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Palm oil expansion in tropical forest margins or sustainability of production? Focal issues of regulations and private standards

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World Agroforestry Centre

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Sonya Dewi is a Senior Landscape Ecologist with formal backgrounds in soil science, computer science and theoretical ecology. She has worked extensively on broad tropical landscape issues from assessment of livelihoods and environmental services through identification of opportunities and constraints on sustainable livelihoods and multifunctional landscapes to studies of spatial land-use planning principles and practices. Recently she leads the development of Land Use Planning for Multiple Environmental Services (LUMENS) tool that has been operational for developing land-based green growth plan. She also explores possible mechanisms of rewards for environmental services, including climate change mitigation through REDD+.

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Abstract

Palm oil expansion captures headlines, primarily out of concern that encroachment to tropical forest causes environmental problem and ignites social issues. Cascading ecological and social issues cause loss of trust, (threats of) consumer boycotts and multiple standards and certification responses. However, diverse sustainability issues should be taken into account within the issue-attention cycle. Most of current production (89%) occurs in SE Asia, with Indonesia in the lead. Peru and Cameroon are examples of current expansion elsewhere. In Indonesia two phases of new establishment of palm oil coexist within a forest transition gradient: (i) (industry-led) expansion into new forest margins with many social and ecological consequences; and (ii) (often farmer-led) conversion of existing agroforestry and tree crop (often rubber-based) or pasture economies in mosaic landscapes. External consumer concerns refer to the expansion phase, rather than to production sustainability or issues of smallholder concern. However, certification standards are only partially adjusted to the latter. After a 'voluntary industry standards' phase of differentiation with and shifting blame to non-certified others, government involvement in Malaysia and Indonesia suggests that standards and certification can trickle down to enforceable good practice standards for all. This leads to ineffective policies that does not address the real issues in local context. On the other hand, subnational jurisdictional entities are the scale at which oil palm production can be balanced with other goals, such as forest conservation and smallholder welfare.

Keywords

Indonesia, Malaysia, *Elaeis guineensis*, certification, RSPO, ISPO

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List of abbreviations and acronyms

APOI	African Palm Oil Initiative
ASB	Alternatives to Slash and Burn partnership for the tropical forest margins
CGIAR	Global research partnership for a food-secure future
CGIAR-FTA	Forests, Trees and Agroforestry research program of the CGIAR
CPO	Crude palm oil
CPOC	Council of Palm Oil Producing Countries
ESPO	European Sustainable Palm Oil
EU-RED	EU Renewable Energy Directive
FFB	Fresh Fruit Bunches
FLEGT	Forest Law Enforcement, Governance and
GAPKI	IPOA
FPIC	Free and Prior Informed Consent
IPOP	Indonesian Palm Oil Pledge
IPOA	Indonesia Palm Oil Association
ISCC	International Sustainability and Carbon Certification (ISCC
ISPO	Indonesian Sustainable Palm Oil
IPOC	Indonesian Palm Oil Committee
MSPO	Malaysian Sustainable Palm Oil
NDC	Nationally Determined Contribution
PKO	Palm Kernel Oil
POFCAP	Palm-Oil Free Certification Accreditation Program
POIG	Palm Oil Innovation Group
RED	See EU-RED
REDD+	Reducing Emissions from Deforestation and (forest) Degradation plus sustainable forest management
RSB	Roundtable on Sustainable Biofuels (RSB)
RSPO	Roundtable on Sustainable Palm Oil
SAN	Sustainable Agriculture Network
SDG	Sustainable Development Goals
SPOI	Sustainable Palm Oil Initiative
SPOM	Sustainable Palm Oil Manifesto
VPA	Voluntary Partnership Agreement
WTO	World Trade Organization

