiversity protection (European Commission 2016).

2.3 Structure of the global palm oil value chains

2.3.1 Main buyers for palm oil and its derivatives

Processors and traders are supplying to a diversified number of end-users. These include a wide range of CGMs and retailers delivering a range of products in the food, chemical, pharmaceutical and cosmetic industries. While much processing and refining of CPO and PKO take place in Indonesia, Malaysia and Singapore, most manufacturing takes place in the countries of consumption and in China, where transnational corporations manufacture products for consumers around the world.

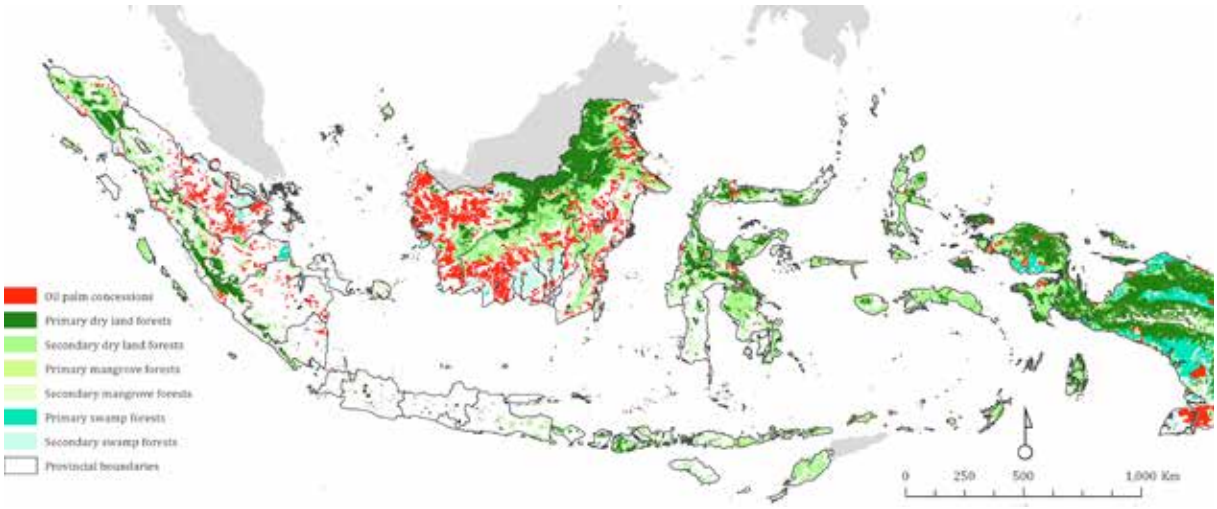
The palm oil processing industry is well developed in Malaysia, where companies maintain higher comparative advantage based on their efficiency (Abdullah et al. 2015). Indonesian companies have been able to slowly expand their palm oil refining capacity over time, thanks to government incentives aimed at capturing more of the added value from manufacturing in the country. Over the last few years, major corporations involved in production and trade have been investing in their refining capacity rather than in expanding their own plantations, so as to absorb the growing supply of CPO and PKO from medium-scale producers and smallholders.

Consumer goods manufacturers and retailers in Western markets have been key drivers in recent sustainability commitments related to palm oil. Major NGOs and advocacy groups have targeted consumer brands and reputations, such as Nestle, Unilever, Krispy Crème and Dunkin Doughnuts, to leverage change among their suppliers (Bregman 2015).

Unlike the cocoa and coffee markets, which are dominated by a handful of retailers and manufacturers, the challenge with the palm oil industry is that the uptake of palm oil is highly fragmented, One of the biggest consumers is Unilever, which consumes 4% of the world's supply of palm oil (Unilever n.d.). This means that individual consumer goods manufacturers and retailers have limited influence and leverage on the supply chain and the sustainability standards of production. Imposing standards on producers is particularly challenging, as a large proportion of palm oil is manufactured and sold in India and China, countries whose consumers are more price sensitive and less concerned with sustainability. Instead, the palm oil supply chain forms bottle-necks at the refining and trading stages, as it is channeled through a relatively small group of processors and traders.

2.3.2 Downstream companies and upstream suppliers

The palm oil sector is dominated by a handful of conglomerates involved in production, processing and trade (i.e. Wilmar, Musim Mas, GAR, Cargill and Asian Agri in Indonesia and Sime Darby and FELDA in Malaysia). These groups source palm oil from their own plantations as well as from a large number of third-party suppliers. According to the Malaysian Palm Oil Board (MPOB), in Malaysia, there are 445 FFB mills, 44 PK crushers, 52 refineries and 19 oleochemical plants (MPOB 2016b). According to the dashboards published by the five major corporate groups in Indonesia, they control an



Map 5. Oil palm concessions in Indonesia. Land cover information for 2013 is based on data from the Indonesian Ministry of Forestry and the information on oil palm concessions was taken from Greenpeace (n.d.) based on data provided by the Planning Department of the Ministry of Forestry for 2015, which is not official and so is used only for illustrative purposes.

estimated 40 refineries, source from about 850 mills, and control about 1600 plantations.[1] The official Government of Indonesia data present lower estimates (Statistik Indonesia 2015). The five major groups control about 60% of the national production, but their market share in processing and trade reaches about 90% of total supply (AgroIndonesia 2015).

According to MPOB (2016a), in 2015, about 5.6 million ha of oil palm had been planted in Malaysia, and 2.6 million ha of this was located in Peninsular Malaysia. This planted area corresponds to private companies (61%), smallholders (16%), FELDA (13%), state agencies (6%), the Federal Land Consolidation and Rehabilitation Authority (FELCRA) (3%) and the Rubber Industry Smallholders Development Authority (RISDA) (1%).

Information about the number of companies, their ownership and the size of their land holdings is unreliable in Indonesia. Official numbers estimate that 10.4 million ha of palm oil had been planted by 2013. Private companies control (51%), smallholders (42%) and state-owned companies (7%) (Directorate General of Estates 2014). The total land area that has been allocated for oil palm concessions is estimated to be much larger. Some predictions indicate up to 15 million ha (see Satriastanti 2016), while a map disclosed by Greenpeace suggests that the total land occupied by concessions could reach 19 million ha (see Map 5). Not all the land allocated for oil palm has been developed, and an important portion of the total planted area is occupied by independent smallholders. These registries also include oil palm concessions at different stages in the approval process and it is unknown how many have obtained final approval by the central government (HGU). Others will likely never complete the process. Clarifying the status of oil palm plantations in Indonesia remains challenging, as Indonesian law makes it illegal to share information about concessions boundaries (see Jacobson 2016).

1 Official statistics on medium- and large-scale industries show there were 548 CPO-processing companies, 43 cooking oil companies and 35 oleochemical companies in 2013 (Ministry of Industry n.d.). According to the Central Statistical Agency, there were 1604 oil palm companies in 24 provinces in Indonesia, 96% of which were located in Sumatra and Kalimantan (Statistik Indonesia 2015).

In Malaysia, licenses for the development and operation of palm oil mills are issued to a company only if it possesses its own (matured) plantation of at least 4000 ha, or has access to plantations belonging to its group or subsidiary companies. In Indonesia, similar rules applied in the past – currently, however, only independent mills without their own plantations, and whose only source of FFB is from independent growers, are permitted. This has stimulated the growth of independent mills in established oil palm areas.

The processing capacity of FFB palm oil mills varies from 10 tons/hr to 96 tons/hr. Mills that have a processing capacity of 20 tons/hr or less are considered small. In recent years, the number of mills and refineries has grown in Indonesia, which is contributing to greater sector integration and therefore improved efficiency (Table 3).

FFBs are transported from plantations to mills where they are processed into CPO and KPO. Transportation is limited to an area of 50–100 km, due to the rapid deterioration of the fruit quality after harvesting. Once the FFB is milled, the resulting CPO is transported to the refinery, which are often located in main export ports (Map 6). Often, large-scale mills and those integrated into estates tend to be more efficient than smaller and less-integrated mills (Azman 2014). Mills located closer to areas of production also tend to produce better quality CPO and have a higher oil extraction rate. Only the major corporate groups have been able to invest in their own refining capacity, which gives them greater control over the market, and greater direct access to downstream buyers. Figure 5 depicts the main actors and simplified flows in the global palm oil supply chain, and presents variations across sites.