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1 Introduction

For many tropical commodities there still is a huge gap in value judgment between consumers living in high-income, and producers in low- and middle-income countries, as documented for tea by Dolan (2010). For oil palm this gap is evident. Consumers are, in response to publicity campaigns by social and environmental NGO's, concerned about the fate of indigenous forest people cheated into contracts by greedy companies hungry for their land for producing a greasy end product, and about the loss of biodiversity associated with the conversion (Wakker et al 2004). Producers, enhanced by publicity campaigns by governments and private sector, continue to explore economic opportunities from land uses derived from forest conversion blocked by double standards in hypocritical rich countries restricting imports without accounting for historical deforestation within their own borders (World Growth 2011; PASPI 2016). In this battle for the hearts (moral justification), rights (rules) and purses (incentives) of international and domestic audiences, focus in the oil palm debate has shifted from attention placed on large-scale plantations to the approximately three million farming household producing 30-40% of the world's palm oil (Azmi and Nagiah 2013) precisely linking moral and economic justifications to support an until now relatively forgotten sector of suppliers, which is growing rapidly. The issue of expansion in tropical forest margins is reframed as one on productivity and technical sustainability, with (failed) expectations of increased farmer income (Hidayat 2017).

From the five tropical commodities considered in a comparative study of how certification emerges in public debate and private sector actions in response to social and environmental issues (Mithöfer et al 2017), palm oil is the most controversial, rather than coffee, cacao, rubber and tropical timber (Meyfroidt et al 2014). In simple words, certification is a response aimed at restoring trust between end-consumers, the primary producers and all the steps in between. Yet, differently to other tree-crops, in oil palm that trust is challenged not primarily by the quality of the product, but by the perceived attributes of the production process and its expansion, largely associated with the environmental and social impacts that this expansion generates. The latter because oil palm (*Elaeis guineensis*) is the crop that, in parts of the humid tropics expands faster than any other crop, since it is comparatively one of the world's most productive crops (with palm oil as the product) as well as more profitable (especially in returns to labour) than most land use alternatives. These attributes have contributed for palm oil to maintain a strong position in the global market. Yet, while exports from producer countries will continue to increase (GAIN 2017a), the total share may decrease due to changes in consumer preferences (USDA 2017).

Oil palm expansion often causes deforestation since its ecological requirements match those of the richest rainforests of the globe (Sheil et al 2009; De Vries et al 2010; Sayer et al 2012; Oosterveer, 2015; Byerlee et al 2017). The environmental impacts of oil palm expansion are large, yet production potential and options to achieve sustainable supply are large as well. Compared to annual oil-bearing crops (including sunflower, colza and soybean) and once established, oil palm fresh fruit bunch (FFB) production has a relative low ecological footprint per unit agricultural output (de Vries et al 2010). Soil quality can be maintained when good management practice is followed (Khasanah et al 2015). The establishment phase, however, has been the primary issue in public debate on environmental and social impacts. It can imply loss of critically endangered and globally unique biodiversity, loss of high carbon stock land cover in lowland rainforests and peatlands, as well as infringement on customary

land use rights and displacement of some local populations. Wider human wellbeing is also at stake where land-clearing fires on peat get out of hand and cause major air pollution (World Bank 2015). Especially in Indonesia and Malaysia oil palm has contributed to the national economy by income from export, employment, and income opportunities for farmers (Rist et al 2010). Oil palm expansion, therefore, has an important role in reducing rural poverty in production zones (Edwards 2015).

While agricultural expansion into tropical forest areas has clashed with conservation goals for a long time (Tomich et al. 1998), the palm oil debate increased in intensity when biofuel policies opened up loopholes in partial accounting for emissions in the mid 2000's. Emission reduction by fossil fuel substitution in importing countries could be accounted for, but the emissions caused elsewhere stayed outside of the accounting scheme (Searchinger et al 2009; van Noordwijk et al 2016). Actual use of palm oil as biodiesel has absorbed a relatively small part of the global production, but it has faced a recent increase to 45% of palm oil imported to Europe[1]. Biodiesel production from palm oil has also increased in producer countries, notably in Indonesia, which adopted a blending target for biodiesel of 20% in 2016, and 30% in 2020 (GAIN 2017b).

As result of growing environmental concerns, the governance of the palm oil sector is growing in complexity. In addition to public regulatory frameworks to govern land use, production and trade of palm oil, several transnational initiatives have emerged supporting non-state market-driven instruments (Pacheco et al 2017a). This, however, responds to a growing involvement of non-state actors (private and non-profit) in the governance of commodities' production, which has increased the pressure for companies to mainstream environmental concerns in all aspects of supply management (Cashore et al 2005; Bush et al 2015). This has resulted in a governance framework in which transnational initiatives were defining higher standards than the minimum demanded by state regulations (Overdevest 2010). In the palm oil sector, a complex governance architecture has evolved with multiple national and international sustainability initiatives.

Main international process was the establishment of a global sustainability standard in 2004 by the Roundtable for Sustainable Palm Oil (RSPO)[2], under a multi-stakeholder process involving industry and civil society interactions. Due to a perceived lack of legitimacy of global private standards (Schouten and Bitzer 2025), national public standards for governing oil palm production emerged in Indonesia[3] in 2011, labelled the Indonesian Sustainable Palm Oil (ISPO) standards, as a mandatory system (Hidayat et al 2017). National standards emerged in Malaysia as a voluntary system, yet these standards are expected to become mandatory in 2019 following the Indonesian steps[4]. As a way to increase the legitimacy of the Indonesian standards vis-à-vis the international private standards, the government of Indonesia has in 2016 initiated a process known as 'strengthening ISPO'. A legal instrument of the new ISPO has been under wide social consultation during 2017. Main features of the new ISPO will be that the system will involve some independent monitoring, and will apply to all palm oil producers, including smallholders.

Two initiatives have emerged in Europe to support sustainable palm oil. The Dutch Oils and Fats Industry (MVO) along with IDH established the European Sustainable Palm Oil (ESPO), project in

[1] https://www.transportenvironment.org/sites/te/files/2016_11_Briefing_Palm_oil_use_continues_to_grow.pdf
[2] http://www.rspo.org
[3] http://www.ispo-org.or.id/index.php?lang=ina
[4] http://www.mpoc.org.my/Malaysian_Sustainable_Palm_Oil_(MSPO)_to_be_Made_Mandatory_by_2019.aspx

2015 to support 100% sustainable palm oil sourcing. This process was conducive to formalize the Amsterdam Declaration, launched in December 2015, made explicit commitments from European governments to support 100% sourcing of sustainable palm oil by 2020, which has been signed by seven European countries.[5]Nonetheless, criticism that certification is not able to halt the pressure from oil palm plantations expansion on deforestation has triggered pledges by major corporate groups, to 'zero deforestation' (Climate and Land Use Alliance 2014; Pasiecznik and Savenije 2017). These commitments have been embraced by major consumer goods companies, retailers, traders and processors (Supply Change 2016). In addition, the major corporate group, involved in palm oil production, processing and trade have embraced "No Deforestation, No Peat, No Exploitation" (NDPE) policies. It is estimated that processors which adopted NDPE policies would cover 74% of Southeast Asia's refining capacity (Steinweg et al 2017). A large number of third-party suppliers have not yet adopted these policies.

In this context of evolving governance systems, involving diverse arrangements between state and non-state actors, the palm oil sector offers an opportunity to explore the challenges and opportunities of global private governance in its interactions with national regulations, from the perspectives of effectiveness and legitimacy. Whereas most economic actors just react to (perceived) pressures from environmental action groups, proactive market actors and other non-governmental organisations turn them into market opportunities. Creating standards and associated certification schemes has promised to lead to problem-solving market instruments in global value chains (Mithöfer et al 2017), but there are valid questions on the (moral) legitimacy and effectiveness of what they do (Von Geibler 2013). Schouten and Glasbergen (2011) suggested that three aspects are ultimately needed to better understand such complex governance processes: legality, moral justification, and acceptance (consent). The latter may in part relate to incentives, and to the moral justification through appeal to concepts of fairness. Certification thus interacts with the three primary ingredients of governance (incentives, regulations and norms, also known as 'carrots, sticks and sermons' dealing with 'what pays', rights and 'what's right'; Bemelmans-Videc et al 2011; van Noordwijk et al 2012; Amaruzaman et al 2017).

Smallholders are seen with a great potential to increase yields while oil palm helps to reduce rural poverty, as mentioned earlier. A range of factors contribute to their lower productivity per unit area, with use of low-quality planting material a major one (Woittiez et al 2017; Lee et al 2014). Initial discussions in the Roundtable on Sustainable Palm Oil (RSPO) did not pay much attention to consequences for smallholders as debate was dominated by the concern for environmental problems mainly attributed to large-scale plantations (Cheyns 2014). Required modifications and simplifications to facilitate uptake of certification by smallholders are now on the agenda (Rietberg and Slingerland 2016). National standards that arose to challenge the voluntary, international codes (Hospes 2014a) aim to protect smallholders by not demanding that certification requirements for plantations apply to them and since the required proof of legal access to land would be a major barrier for smallholder certification (Brandi et al 2015). Many questions remain on how to address the market and institutional barriers facing smallholders who so far sold to mills that increasingly will no longer accept FFB of uncertain origin. Gradually space was created for joint fact finding, standards and

[5] https://www.euandgvc.nl/documents/publications/2015/december/7/declarations

pledges for cooperation, although the process itself has been contested (Ruysschaert and Salles 2014; Hospes 2014a; Pye 2016).