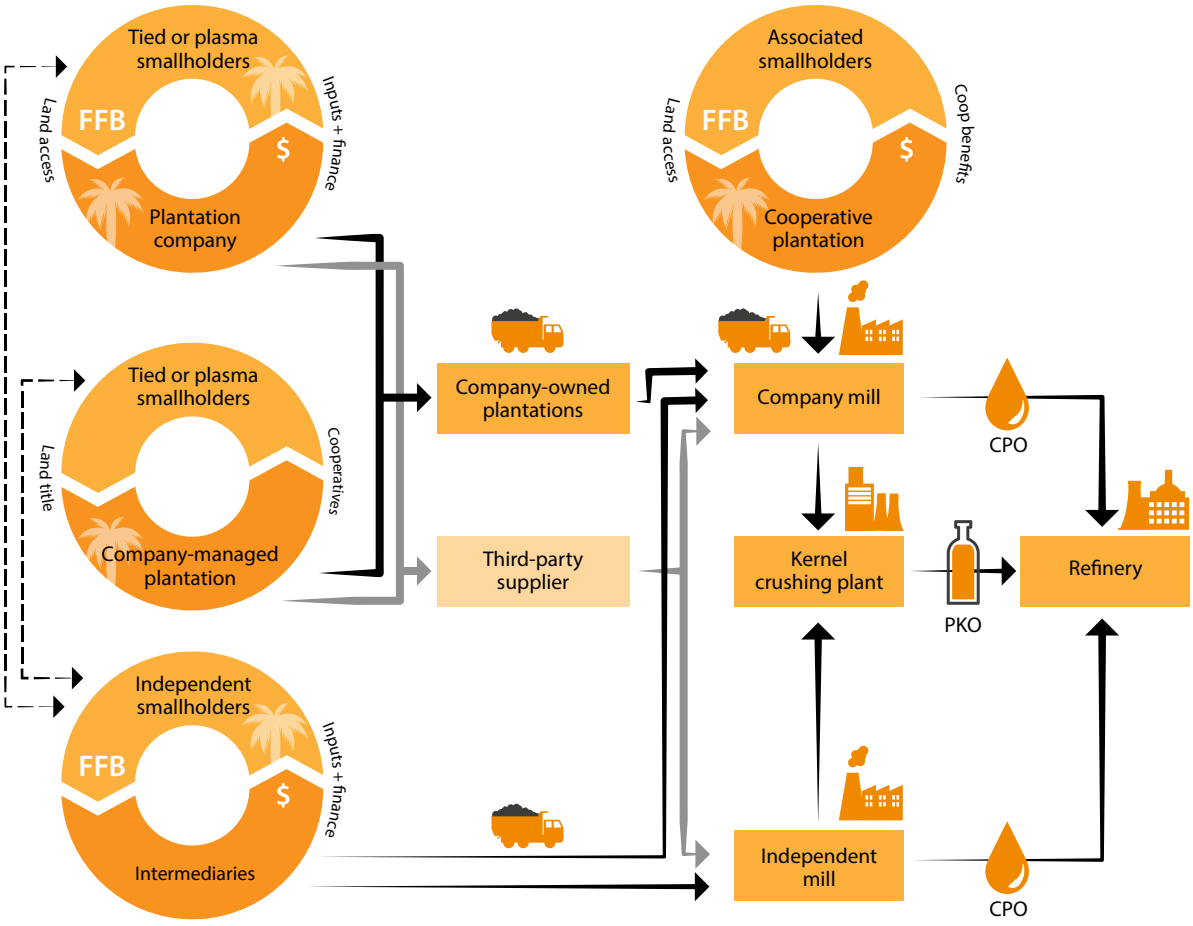
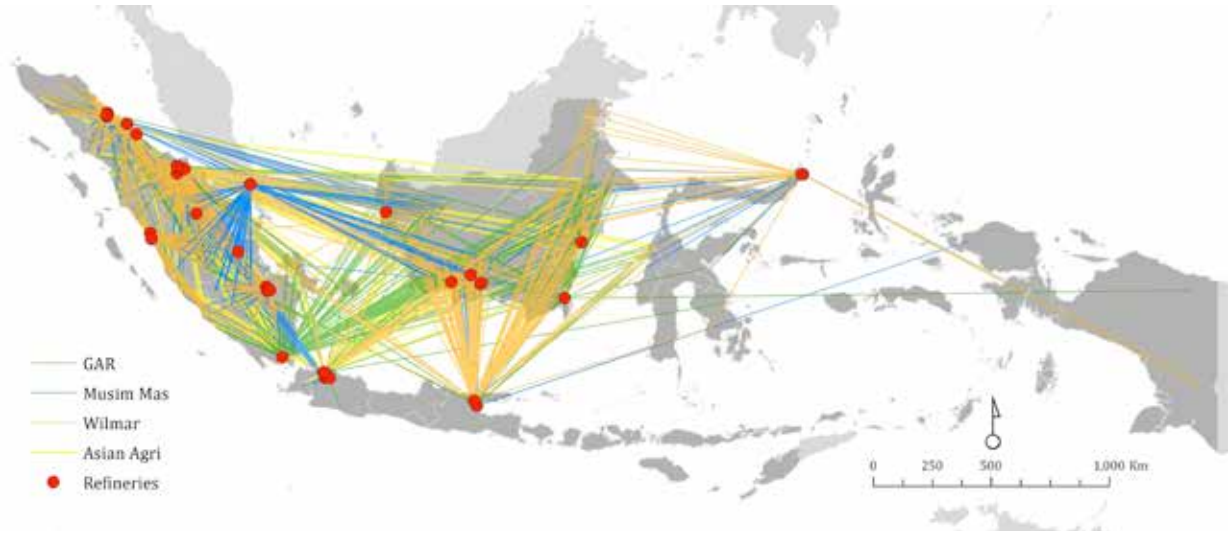


Figure 5. Simplified palm oil value chain. Authors' elaboration, taking elements from Suharno et al. (2015) in reference to circumstances in Central Kalimantan, and the description of the palm oil supply chain by Musim Mas (2015) in Indonesia.



Map 6. Supply networks for palm oil from mills to refineries in Indonesia. This information is preliminary and based on dashboard from companies, and is provided for illustrative purposes.

Smallholders have begun to adopt oil palm as a key agricultural crop and have been growing rapidly in number and area, both in Indonesia and Malaysia. Out of a total 5.6 million ha of planted oil palm in 2015, there were roughly 0.68 million independent smallholders, holding a total of 0.90 million ha of planted oil palm in Malaysia. (MPOB 2016a). In Indonesia, there are 1.46 million smallholders controlling about 4.3 million ha. This includes both tied and independent smallholders (Directorate General of Estates 2014).

In Indonesia, the majority of smallholders are located in Sumatra where the oil palm sector is well established and plantations are mature. There are fewer smallholders in Kalimantan where industrial plantations tend to dominate. In most situations, smallholders develop in the small gaps between larger oil palm concessions (Map 7). Lately, however, there has been a significant increase in the number of medium-scale oil palm investors, including local elites and absentee landholders with sharecropping contracts (Ekadinata et al. 2013).

Map 7. Oil palm plantations as share of total district area in 2013 (in %) based on information from the Directorate General of Estate Crops (2015).

According to van Noordwijk et al. (in press), the relationship between mills and FFB suppliers is to a large extent shaped by the context. In the Malaysian model – and still prevalent in older oil palm areas of Indonesia – mills have contracts with smallholders who are seen as 'outgrowers,' and are managed through a range of contractual structures mediated by government agencies or companies. In new oil palm zones and forest frontiers, the 'nucleus estate – plasma' scheme tends to dominate. Under this model, the company obtains rights to develop the plantation on local community lands, clears the area and develops the plantation, a major portion of which (80%) is often owned by the company while 20% is planted for smallholders. However, the company may choose to manage the whole operation under a 'one-roof-management' scheme.

Plantations also tend to attract immigrant workers for both permanent and casual labor in the plantations. A portion of these workers, when they accrue enough savings, opt to buy land and develop their own independent small-scale oil palm plantations, on lands that are often acquired from local villagers. As a result, immigrants contribute to the expansion of smallholders in production zones.

2.3.3 Contribution of palm oil to the economy

Oil palm is one of the most dynamic commodity crops in Southeast Asia, and has made important contributions to economic development in Malaysia and Indonesia. But its economic impact has varied significantly. The palm oil sector provides about 3.8% and 1.8% of GDP in Malaysia and Indonesia, respectively. Palm oil production is also more labor intensive than other agricultural activities, contributing to employment opportunities (Table 3). The palm oil industry in Malaysia is more heavily connected to other production sectors in comparison with Indonesia. This results in a greater multiplier effect, and as such, has a much more pronounced influence on the Malaysian economy than on the Indonesian (Jaafar et al. 2015).

In Indonesia, the estimated contribution of the palm oil sector to national tax revenues in 2012/2013 ranged from USD 0.8 to USD 1 billion. This equates to only 1% of the total Indonesian tax revenue for 2013, which reached USD 103 billion for that year, of which the agricultural, forestry and fishery sectors contributed USD 1.6 billion (Falconer et al. 2015). Tax collection from the palm oil sector in Indonesia is dominated by export tax (64%), and to a lesser extent by land and buildings tax (15%) and income tax (15% including individual, corporate and land and building seller taxes).

Table 3. Palm oil contribution to key economic indicators in 2013.

	Malaysia	Indonesia
Total production, KPO (million tons)	2.3	5.5
Total production, CPO (million tons)	19.2	27.8
Total exports, CPO (million USD)	2.99	4.98
Total exports, palm oil fractions (million USD)	10.08	13.56
No. of jobs in the palm oil sector (millions)	0.44	3.72
No. of smallholders in the palm oil sector (millions)	0.68	1.46
Total GDP (million USD)	310,616	793,728
Agricultural GDP (million USD)	28,278	106,254
Palm oil sector GDP (million USD)	11,756	14,279
Agricultural GDP / Total GDP (in %)	9.1	13.4
Palm oil sector GDP (million USD) (in %)	3.8	1.8

Sources: Malaysia: Department of Statistics Malaysia (2015), ITC (2016). Indonesia: Central Statistical Agency (2015), Ministry of Agriculture (2015), and ITC (2016). The year 2013 was selected since it is the last year for which official statistics in both Malaysia and Indonesia are considered final. Assumed exchange rate is MYR 3.28 per USD for Malaysia, and IDR 12,000 per USD for Indonesia.

The tax-to-GDP ratio of the palm oil sector in Indonesia is about 7%, significantly lower than the average tax-to-GDP ratio for the country overall, which was 12.3% in 2012 and averaged around 13% for other sectors such as manufacturing, electricity and gas (Prastowo 2014). In addition, many of these fiscal earnings are retained at the central government level, with only 11–14% being redistributed back to local governments. It is noteworthy that the national government has different channels for distributing fiscal resources to provinces and districts, including social programs that even reach the village level, targeting the most vulnerable social groups.

3 Socioenvironmental impacts and trade-offs

3.1 Socioeconomic impacts of oil palm development

3.1.1 Large- versus small-scale agribusiness expansion

Oil palm agriculture has expanded through different business models. However, in most of the situations, large-scale, monocrop plantations were given preference and privilege by state and private investors. Most expansion in Malaysia and Indonesia has taken place in medium- and large-scale monocrop estates.

These estates have included smallholders through a range of different partnership schemes. In some cases, plantations have integrated smallholders through 'outgrower' schemes, while others have expanded into smallholder lands through rental agreements. In Malaysia, the government has established resettlement schemes for landless poor or local landholders, orientated around palm oil plantations, while in Indonesia, smallholders are developing operations independently and linking to companies through cooperatives and associations (Figure 6). Independent smallholders and cooperatives are also more common in Africa and Latin America.

In Malaysia and Indonesia, oil palm expansion has taken place mainly through medium- and large-scale monocrop plantations, either state owned or private. In Indonesia, private companies are leased public lands, which are granted through concession permits. The Nucleus Estate and Smallholder (NES) scheme was set up in 1979, supported by the World Bank. Under this scheme and its various successors, such as the *Perkebunan Inti Rakyat-Trans* (PIR-Trans) program (1986–1994) and the *Koperasi Kredit Primer Anggota* (KKPA) scheme (1995–1998), a company develops the lands leased to it from the government (nucleus) as well as lands belonging to smallholders (immigrants or local people), who are tied to the company through partnership agreements. As part of these schemes, plasma smallholders were provided with government loans disbursed through several state-owned banks (Caroko et al. 2011). The loans are provided to the nucleus plantation company, which then lends these sums to the plasma shareholders to finance the planting of oil palms. The interest on these long-term

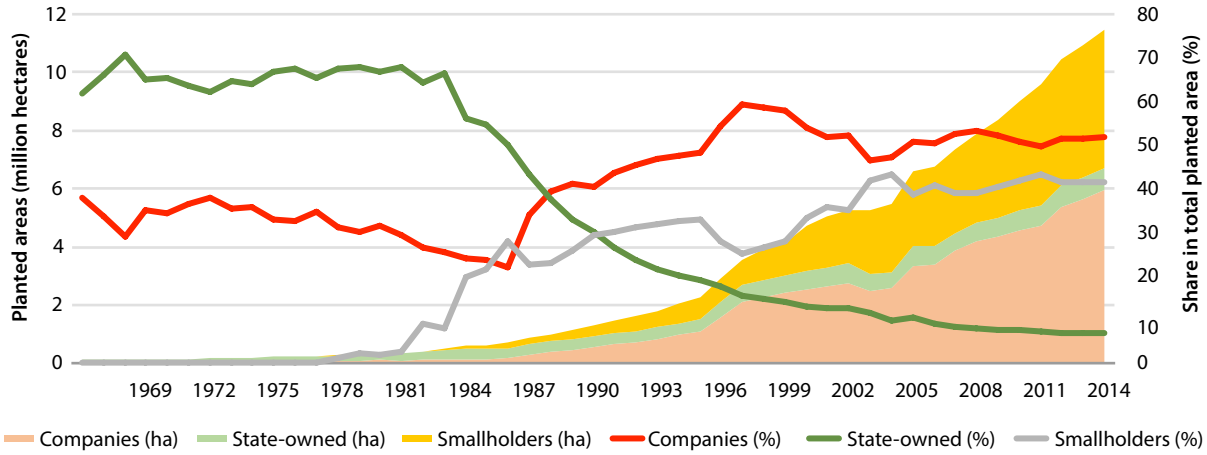


Figure 6. Oil palm expansion in Indonesia by type of actor based on information from the Directorate General of Estate Crops (2015), final data to 2013 and estimated to 2015.

loans is repaid by a deduction from the price the smallholders get for their FFBs, thus reinforcing their dependence on the nucleus plantation company (Molenaar et al. 2010; Cramb and McCarthy 2016). In other cases, companies manage the plantation under a modality known as one-roof-management, in which they develop and manage the smallholders' lands and pay a rent on the basis of individual land contributions.

Increasingly, however, smallholders are developing their operations independently from the nucleus estate, by aggregating and linking to companies through cooperatives and associations. This latter type of independent smallholders is more commonly found in Africa and Latin America. Independent smallholders tend to develop the plantations on their own, and depend on intermediaries for selling the produce as well as accessing inputs and credit.

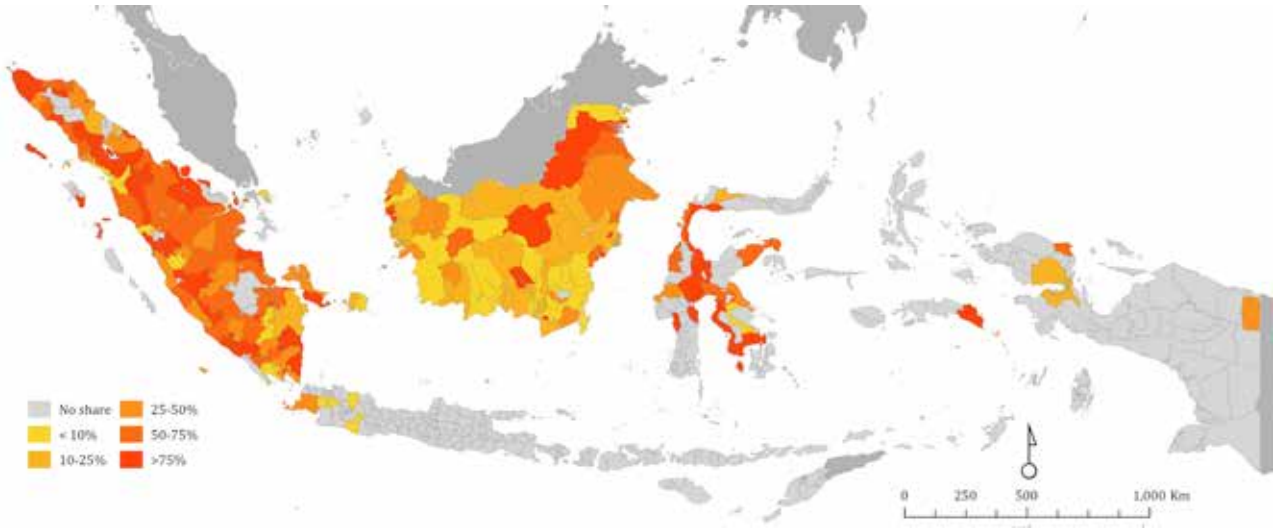
Table 4 summarizes the main features of these different types of producers and schemes, distinguishing whether they are present in Malaysia, Indonesia, or both. It draws on a typology that was developed by Cramb and Curry (2012) for countries in Southeast Asia. This is only a simplified description of the different schemes, since important variations may occur.

Table 4. The most typical forms of oil palm production in Malaysia and Indonesia.

Forms of production	Characteristics	Countries
Estates (medium- and large-scale plantations)	• Private and/or state owned • National and/or foreign investments • State land or customary land	Malaysia and Indonesia
Managed smallholder schemes	• Resettlement schemes for landless poor or existing landholders • Landholders manage own lots or agency manages whole scheme	Malaysia
Nucleus Estate and Smallholder (NES) scheme	• Private or state-owned plantation company as nucleus, and settlers on state land and/or local customary landholders as 'plasma' or 'outgrowers' • Smallholders receive planting material, inputs, credit and technical advice	Indonesia
Joint-venture schemes	• Customary land is consolidated in a trust held by a government agency that forms a joint-venture company with private investors • Customary landholders issued with communal title, conditional on development by a private or state-owned plantation company • Partnership schemes through which the company develops and manages land for farmers and pays a rent on the basis of individual land contributions	Malaysia (Sarawak) Malaysia (Sabah) Indonesia
Medium-scale landholders	• Absentee landholders managing their land directly or under sharecropping agreements with local producers • Often formal direct access to mills and sources of commercial credit	Indonesia
Independent smallholders	• Self-managed smallholders depend on intermediaries for selling the produce and accessing inputs and credit • Some independent smallholders can be associated in cooperatives	Malaysia and Indonesia

Source: Adapted by authors from a typology developed by Cramb and Curry (2012).

The statistics detailing the number of smallholders involved in the different schemes are limited. In Indonesia, of the 1.46 million smallholders engaged in the palm oil sector, about 20% are tied to companies through different partnership schemes, while 80% are independent. Unfortunately, the number of the smallholders who are members of functioning cooperatives remains unknown, as is the number of medium-scale landholders in production zones. There are greater numbers of both independent smallholders and those operating under schemes in Sumatra than in Kalimantan, because oil palm agriculture originated in Sumatra. As processing and transport infrastructure have developed only relatively recently in Kalimantan, independent smallholders remain low in number (Map 8). In addition, the industrial palm oil plantations employ about 0.44 million and 3.72 million permanent and seasonal workers in Malaysia and Indonesia in 2013, respectively (see again Table 3).



Map 8. Smallholder share of total oil palm areas by district in 2013 (in %) based on information from the Directorate General of Estate Crops (2015).

3.1.2 Wider social impacts from oil palm expansion

A study of the poverty impacts of oil palm plantations across Indonesia, based on a multiregression analysis on nation-wide district panel data, suggests that oil palm expansion in the country has delivered positive outcomes in terms of poverty reduction. Increasing the palm oil share of land devoted to oil palm agriculture in a district by 10 percentage points would correspond to a 10% reduction in the poverty rate, and a narrowing of the poverty gap (Edwards 2015). The same author argues that this effect is more evident when looking at large-scale plantations, and finds no evidence of immediate impacts associated with smallholder expansion. However, smallholder expansion could have similar economic impact to that of large-scale plantations in a few more years. In addition, oil palm expansions would correspond to a small boost in the value of land, agricultural output, manufacturing output and district GDP, suggesting positive spillover effects through local production or consumption linkages.

The establishment of large-scale oil palm plantations and processing units is an important economic activity that strongly influences the rate of land development in a region, including additional plantation expansion and greater milling capacity. It speeds up the development of infrastructure (e.g. the construction of roads to open up less accessible areas, and the provision of health and educational facilities) and stimulates the growth of the local economy as plantation workers spend their earnings locally and the plantation company itself makes use of local services. Economic diversification may also take place in the surrounding area, for example, moving from subsistence agriculture to market-oriented cash crop production. Urban employment opportunities may also subsequently increase (Budidarsono et al. 2013).

Empirical research carried out in Riau Province, Sumatra – where a large portion of land has been converted to oil palm – assessed the development impact of large-scale oil palm plantations on the local economy. It showed that the investment in palm oil production strongly induced local economic growth. About 84% of the additional income earned from oil palm plantations was spent locally, considering that nearly three-quarters of the necessary inputs needed were provided locally. Budidarsono et al. (2013) estimates that IDR 1 million change in income (or investment expenditures) in Riau Province could deliver a change of IDR 2.48 million. The same authors, based on a sample of 516 villages across Indonesia – of which about 60% are dominated by oil palm – find that oil palm-dominated villages perform positively on almost all development indicators, i.e. income, schools, shops, access to electricity, roads, health institutions and banks. Interestingly, the oil palm villages are characterized by a process of wealth accumulation and investments in the non-farm sector (Löffler et al. 2014).