A broader perspective on the way oil palm standards evolved, as part of wider changes in the sector governance system, can be obtained by linking it to the common framework for the comparison of five globally traded and contested tropical commodities provided by Mithöfer et al (2017). The three primary building blocks for this analysis are 1) the issue attention cycles, 2) management swing potential or the difference between best and worst way of producing a certain commodity (Davis et al 2013) and 3) the structure of value chains (Fig. 1). Comparison across the commodities is focused in this framework on the role of 'certification', either as short-term tactic to shift blame to uncertified others, or as long term strategy to regain trust and ensure improvement in balancing local and global needs and concerns (Mithöfer et al 2017).

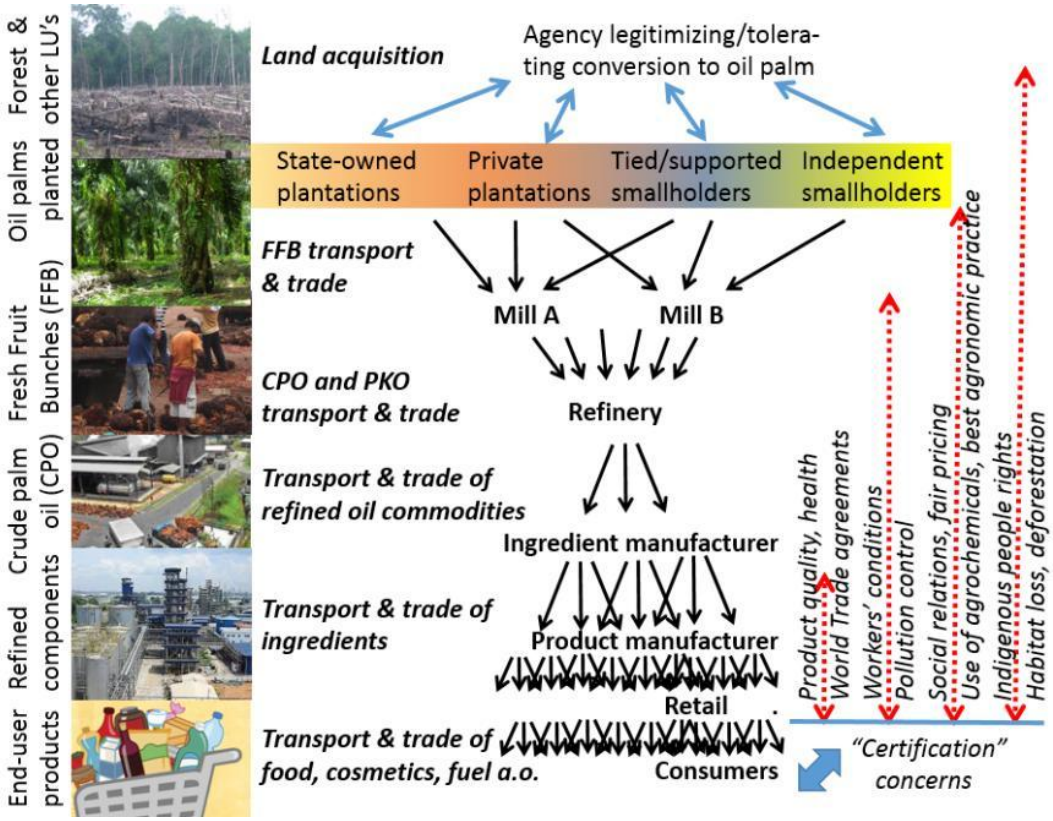

Figure 1. Simplified illustration of the palm oil value chain and the way end-user concerns apply