Despite its positive impacts on economic growth, oil palm expansion is also associated with adverse incorporation (McCarthy 2010). Social exclusion of local indigenous groups has consistently accompanied the expansion of large-scale plantations in frontier lands, facilitating dispossession of native populations that held customary rights over lands taken over by companies (Colchester et al. 2011; Li 2015). While oil palm expansion has clear economic benefits and has become a lucrative option for many smallholders, this option is often only available to the most capitalized farmers, who have the investment capital available to open up land and develop new plantations. In many cases, immigrants have benefited more than native people (Rist et al. 2010). In addition, not all experiences with schemed smallholders have been positive. In some cases, native populations have been forced to give up their lands due to oil expansion by companies (Potter 2008) and those who cannot afford to invest in oil palm are faced with rising prices for food and non-food items.

Plantation development has triggered important internal migration, from more populated areas of Indonesia, mainly from provinces located in Java, to rural areas in Sumatra and Kalimantan, as a result of increased demand for seasonal workers (Pye et al. 2012). Oil palm development has also stimulated migration by Indonesian workers to Malaysian plantations (Tirtosudarmo 2009), where labor is scarce. It can be argued that, considering the slow absorption of labor in urban areas, the palm oil sector has made an important contribution to the generation of job opportunities and income in rural areas. In addition, many immigrants and native populations who embrace oil palm production, may not always have the family labor required to maintain their plantations, so are forced to hire wage workers as well.

Spontaneous immigration continues to supply the workers needed in production zones. For example, about a quarter of the population in Riau Province are migrants, and their numbers continue to grow. This province is not only attracting second-wave migrants from Java, but also large numbers from other northern and southern Sumatra provinces. Some of the immigrants were formerly wage-workers on oil palm plantations who have managed to save enough money to establish their own small-scale plantations, and others are domestic investors buying up larger areas, sometimes up to several hundred hectares. They invite smallholders to cultivate oil palm through share-cropping agreements. In addition, local communities see that oil palm farmers earn more money and are able to increase their assets, which encourages them to also plant oil palm (Löffler et al. 2014). Since oil palm is produced for the most part in large plantations or by wealthy smallholders using migrant labor, oil palm agriculture may lead to increased income disparities and inequality within a region (Obidzinski et al. 2014).

3.1.3 Income differences among smallholders versus workers

Oil palm plantation workers are both permanent and temporary, hired by plantations under different conditions, while smallholders may be either immigrants or native, producing oil palm with different degrees of specialization. The social groups involved in the upstream production of palm oil do not form a homogeneous group, and it is increasingly recognized that smallholders and plantation workers may actually constitute a very diverse group, not only in terms of their scale of production but also their social and cultural attributes. The benefits obtained from oil palm vary across groups.

Oil palm plantations employ both permanent and seasonal, or casual, workers for different types of activities including planting, weeding, applying fertilizers, harvesting, cleaning channels and other tasks. Plantation workers, native or immigrants, are often employed for harvesting while other activities are carried out by casual workers. Permanent workers in the large plantations generally experience better conditions than their peers in medium-sized plantations. These conditions include compliance with official labor standards and migrations regulations, as well as training, subsidized housing, treated water supply, electricity, insurance (Norwana et al. 2011) and other basic social services (i.e. health, education) (Obidzinski et al. 2012).

Often companies prefer to hire immigrants rather than local people as plantation workers, since the former may dedicate more time and effort to their activities. Plantation companies outsource many tasks to specialized labor contractors who set their own conditions and allow workers to carry out activities under more precarious labor conditions and fail to deliver the same employment benefits. Both male and female workers are employed with different responsibilities. Males are often hired for harvesting activities while women are employed as casual labor for weeding, cleaning and applying fertilizers. Women's labor conditions are often more precarious than men's (Li 2015).

Over time, the local labor supply has increased in areas with established plantations. As such, some companies have shifted from recruiting families for permanent positions with associated housing and schooling, to recruiting individual males for permanent positions and then contracting casual labor, often women, for low-paid and more seasonal jobs (Li 2015). This has a detrimental impact on the social structures surrounding plantations.

Immigrant plantation workers who invest in their own smallholder plantations often suffer from limited access to good quality seedlings, agricultural inputs and technical assistance, resulting in operations with comparatively low yields (Budidarsono et al. 2013). Plasma smallholders may also invest their savings in additional, independent oil palm plots and a significant portion of local villagers have gradually converted their farmland to oil palm, shifting from more diversified mixed subsistence and cash income production systems to ones dominated by oil palm (Feintrenie et al. 2010). This has translated into larger income streams from these farmers, but has increased their vulnerability to market forces (Rist et al. 2010).

No studies exist that systematically assess the impacts of palm oil sector development on this diverse group of local actors, only studies of scattered cases in different locations. Evidence suggests that farmers tied to companies under plasma schemes tend to obtain better incomes than independent smallholders since their yields are also higher. However, much of the income obtained (other conditions being equal) is associated with the yields obtained (Lee et al. 2011). Permanent plantation workers also tend to be better off than smallholders, both plasma and independent, since they obtain higher and more regular salaries from oil palm agriculture than do smallholders from their income streams. This is not the case for temporary or casual labor, which may include independent smallholders trying to supplement their cash incomes.

Obidzinsky et al. (2012), based on analysis of three cases in West Papua (Manokwari), West Kalimantan (Kubu Raya), and Papua (Boven Digoel), argue that all local groups that depend on oil palm for their living, i.e. plantation employees, out-growers and investing households, reported significant economic gains. But these benefits are not evenly distributed since employees tend to benefit more. Other stakeholders, particularly traditional landowners, experienced restrictions on traditional land use rights and ultimately land losses. A study in Central Kalimantan looking at differences across three different smallholder models (cooperative plasma models, company-managed plasma and independent smallholders) finds that the first two models perform better than independent smallholders, because they obtain higher yields per hectare and operate more efficiently, reducing their costs (Suharno et al. 2015). In turn, the authors argue that there is significant potential to improve productivity and profitability among independent smallholders who are achieving only 52% of their potential yields and the lowest profits for all sample farmers.

When comparing across smallholder systems, smallholders cultivating oil palm under specialized monocrop systems tend to earn more than those practicing more traditional diversified agriculture and combining perennials such as coffee, cocoa and rubber, with rice and other cash crops. Feintrenie et al. (2010) argue that during the past three decades, the increased income obtained from monocrops – oil palm, rubber, cocoa – has driven the conversion of traditional agroforesty systems into more productive monoculture plantations, and that smallholder farmers have been reacting rapidly to the economic opportunity of increased household incomes offered by specialized systems. These authors find that net returns to land and labor are comparatively higher in monocultures as compared with agroforests, and that monocrop rubber and oil palm plantations are highly profitable; yet, while net return to land is on average higher for rubber monoculture than for oil palm, net return to labor in oil palm production is almost double that of rubber monocrop systems.

3.1.4 Impacts on shifting production dynamics and food systems

Oil palm expansion, as mentioned above, is driving the conversion of agroforestry systems and food crops. This trend, however, is not well understood as data are limited. There are three dimensions to the food security problem. The first is related to the availability of food as result of the displacement of food crops by industrial crops – those that require processing to be consumed, such as palm oil. The second is the capacity of rural households to access food from markets, which is related to their income levels and to the availability of food substitutes in the market. The third is related to the quality in terms of nutrients of the food acquired in the market that replaces the food produced on farms.

With regard to the first dimension, it is a well-understood fact that oil palm expansion has occurred to the detriment of some food crops, notably rice. The production area for rice has fallen in both Jambi and Riau provinces, due to the rapid expansion of oil palm (Löffler et al. 2014). In a survey of 255 randomly selected oil palm farmers in eight villages near the forest frontier of Riau Province, Löffler et al. (2014) find that 46% of farmers had planted oil palm on areas that had previously been used to produce food. These findings were confirmed by an analysis undertaken at the province level, which shows that around 8000 out of 20,070 ha of rice fields were converted into oil palm plantations between 2002 and 2009 (Löffler et al. 2014). This is a trend mirrored by other provinces. While the profitability of oil palm may be the major driver behind this shift, anecdotal evidence also suggests that increasingly unpredictable rainy seasons are having an influence.

As a consequence, Riau Province has become a net importer of rice, along with other food items, including fruits. It can also be argued, however, that this is in fact a result of the growing purchasing power derived from higher incomes because of palm oil agriculture. This additional income gives farmers, as well as other local people, greater access to purchasable food items. Although the income earned from oil palm cultivation enables local people to buy their food in shops, the reduction in rice production has become a national concern. Falling rice production has wider implications for food sovereignty and has made the country more vulnerable to internal price fluctuations. As such, the Indonesian Government has made rice production, including its intensification, one of its major agricultural policy concerns. This is considered important for national stability, as rice accounts for a relatively large share of household expenditures in the country (Löffler et al. 2014).

3.1.5 Opportunities to upgrade small-scale oil palm producers

As discussed previously, while palm oil yields in Southeast Asia are by far the highest, they are still far below the maximum achieved in field trials. Both plant breeding and variations in production systems account for this yield gap. According to Donough et al. (2009, 2010) the gap between actual yield and maximum theoretical yield potential at a plantation may be partitioned into three components. Yield gap 1 is due to inefficiencies during plantation development and the immature period. Yield gap 2 arises from inaccurate assessment of nutrient requirements, and yield gap 3 is due to inefficient management of the mature stand. There are not many options for correcting yield gap 1, but yield gaps 2 and 3 can be corrected in existing mature plantations by following best management practices (BMPs). These BMPs refer to three practices: crop recovery, canopy management and nutrient management.

Smallholder yields are on average considerably lower (11–40%) than those of plantations in Indonesia (Suharto 2009 *in* Molenaar et al. 2010). Companies have better access to high-quality seedlings, either through their own research and development units or through government agencies that produce seedlings. Companies also tend to more rigidly follow BMPs. Smallholder yields vary considerably depending on the production system (Molenaar et al. 2010). Tied smallholders obtain higher yields than do independent smallholders. A study conducted among smallholders in Indonesia finds that those under plasma schemes have 15% higher FFB yields when compared with independent smallholders (Molenaar et al. 2013). This is because smallholders under plasma schemes tend to adopt similar management practices to those used by the companies, while independent smallholders do not have the technical capacity or knowledge of good management practices (e.g. applying the recommended doses of fertilizers and pesticides).

Fertilizer plays a key role in productivity. This is associated with applying the right types and quantities of fertilizer, as well as making use of empty fruit bunches (EFBs) as compost (Molenaar et al. 2010). In many cases, nutrient deficiencies were found in Indonesian oil palm smallholder plantations (Molenaar et al. 2010; Woittiez et al. 2015), and explain lower oil palm yields. The planting material used also has an important effect. Half of the Indonesian smallholders were found to be growing *dura* or *pisifera* rather than *tenera* palms. *Tenera* palms have a higher oil extraction rate, and a higher yield under optimal management (Molenaar et al. 2013).

Improving harvesting frequency and quality control could also improve smallholder yields. The appropriate time for harvesting is associated with the ripeness of the oil palm fruits. Inappropriate harvesting of fruits affects the number of bunches that will be accepted by mills, as it negatively impacts the oil extraction rate. Pruning practices could also be improved (Molenaar et al. 2013) since suboptimal pruning decreases the capacity of palms to produce sugars that can be used for growth, and reduces the visibility of ripe bunches.

Yield improvements, therefore, are associated with a broad range of management practices, as well as bad-quality planting material. Replanting will not be possible unless the appropriate institutional conditions are in place. Four strategies have been suggested to facilitate the transition to more intensive production systems, namely: 1) training smallholders in sustainable intensification of existing plantations; 2) supporting replacement and replanting efforts in cases of high proportions of *dura/ pisifera* palms or aging palms; 3) ensuring shorter and more effective lines of communication between CPO mills and smallholders regarding quality and pricing of FFBs; and 4) providing smallholders with improved access to external and affordable financing (Molenaar et al. 2013).

3.2 Environmental impacts of oil palm development

3.2.1 The impacts on deforestation and carbon emissions

Several studies argue that oil palm expansion drives forest conversion (Koh and Wilcove 2008, 2009), which has implications for biodiversity loss, ecosystem services and climate change. Oil palm has taken over from a range of different land uses including undisturbed and disturbed primary forests, secondary forests, agroforestry systems, degraded lands and peatlands. Information on the role of oil palm in driving deforestation and its magnitude remains inconclusive. Obviously, the most significant environmental impacts occur when oil palm expands onto undisturbed forest land, since it leads to extensive carbon emissions, biodiversity loss and reduced water quality. The most severe carbon emissions occur when oil palm expands onto peatlands. However, when oil palm expansion occurs into agroforests or logged-over forests it can result in a carbon debt (Searchinger et al. 2009).

Gunarso et al. (2013), when assessing the land use change associated with the expansion of industrial-scale oil palm plantations in Indonesia, Malaysia and Papua New Guinea in the period 1990 to 2009/2010, indicated that out of the 9.6 million ha that were converted to oil palm during that period,

only 4.1% of conversion took place in undisturbed forests, 32.4% in disturbed forests, 33.9% on other plantations and agroforestry systems, 17.8% on shrub lands and grasslands, 8.3% on bare soils and 3.4% in other land use areas. This study stresses the fact that the environmental impacts of oil palm vary depending on previous land uses, suggesting also different impacts on biodiversity.

Impacts on CO_2 emissions from oil palm expansion have been significant. This is mainly the result of expansion into peatlands. Between 1990 and 2009/2010, net CO_2 emissions from land use change due to oil palm plantations, peat fires and peat oxidation increased from 92 to 184 Tg CO_2 yr^{-1} in Indonesia, Malaysia and Papa New Guinea (Agus et al. 2013). Between 2007 and 2010, the total area of industrial-scale oil palm agriculture on peatlands increased by over half a million hectares, from 1.6 to 2.15 million ha. Some 0.2 million ha of this expansion was in Malaysia – nearly all of it in Sarawak – and the rest was divided more or less evenly between Sumatra and Kalimantan (Miettinen et al. 2013).

Establishing plantations in peatlands tends to be more expensive (Budidarsono et al. 2012), but expansion continues as peatlands tend to have lower population densities in comparison with lands with mineral soils. The use of fire to clear forests and facilitate their conversion to oil palm – a process that usually takes 5 years – has increased GHG emissions from land use change, and can also negatively impact existing oil palm and timber plantations. About 2.6 million ha was destroyed by fire between June and October 2015, and a third of this was peatland. The use of fire is often associated with land speculation and, overall, the costs of fire largely outweigh the benefits. In 2015, fires resulted in USD 16.1 billion of damages and losses, with an estimated benefit of USD 8 billion for every hectare burned (if converted to palm oil) (World Bank 2015). The fire and haze crisis has exposed and highlighted the weaknesses in land governance in Indonesia.

3.2.2 The biodiversity impacts of oil palm expansion

Oil palm plantations have transformed Indonesian landscapes by stimulating the conversion of primary and secondary forests, with detrimental impacts on biodiversity and ecosystem function. There is a lack of studies that look systematically at the impacts of oil palm plantations on species richness and composition. Savilaakso et al. (2014) conducted a systematic review of the impacts of oil palm plantations on biodiversity and ecosystem function, and found that out of 1201 articles related to the topic, only 25 of them conducted a rigorous, quantitative analysis aimed at identifying causal relationships. Its conclusion was that oil palm expansion has led to reduced species richness when compared with primary and secondary forests, and that the composition of species assemblages also change after forest conversion to oil palm plantation.

With respect to abundance, results vary depending on species. It appears that certain invertebrate species, e.g. generalist species, increase in abundance after forest conversion whereas others decline. The authors also indicate that the results may differ for vertebrates, as none of the studies in the meta-analysis looked at the abundance of vertebrate taxa in forests compared with plantations (Savilaakso et al. 2014).

Again, there is limited evidence on the differentiated impacts of large-scale plantations vis-à-vis smallholder plantations in terms of biodiversity, since the former tend to expand through relatively large-scale and homogeneous blocks, while the latter tend to develop in more heterogeneous mosaic agricultural models and in association with other land uses. A study by Azhar et al. (2011) cited in Savilaakso et al. (2014) assesses the differences in species richness and community composition between smallholder and industrial plantations suggesting that, on average, smallholdings with mixed-age stands support higher bird species richness than do industrial plantation estates that have uniform age structure (from <6 years old to >25 years old). There is a need for more research on the differentiated impacts of large-scale versus smallholder production systems on biodiversity, as well as their impacts at a wider landscape level.

3.3 Discussion on socioenvironmental trade-offs

There is no doubt that while oil palm expansion has led to accelerated deforestation in both Malaysia and Indonesia, it has also contributed to national earnings. As the majority of palm oil produced is exported, it generates significant export revenues and stimulates local economic growth through employment as well as spillover effects in the development of services and infrastructure in production zones.

The social, environmental and economic trade-offs change over time and vary across regions, influenced by local contexts and political economies (McCarthy et al. 2012). These trade-offs are also influenced by the productivity of oil palm systems and by how much environmental damage is done by expanding onto peatlands versus mineral soils. It has been argued that the environmental swing potential of palm oil is huge, depending on prior land use, type of soils, harvesting techniques, harvest timing and fertilization practices (Davis et al. 2013).

The observed trade-offs depend to a large degree on the type of production system and the actors involved. Large-scale plantation companies tend to be comparatively more efficient, achieving higher yields and maximizing profits. Smallholders struggle to balance their limited cash flows with the fertilizer inputs and labor required to maintain a healthy plantation, while little is known about practices of an expanding group of medium-scale landholders.

Social and environmental trade-offs are not just explained by the scale of plantations or their management practices. Context plays a considerable role. The quality of services provided to smallholders, the effectiveness of intermediation systems, the legal status of farmers affecting tenure security and access to services, and the availability of services providers (Molenaar et al. 2013) all affect socioenvironmental trade-offs.

4 Policies and initiatives for sustainable palm oil

Multiple public policies and regulations, and private-sector-driven initiatives have emerged to influence the development of the palm oil sector. Policy discourses converge over the issue of sustainability but are embedded in broader policy objectives of economic development and poverty reduction. Figure 7 illustrates the complexity of the palm oil policy arena, shaped by a multitude of public and private interventions to improve palm oil production and trade, with an emphasis in Indonesia. These efforts unfold at the global, national and subnational level. This section describes some of the highest profile initiatives, their scope of implementation and their outcomes. It is noteworthy that since many of these initiatives are still in their infancy, it is still early to assess their likely outcomes.