At the consumer end, the value chain for palm oil branches out to a wide range of consumer products (Corley and Tinker 2016). Often consumers don't realize that what they buy includes palm oil components (Simons 2014). At the primary production side of the value chain, land, formal or *de facto* land use rights, labour, skills, know-how, planting material, machinery (if burning is to be avoided) and agrochemicals are combined to get plantations started. The main harvest of Fresh Fruit Bunches (FFB) is rapidly converted in industrial mills to a multi-purpose and storable commodity in the form of crude palm oil (CPO) and palm kernel oil (PKO). Two types of mills are indicated in Fig. 1: a type A with full control over its FFB sourcing, and a type B that includes produce from independent smallholders. CPO and PKO can be transported to refineries to be transformed into basic ingredients for a wide range of products in the food, cosmetics and biofuel industries (Basiron 2007)

that reach consumers across the globe. The global palm oil value chain is characterized by a large number of consumer manufacturer companies and retailers downstream the value chain, as well as by a large number of upstream suppliers, with a growing portion of medium-size and smallholders. However, the middle part of the value chain tends to be concentrated in a limited number of large corporate groups and traders, both on the production and consumption side of the chain (Pacheco et al 2017b). This latter group has received most of the pressure of NGOs campaigns and end-market companies.

In analysing the role of oil palm in tropical forest margin landscapes and in the national and international debates they relate to, we will focus on three questions:

1. How are global value chains of palm oil interacting with issue attention cycles and the related management swing potentials?
2. How are the three dimensions of governance (incentives, regulations and norms) interacting along the issue attention cycle? Are landscape level, national and international scale discourses interacting in synergy?
3. Which new directions are currently emerging in the way the production stage (smallholders, plantations) interact with national and international public-private governance?

We will use a geographically targeted literature review to find answers, making use of the CGIAR-FTA sentinel landscapes (FTA-SL) portfolio that is balanced over the three tropical continents and provides a 5% sample of area, 8% of people, 9% of tree cover and 10-12% of potential tree crop presence across the tropics, with quantified biases across zones, transition stages and human development index (Dewi et al 2017). The final discussion will get back to the overarching question whether trust between producers and consumers is restored by current certification efforts and will comment on the 'shifting blame' perspective, the contest for the moral high ground and business tactics.

2. Geographic focus for the review

Building on earlier networks that include the ASB-partnership for tropical forest margins (Minang et al 2014) and the Poverty and Environment Network (Wunder et al 2014), the sentinel landscapes portfolio of the CGIAR research program on Forests, Trees and Agroforestry (FTA-SL) includes situations across the full range of 'forest transition' stages in all relevant climatic zones of the tropics (Dewi et al 2017). Oil palm is a relevant part of three CGIAR-FTA landscapes: Indonesia (Sumatra/Kalimantan), Cameroon and W. Amazon (Peru). Figure 2 shows the FTA-SL network superimposed on a map of the 80 M ha that is most similar to the current places where oil palm is grown (Dewi et al 2017). Whereas the Sumatra and Kalimantan landscapes are mostly within this suitability domain, the W. Amazon and Cameroon landscapes provide evidence of landscapes where oil palm is one of the many options in the two continents that together account for only 10% of global production.