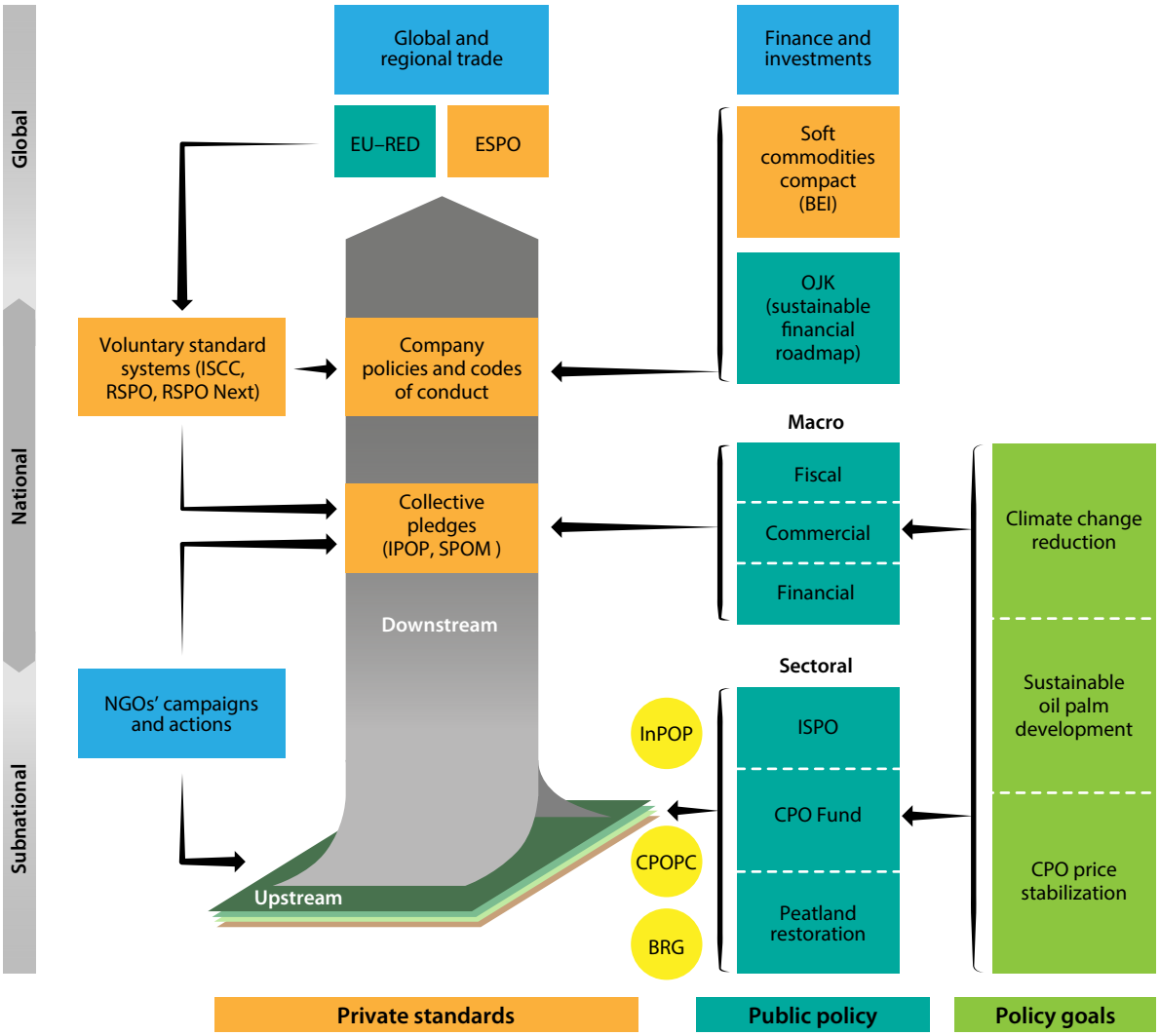


Figure 7. Emerging institutional architectures in the palm oil sector involving public-policy- and private-sector-driven initiatives toward sustainable oil palm development.

Note: Acronyms included in the figure, in alphabetical order are: CPOPC = Council of Palm Oil Producing Countries, ESPO = European Sustainable Palm Oil, EU-RED = European Union Renewable Energy Directive, IPOP = Indonesian Palm Oil Pledge, ISCC = International Sustainability and Carbon Certification, ISPO = Indonesian Sustainable Palm Oil, OJK = Indonesian Financial Services Authority, RSPO = Roundtable on Sustainable Palm Oil, SPOM = Sustainable Palm Oil Manifesto, SCC = Soft Commodities Compact.

4.1 Policies to achieve sustainable palm oil production and climate change mitigation

The 2000s have delivered a range of different initiatives to improve the governance of the palm oil sector, incorporating some sustainability aims. In March 2011, the Indonesian Government launched its Indonesian Sustainable Palm Oil (ISPO) standard (Box 1), a mandatory, third-party-audited, verification system, based on existing Indonesian regulations (Ministry of Agriculture 2011). The standard was introduced to ensure the adherence of oil palm plantations to government laws and policies, and reduce the negative reputation of the crop by showing that Indonesian regulations could deliver sustainable production. ISPO also aims to support the international commitment of the Indonesian Government to reduce national GHG emissions.

Currently, meeting the ISPO standard is mandatory for all palm oil plantations and mills and voluntary for smallholders; so far, the standard has fallen short in a number of respects (Box 1). Currently, only 130 companies hold ISPO certificates (ISPO 2013), and as such, the standard has failed to reassure consumers, NGOs and foreign governments of its effectiveness in reducing negative environmental and social impacts, at least in comparison with the standards issued by the Roundtable on Sustainable Oil Palm (RSPO). ISPO has gone through a number of revisions in relation to its timeframe for compliance, and in March 2015 it was rebranded as the Indonesian Sustainable Palm Oil Certification System (Ministry of Agriculture et al. 2015). Currently, some branches of the Indonesian Government are assessing the shortcomings of ISPO in order to bring more coherence to the system.

The Malaysian Palm Oil Board (MPOB) is the key government agency in Malaysia to regulate and implement palm-oil-related activities and policies. It was established in 1998 and acts as the governing body of the voluntary MSPO certification standard. The introduction of ISPO was followed shortly afterward by the Malaysian Sustainable Palm Oil (MSPO) standard, a voluntary national certification scheme for oil palm farmers in Malaysia. In 2015, The Council of Palm Oil Producing Countries (CPOPC) was also formed (MalayMail Online 2015). One of the main objectives of this council was to harmonize ISPO and MSPO, counteract some of the negative press the industry was receiving

Box 1. The Indonesian Sustainable Palm Oil (ISPO) system

Date initiated: March 2011
Number of principles and criteria: 7 principles, 28 criteria, 15 subcriteria
Coverage: National
Mandatory or voluntary: Mandatory for plantation companies integrated with processing facilities, plantation companies conducting cultivation, plantation companies processing estate crops. Voluntary for plasma (tied) smallholdings, independent smallholdings whose area is developed and/or managed independently by smallholders, and plantation companies producing palm oil for renewable energy. Standard for smallholders under development
Oversight and management: Ministry of Agriculture, ISPO Commission
Basis of standards: Indonesian Government laws and regulations. Revised by Minister of Agriculture. Regulation Number 11/Permentan/OT.140/3/2015 on the Certification System of the Indonesian Sustainable Palm Oil
Auditing: Plantations must undergo third-party auditing by independently accredited auditors. Accreditation provided by the ISPO Commission
Certification: The certification body may issue the ISPO certificate only after approval by the ISPO Commission's decision
Frequency of surveillance: Annual
Transparency and public availability of audits: Audits are not publicly available
Complaints/grievance procedure: Yes
Time frame for implementation: Date has been moved a number of times

internationally, and reclaim sovereign control over the governance of palm oil production, in the face of an increasing number of private sector standards.

The Indonesian Government has also issued a number of policies to address Indonesia's growing contributions to global GHG emissions and climate change. The previous administration installed policies to protect primary forests and peatlands. The most prominent of these was a presidential instruction ("decree") signed by Indonesian President Susilo Bambang Yudhoyono on 20 May 2011, for a moratorium on issuing new permits on primary natural forest and peatland (Government of Indonesia 2013). The moratorium was part of a broader USD 1 billion Indonesia–Norway partnership to reduce emissions from deforestation and degradation (REDD Monitor 2010).

The moratorium's effectiveness has been called in to question, however (Busch et al. 2015), along with other regulations related to land use planning, the protection and restoration of peatlands, and the One Map initiative, which aims to develop a unified map of land use agreed upon by all ministries. Most of these initiatives, while benefiting from the support of the central government, have failed to materialize. Furthermore, in reaction to the fire and haze crisis of 2015, the government issued a presidential instruction banning the clearance and exploitation of peatlands, and new planting in burned areas, as well as setting up a peatland restoration agency (BRG) with the goal of restoring about 2 million ha of damaged peatlands in the next 5 years (Jong 2016). More recently, in April 2016, the Indonesian Government declared an additional moratorium on concessions for oil palm development. At the time when this report was written, the scope of this moratorium had still not been defined.

President Jokowi's commitments to empower rural communities and indigenous peoples' rights over the management of their land, reflects the Constitutional Court's Decision no. 35/PUU-X/2012. The Court declared that customary forests are no longer state forests, effectively returning the stewardship of these forests to indigenous peoples. But the Ministry of Forestry has been slow to implement the necessary changes (AMAN n.d.). In addition, a major issue constraining the governance of the palm oil sector is that a large but still unknown portion of land under palm oil cultivation is occupied illegally by smallholders, as these lands are still classified as state forests. The government has made some efforts to regularize these settlements, but these endeavors are still in their infancy (Sirait 2015).

Most of the policy interventions have faced considerable barriers to implementation, including tensions among different levels and sectors of government, the intertwined interests of local politicians and investors, uneven law enforcement, and government reliance on revenues from concession permits (Brockhaus et al. 2012). Recently, Indonesia defined its Intended Nationally Determined Contributions (INDCs) under the Paris Agreement, including a 26% emission reduction by 2020 and 29% emission reduction by 2030 based on a 2010 projected business-as-usual scenario (Government of Indonesia 2015). Emissions from land use change (including deforestation for agriculture and peatland fires) account for 63% of the country's emissions profile (as per Indonesia's Second National Communication to the UNFCCC of 2010). The INDC document recognizes that climate change adaptation and mitigation efforts are multisectoral in nature and require an integrated approach, but current policies, regulations and interventions remain largely disconnected. Indonesia's environmental and land use policies are often rendered impotent by embedded sectoral thinking and internal resistance to ministerial collaboration, originating from influential groups with vested interests.

Conflicting regulations and policies, which slow implementation on the ground, remain a major barrier to change in Indonesia. It is still not clear yet how the government's environmental policies will align with their economic and rural development goals related to palm oil as a key export commodity. As mentioned earlier, the government has launched a CPO fund, to subsidize the expansion of the domestic biodiesel market and support the replanting of smallholder concessions. But the specific implementation mechanisms are still under discussion, in particular about how to channel funds for replanting.

4.2 Demand-side policies to drive sustainable production

Some governments in developed consumer countries are also taking action with regard to palm oil procurement. Most significant is the European Union Renewable Energy Directive (EU-RED) (Directive 2009/28/EC), which requires all biofuel feedstocks, including biodiesel derived from palm oil, to meet certain standards. Only biofuels that are considered to achieve a 35% or 50% reduction in greenhouse gas emissions (before and after 1 January 2017, respectively) are considered under the directive. As such, a number of palm oil producers in Malaysia and Indonesia, mainly those that are part of the largest palm oil conglomerates, certify their oil under the International Sustainability and Carbon Certification (ISCC) standard, which uses the EU-RED as a foundation for its principles and criteria (Box 2).

Box 2. International Sustainability and Carbon Certification (ISCC)

Date initiated: 2010
Number of principles and criteria: 6 principles, 45 criteria, 59 subcriteria
Mandatory or voluntary: Voluntary for producers, but mandatory when selling in to EU renewable fuels market
Oversight and management: ISCC is a multistakeholder initiative governed by an association with more than 80 members. ISCC was developed through an open multistakeholder process involving around 250 international associations, corporations, research institutions and NGOs from Europe, the Americas and Southeast Asia.
Basis of standards: EU Renewable Energy Directive
Auditing: Independently accredited auditors
Certification: Audit is carried out by the third-party certification body that issues certificate of compliance. ISCC then publishes certificate and handles sustainability declarations
Frequency of Surveillance: Annual auditing
Transparency and public availability of audits: Not public
Complaints/grievance procedure: Yes, complaints, appeal and arbitration process
Time frame for implementation: N/A

Additionally, 11 European countries have adopted some form of sustainable palm oil commitment at the national level, and three more will potentially introduce one (Esselink and van der Wekken 2015). In October 2012, a number of UK sector associations with significant interests in the supply or use of palm oil, made a public statement of their various commitments to sourcing sustainable palm oil. In March 2016, France introduced a tax on noncertified sustainable palm oil imports as part of a national biodiversity bill (Barbière 2016), yet it still has to be reviewed and ratified in the upper house.

Biodiesel companies and product manufacturers in Europe have established the European Sustainable Palm Oil (ESPO) initiative with its commitment toward 100% sustainable palm oil in 2020. 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. It is facilitated by three European sustainability organizations, i.e. Caobisco, Fediol and Imace. Parties confirmed their commitment by signing the Amsterdam Palm Oil Declaration on 7 December 2015. Its mission and objectives are to support the uptake of more sustainable palm oil in Europe by working in close collaboration with national initiatives, RSPO and EU associations. It will do this by encouraging the involvement of nonmember companies, sectors and countries and the synchronization of activities. It is still not clear how influential ESPO will be in the palm oil market.

Although demand-side government interventions have been met with hostility from producer governments, notably in Malaysia and Indonesia, more can be done to make sustainable production more financially competitive in global markets, and incentivize action among producers and their

governments. However, measures must also be taken to ensure that any competitive or financial benefits are passed on to producers who ultimately are the ones incurring the costs associated with making necessary changes in production practices, rather than financial benefits being retained by retailers and manufacturers.

4.3 Private initiatives to enhance the governance of supply chains

In reaction to slow and often ineffective national policies and regulation to mitigate the negative environmental and social impacts of oil palm agriculture in Indonesia, a number of NGOs and civil society groups began media campaigns against major producers, manufacturers and retailers of palm oil. These campaigns attacked corporate brands and threatened consumer and investor relationships, resulting in the emergence of a range of private and market-based policies and standards for sustainability (Gnych et al. 2015).

Perhaps the most prominent of these standards is the Roundtable on Sustainable Palm Oil (RSPO) (Box 3), which was formally established in 2004 (RSPO 2016a). The RSPO emerged through a multistakeholder process, which included both private sector and civil society organizations. Since its inception, the RSPO has seen a slow but steady uptake of the standard, which now certifies roughly 21% of the total global supply (RSPO 2016b). In spite of its coverage of the global market, the RSPO has received extensive criticism regarding the stringency of its principles and criteria and its ability to enforce companies' compliance on the ground.

Despite animosity over sovereign rights in relation to private standards in Indonesia, there have been attempts to find common ground between public and private standards. A recent joint study between ISPO and RSPO identifies a number of similarities and differences between the two standards. While there is significant scope for alignment, particularly in the auditing process, key differences remain in the treatment and definition of High Conservation Value (HCV) areas within concessions, and the rules to follow for developing new plantations, which are more stringent in RSPO vis-à-vis ISPO criteria (Ministry of Agriculture et al. 2015). It is not clear what steps will be taken by the two parties in order to promote greater alignment.

Box 3. Roundtable on Sustainable Palm Oil

Date initiated: 2004
Number of principles and criteria: 8 principles and 43 criteria
Coverage: More than 32 companies with more than 131 palm oil mills in Indonesia have obtained RSPO certification
Mandatory or voluntary: Voluntary, market based
Oversight and management: Secretariat based in Kuala Lumpur, Malaysia. Working groups address different issues
Basis of standards: The RSPO P&C was ratified in the General Assembly of the RSPO in 2007. According to the RSPO regulations, the RSPO P&C is reviewed every 5 years. In 2012, the RSPO P&C standards from 2007 were reviewed and the results of the review were adopted by RSPO members in May 2013
Auditing: Plantations must undergo third-party auditing by independently accredited auditors. Accreditation of auditors provided by the Accreditation Services International (ASI)
Certification: The certification body may issue the certificate
Frequency of surveillance: Annually
Transparency and public availability of audits: Yes, available on RSPO website
Complaints/grievance procedure: Yes
Time frame for implementation: N/A but members are required to submit a time-bound plan for achieving group-wide certification

In 2010, the Consumer Goods Forum (CGF) and its members committed to supporting zero net deforestation by 2020 (Brown and Zarin 2013). In 2013, a new wave of sustainability commitments began to emerge. The "No Deforestation, No Peat, No Exploitation" movement was driven by a handful of international advocacy and civil society groups. Their message was simple and aimed to achieve what the RSPO had failed to do – stop the deforestation of biodiverse and carbon-rich primary and secondary forests and peatlands. Campaigns targeted major oil palm traders such as Wilmar, GAR, Musim Mas, Cargill, Asian Agri and Astra Agro. These commitments differed from past sustainability policies in that they were applied to not only their operations but those of their third-party suppliers. As such, commitments moved down the supply chain and were imposed on producers who had, until then, faced limited exposure to global sustainability demands.

In December 2014, the growing number of "No Deforestation" commitments spurred the New York Declaration on Forests. This declaration, which includes national and subnational governments (in Indonesia) as well as civil society and private sector organizations, aims to halve the rate of deforestation by the end of 2020. These commitments also resulted in more regional and local-level alliances such as the Malaysian-dominated Sustainable Palm Oil Manifesto (SPOM), while in Indonesia this took the form of the Indonesian Palm Oil Pledge (IPOP), an association of five companies working toward the same goal (Box 4).

Box 4. The Indonesian Palm Oil Pledge (IPOP)

Date initiated: 2014
Number of principles and criteria: N/A but they do have programs on 1) farmer empowerment, 2) tenurial reform, and 3) engagement
Mandatory or voluntary: Voluntary
Oversight and management: Secretariat based in Jakarta
Basis of standards: It is not a standard but an association of oil palm companies that have self-imposed "No Deforestation, No Peat, No exploitation" policies
Auditing: N/A
Certification: N/A
Frequency of surveillance: N/A
Transparency and public availability of audits: At the discretion of member companies
Complaints/grievance procedure: No
Time frame for implementation: Time-bound commitments made by the companies themselves, to ensure that their supply chains are deforestation free by a certain date

Since the inception of IPOP, the Indonesian government has strongly opposed it, branding it a cartel, in violation of Indonesia's competition laws and ultimately threatening the government's sovereignty. In addition, the government argues that companies' commitments to zero deforestation are actively excluding smallholders and small- and medium-scale enterprises (SMEs) from global markets (Saturi and Nugraha 2015). As of December 2015, 188 companies had made commitments to support sustainable palm oil production, 61 of those also included commitments to zero deforestation (Supply Change 2016). A high-profile initiative that embodied zero-deforestation commitments in Indonesia and beyond, IPOP was disbanded in June 2016 after a tense relationship with the government (Vit 2016).

As a number of its corporate members have adopted additional "No Deforestation" commitments, the RSPO recently launched RSPO Next (RSPO 2016c). This is the second initiative to emerge from RSPO member companies and goes beyond the principles and criteria of the original RSPO. The Palm Oil Innovation Group (POIG) was started by Greenpeace, Agropalma, New Britain Palm Oil and others to demonstrate companies' ability to not only mitigate negative environmental and social impacts, but also to create positive ones.

These private sector commitments rely heavily on the concept of High Conservation Value (HCV), but also go beyond it. Many stakeholders in the palm oil sector were divided over a definition of forests and a methodology for designating 'go' and 'no-go' areas. On the one side, the NGO-driven High Carbon Stock (HCS) Approach Steering Group developed a toolkit to inform company practices on no deforestation (High Carbon Stock Approach Steering Group 2015), and on the other side the private-sector-driven HCS Plus commissioned a High Carbon Stock Study, linked to SPOM. Both groups arrived at different carbon thresholds to define HCS forests, and gave different guidance on how to make estimates of carbon emissions from land conversion, and how to achieve carbon neutral development, among others. A working group, involving key actors from both camps was created, which were able to align the two definitions and methodologies, and a position was launched on November 2016 (Greenpeace 2016).

Finally, it is important to highlight the initiatives adopted by financial actors, both in the international and national arenas. The Banking Environment Initiative (BEI) along with the CGF have developed the Soft Commodity Compact (CISL 2016), which consists of a set of technical guidelines to help the banking industry transform soft commodity supply chains, including the elimination of deforestation, through their clients. At a national level, Indonesia's eight largest commercial banks have committed to adopting responsible lending practices, in the context of a Sustainable Financial Roadmap developed by the Indonesia Financial Services Authority (OJK) (OJK 2014).

4.4 Discussion: Emerging risks in a divided sector

There has been a considerable evolution in environmental awareness since the palm oil campaigns of the late 1990s. Increasing global acknowledgement of the risks that climate change presents has resulted in both governments and the private sector publicly committing to engage in both adaptation and mitigation activities, which have evolved to become more tangible sustainability commitments. However, what, when and where these actions will take place has yet to be clarified. Methodologies for shifting to lower emission growth strategies are unclear and all actors are struggling to manage the trade-offs between people, planet and profit.

The wave of public and private standards for palm oil have not always been met with support from the Indonesian Government, which faces the considerable challenge of maintaining economic development. Market-based standards and regulations on imports by countries, notably in the EU, have been interpreted as an intrusion into national sovereignty and jurisdictions, and as being in contravention of international trade laws. Although it is not yet supported by data or evidence, it is feared that the imposition of such standards will exclude smallholders and SMEs from global markets and have a detrimental effect on economic development in rural areas, as well as at the national level. As such, one of the greatest challenges to the evolving sustainability of the Indonesian palm oil sector are the political rhetoric and stonewalling surrounding the movement. The lack of buy-in from influential private sector associations and lobby groups at the national level exacerbates this resistance. Anecdotal evidence suggests that there is concern from many in the industry that increased transparency in investments and traceability of supply chains will expose corruption and illegality that have become business-as-usual in the Indonesian palm oil sector.