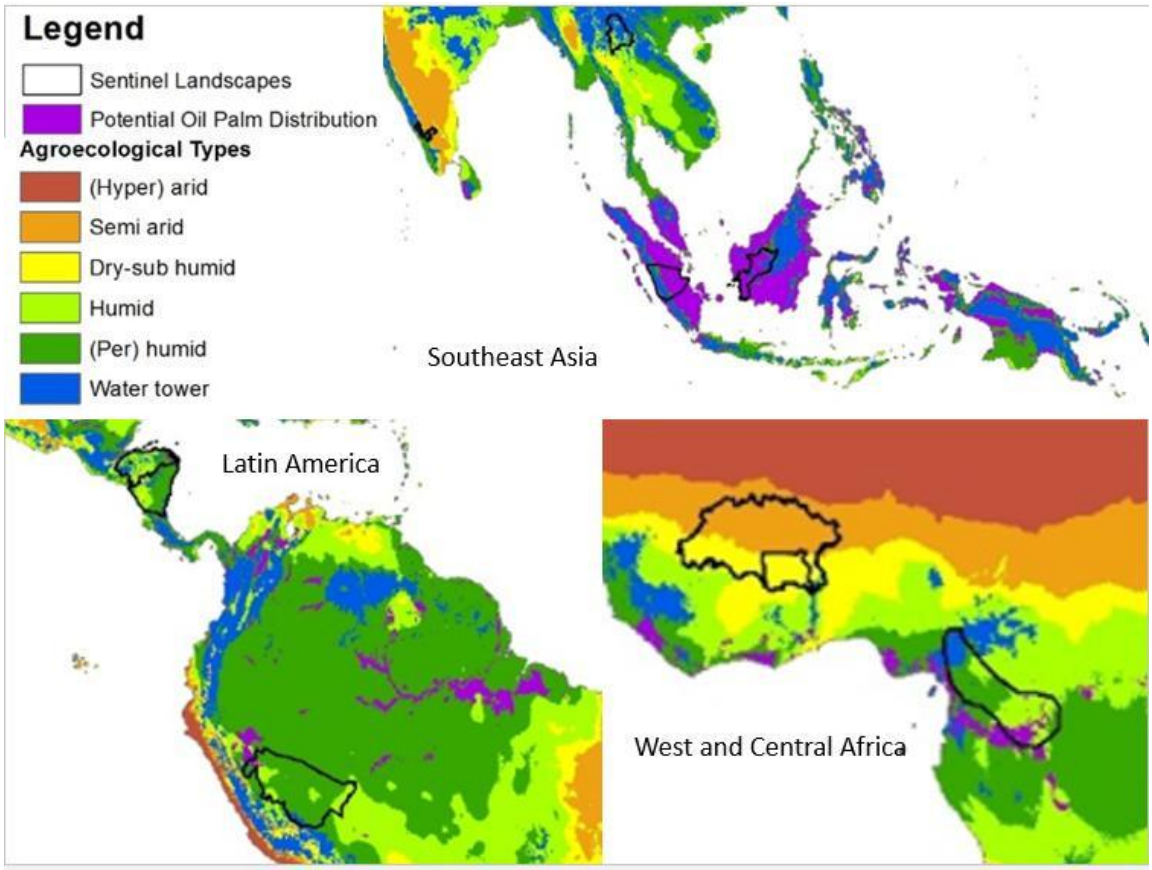

Figure 2. Areas (in purple) where oil palm is most likely to expand based on similarity of conditions with current extent, across ecological zones (derived from Dewi et al 2017)

The analysis started with a compilation of basic data on the production process and value chain, and literature review of the social and ecological diversity of current production systems and the cascade of environmental and social issues that contributed to current standards (Supplementary information). The key environmental and social issues that have been associated with palm oil and timeline of public discourse are summarized in Table 1, under the headings social, economic, environmental services and biodiversity. It has been a rapidly moving target over the past decade, but most issue were already identified some twenty years ago (Tomich et al 1998)

Among the countries that are part of the FTA-SL portfolio, Indonesia is the world's leading palm oil producer, and jointly with its neighbour Malaysia has been the primary producer country voice in the international debates.

Table 1. Timeline of selected issues and public and private sector responses (expanded from Simons, 2014)