The advocacy movement has, until now, focused on creating the necessary pressure to achieve sustainability commitments from companies and government. Now industry stakeholders and government must operationalize those commitments along the length of the supply chain. This applies to not only their own operations, but also to the integration and upgrading of third-party suppliers (smallholder producers and small businesses). It also means ensuring that consumers, and the retailers and manufacturers who supply them, transition to new models of consumption.

But adapting business practices takes huge levels of investment and is fraught with risks. The diversity of the Indonesian supply base for palm oil – from large well-funded multinational corporations to almost invisible SMEs and private investors as well as smallholders of all shapes and sizes – is making adaptation challenging for governments and the private sector alike. In addition, the limited organization of smallholder palm oil growers limits their voice and power in policy debates.

4.5 Technical assistance and partnerships to advance sustainability

The challenge to implementing corporate and public sector sustainability commitments has resulted in a range of organizations and associations emerging in the institutional landscape to help develop the methodologies and structures needed.

One of the most prominent of these is The Forest Trust (TFT), an NGO that works with companies to implement their zero deforestation commitments. Representatives for TFT have publicly criticized the RSPO (Lang 2015), stating that it is an inadequate tool for achieving the systemic changes needed for truly sustainable production. As such, it advocates an approach based on values, transparency, transformation and verification, which seeks to transform companies from within. Many of the companies that have committed to eliminating deforestation and peatland conversion from their supply chains have faced considerable barriers to implementation, both internally in changing the behaviors and business-as-usual methods of their employees, but also externally in changing the mind sets of their third-party suppliers and the communities surrounding their operations.

A number of organizations are also working to develop new business models and value chain structures to support the inclusion of smallholders in new sustainable value chains. These include development organizations such as the Sustainable Trade Initiative (IDH) and the Netherlands Development Organization (SNV), multilateral banks such as the International Finance Corporation (IFC), and private sector associations and working groups such as PIS Agro, and the SMART working group. Many of these models seek to increase the transparency and traceability of the supply chain at the local level and aggregate smallholders in order to access the financial investments needed to replant and increase yields, as well as meeting internationally recognized sustainability standards. Winrock International, along with other organizations, are in process of implementing the Alliance for Sustainable Palm Oil or *Aliansi Sawit Lestari Indonesia* (ASLI), originally established to support IPOP. This latter project is changing its orientation as a result of the disbandment of IPOP.

Most of the projects and interventions mentioned above often struggle to scale up. For many smallholders and small businesses, transparency exposes legal risks associated with insecure land tenure and incomplete licensing. There is a growing acknowledgement among private sector actors and NGOs that these commitments will not be achievable without moving beyond supply chains and adopting a jurisdictional approach. Private–public partnerships and the support of local government are therefore essential to plan future economic development and enforce areas of production and areas of protection.

Private sector actors, NGOs, donors and development organizations are supporting jurisdictional efforts to map smallholders, and enable district-level monitoring, reporting and certification (Wolosin 2016). Provincial-level regulations are also emerging in support of market-based mechanisms for sustainability, such as the commitment by South Sumatra's Provincial Government to turn South Sumatra into a sustainable province (IDH 2016) and the Provincial Government of Central Kalimantan's which issued a regulation acknowledging the concept of HCV and allowing palm oil companies to retain and protect areas within their concessions (Plantation Office of Central Kalimantan Province 2014). Many such governments hope that by supporting market-based sustainability standards, they will encourage investment from responsible multinational corporations in their districts, which will deliver economic development (Gnych and Wells 2014).

Government also faces implementation challenges. Despite existing policies and regulations that support sustainable production, little has changed on the ground. There is a complete lack of engagement of local actors when developing new national-level policies and regulations and limited feasibility analyses have been done. Therefore, regulations and policies are disadvantaged and weakened from the start. Collaboration and coordination between sectors and ministries is inadequate, both in terms of the collaborative process design and the incentives in place to ensure that effective collaboration happens. Improvements in collaboration across sectors and government levels are therefore a priority.

As well as creating incentives for farmers and businesses that ensure that sustainable production is competitive against unsustainable production, there is also a need for clear incentives to be put in place for the government itself (both carrots and sticks). These may include fiscal and political incentives for government to clarify land tenure and the legality of operations through transparent and equitable processes. Without improving government processes, successful collaboration, the alignment of policies and regulation, data collection, conflict mediation, and land use planning will never be achieved.

In summary, there is a need for:

- *Inclusivity in the sustainability agenda:* Sustainability must move beyond national and international debates to the local level and those involved in the everyday practicalities of the industry. Subnational civil servants must understand and support a more long-term and formal development plan for the sector. Smallholder farmers and their families, including women and children, must be engaged in the discussions and the process.
- *Investment (financial and technical):* A huge amount of investment is needed to increase yields and raise production to the minimum standard accepted by the global market. This investment may come from a range of different sources, likely blending private and public money, but will rely on current risks being mitigated and managed.
- *Integrated governance:* Currently policy and regulation suffer from being embedded in sectoral, and public versus private silos. The connections between global trade, agricultural production and broader land use planning and management are clear. As such, Indonesian ministries must show greater internal and external collaboration when developing new policies and work together to develop incentives that support enforcement.

5 Conclusions

Oil palm agriculture has undergone significant expansion to keep up with dramatic increases in global demand for this versatile vegetable oil and its derivatives. This expansion has been facilitated by public and private sector policies and institutional structures that encouraged investment in Malaysia and Indonesia, in both agricultural production and downstream processing.

Much of the initial expansion of oil palm took place through large-scale plantations; yet a growing number of smallholders and medium-scale producers are adopting oil palm agriculture as their main source of income or asset accumulation strategy. This has led to the sector becoming increasingly complex and challenging to govern.

The palm oil industry supplies a global market, but is highly concentrated in the processing and trade stages of the value chain. Because of the substantial investments of capital required to develop processing and transport facilities, this stage of the supply chain is dominated by a handful of corporate groups, which also tend to reap the largest portion of benefits. Conversely, the supply base has expanded and diversified over time to include a large proportion of smallholders and SMEs, while processors and traders increasingly supply a large number of CGMs and retailers across the globe.

The optimum conditions for oil palm agriculture correlate with some of the world's most carbon- and biodiversity-rich tropical forest regions. Its expansion, therefore, has led to significant trade-offs between economic growth and environmental impacts. Considering the carbon storage potential of peatlands, and growing global concerns surrounding climate change, the environmental impacts of palm oil are even more prominent. Although oil palm plantations tend to create homogeneous landscapes with reduced biodiversity compared with primary and secondary forests and mosaic landscapes, their environmental impacts depend on previous land uses. While oil palm expansion has converted primary forests, expansion has also taken place on logged-over forests, agro-forestry systems, and lands occupied by rubber plantations, contributing to a much more complex land use change process.

Through its fiscal earnings, palm oil has generated significant resources for government at both the national and subnational levels. It has also generated direct livelihood opportunities for a large number of tied and independent smallholders and SMEs, as well as other indirect opportunities for local actors. There have been significant efforts to support the transition to more sustainable palm oil production. But the lack of coordinated government policy, effective incentives and consistent enforcement – and the subsequent emergence of numerous civil-society-driven, market-based private standards – bring new opportunities and challenges for the governance of the palm oil supply chain.

The uptake and implementation of voluntary standards remain slow, and any push for the adoption of more stringent standards may only widen the gap between large corporations and medium- and small-scale growers. The latter can and will only settle for mandatory government standards that are less stringent and therefore suffer from reduced legitimacy in consumer markets. While harmonization between voluntary and mandatory standards is required, it is unlikely that this will happen anytime soon. Emerging company commitments to deforestation-free supply chains may, however, function to leverage the upgrading of the smallholder supply base. Their success will require significant support from the state. In particular, the critical issues and challenges are associated with land use planning and tenure. Improved stability and certainty over government policies will support and incentivize investments in upgrading smallholder production and their continued inclusion into global supply chains.

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There is abundant literature focusing on the palm oil sector, which has grown into a vigorous sector with production originating mainly from Malaysia and Indonesia, and on increased palm oil consumption in many countries around the globe, particularly European Union states, China and India. This sector expansion has become quite controversial, because while it has negative social and environmental impacts, it also leads to positive benefits in generating fiscal earnings for producing countries and regular income streams for a large number of large- and small-scale growers involved in palm oil production. This document reviews how the social, ecological, and environmental dynamics and associated implications of the global palm oil sector have grown in complexity over time, and examines the policy and institutional factors affecting the sector's development at the global and national levels.

This work examines the geographies of production, consumption and trade of palm oil and its derivatives, and describes the structure of the global palm oil value chain, with special emphasis on Malaysia and Indonesia. In addition, this work reviews the main socioenvironmental impacts and trade-offs associated with the palm oil sector's expansion, with a primary focus on Indonesia. The main interest is on the social impacts this has on local populations, smallholders and workers, as well as the environmental impacts on deforestation and their associated effects on carbon emissions and biodiversity loss. Finally, the growing complexity of the global oil palm value chain has also driven diverse types of developments in the complex oil palm policy regime governing the sector's expansion. This work assesses the main features of this emerging policy regime involving public and private actors, with emphasis on Indonesia.

There are multiple efforts supporting the transition to a more sustainable palm oil production; yet the lack of a coordinated public policy, effective incentives and consistent enforcement is clear and obvious. The emergence of numerous privately driven initiatives with greater involvement of civil society organizations brings new opportunities for enhancing the sector's governance; yet the uptake of voluntary standards remains slow, and any push for the adoption of more stringent standards may only widen the gap between large corporations and medium- and small-scale growers. Greater harmonization between voluntary and mandatory standards, as well as among private initiatives is required. Commitments to deforestation-free supply chains have the potential to reduce undesired environmental impacts from oil palm expansion, and while this risks excluding smallholders from the supply chains, such commitments may function to leverage the upgrading of smallholder production systems. Their success, however, will require greater public and private sector collaboration.

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