	Social	Economic	Environmental Services	Biodiversity
1965-1995	Rapid growth of oil palm production in Malaysia (private companies, FELDA), followed by Indonesia; Indonesian Palm Oil Association (GAPKI) formed in 1981; the nucleus-estate plasma concept was linked to transmigration programs as public-private partnership		Mill-related water pollution issues emerged and became subject to local regulation. Environmental Impact Assessment procedures were adopted in many countries	
1997	During final years of the Indonesia's New Order government conflicts between indigenous people, state-sanctioned con-cessions and migrant labour flared up		Indonesia in fire: haze affects SE Asia; ASEAN regional Haze Action Plan; research shows fire used as both weapon and tool; Greenpeace and WWF involve	
1998	Sawit Watch initiated as watchdog/advocacy NGO, emphasis on social conflict		Public campaigns link oil palm expansion to the fires; Unilever launches Sustainable Agriculture Programme; Indonesia pledges zero-burning policy	
1999	CIFOR/ICRAF research documents underlying causes of fire and consequences			
2000	Malaysian Palm Oil Board established		2000 WWF and IUCN implement project Fire-Fight SE Asia;	
	WWF and Dutch Stichting Doen showcase sustainable palm oil; Unilever partners to develop criteria on economic, environmental and social aspects			
2001	Dutch financial institutions sign anti-deforestation code; further companies sign up for sustainable palm oil commitment			
2002			Kalimantan fires, hotspots in plantations;	
	First multistakeholder meeting organized by WWF			
2003	Roundtable on Sustainable Palm Oil (RSPO) formalized; develops and adopts principles and criteria (no explicit carbon accounting included			
2005			EU Biofuel policy leads to attention for perverse incentives due to partial C accounting	Friends of the earth report on "Oil for Ape" scandal; renewed campaigns
2007		Malaysian Palm Oil Council (MPOC) launches fund to improve sustainable practice and biodiversity conservation		
	Roundtable on Sustainable Biofuels (RSB) initiated, following RSPO model			
2008	First RSPO certified palm oil on the market; UTZ contracted for traceability services			
2009	Indonesian Sustainable Palm Oil (ISPO) standard launched			
2010	International Sustainability and Carbon Certification (ISCC) developed; Unilever pledges 100% sustainable palm oil by 2015; Dutch government pledges 100% sustainable palm oil import by 2015; Consumer Goods Forum (CGF) pledges Zero Net deforestation by 2020			
2011	Indonesian government implements moratorium on forest and peatland conversion			
	Indonesian palm Oil Association (IPOA) withdraw from RSPO member to support ISPO			
2013	WB-IFC study on smallholder typology and issues		Above-average fires in land clearing season in Indonesia, discussion on Singaporean and Malaysian companies and finance; RSPO members are implied in land clearing fires	
	Cooperation between ISPO and RSPO; further companies join pledges; RSPO considers but defers explicit C accounting standards (Agus et al. 2013a,b); Malaysian Sustainable Palm Oil (MSPO) standard launched (Basiron, 2015); Greenpeace and oil palm industry cooperate in Palm Oil Innovation Group (POIG)			
2014	Indonesian Palm Oil Pledge (IPOP); New York Declaration on Forests (UNFF)			
2015	Council Palm Oil Producing Countries (CPOPC) formed by Malaysian and Indonesia government			
	Indonesia Oil Palm Estate Fund Agency established in order to support the development of sustainable oil palm plantation, with funding for capacity building, R&D, promotion, replanting, infrastructures of oil palm plantation, down-stream industry, and preparation and use of renewable energy as biodiesel.			
			Broader zero-deforestation pledges; negative response to IPOP within GoI publicized	
			Worst fires since 1998 re-open old wounds and public debate	ISPO excludes high-conservation value concepts outside of protected areas
			Jurisdictional approaches gain traction, linked to possibilities to compensate for avoided deforestation	
	European companies commit to buying 100% sustainable oil palm in 2020: Amsterdam declaration			
2016	The Government of Indonesia, through the statement of President Jokowi in April 2016, is preparing a moratorium regulation on new oil palm permits to take effects immediately, with the rationale of boosting the productivity within the existing plantation and speeding up the plantation establishment in areas with permits. In July 2016 the IPOP is dissolved, after severe criticism on its 'externally imposed' agenda. In December a moratorium on further peatland use permits is declared in a presidential degree. In December 2016 a law is proposed to parliament to clarify regulations on oil palm, support the industry and set up a palm oil board, similar to what Malaysia has.			

Although the debate and the rise and fall of specific organizations is a rapidly moving target given different perspectives among stakeholders on the ways ahead, authors have been involved in several of the initiatives, and reflect here on their scope and the responses they triggered, as well as what is reflected in the scientific literature.

3. Structure of the global palm oil value chain

3.1 Statistics on oil palm expansion

A value chain is here interpreted as the interlinked activities of production, marketing, transformations and distribution that start with primary production upstream the value chain, and lead to products and services that end-users appreciate, generally associated with an increase of market value per unit constituent along the chain. Palm oil has become a global commodity, with a growing demand not only in developed economies, but also emerging economies (e.g. China and India), and increasingly in developing countries that depend more on imported vegetable oils. Since palm oil supplies food and industrial uses (e.g. cosmetics and detergents), it has greater versatility to meet different markets (Rival and Levang 2014).

Oil Palm is of West African origin and was domesticated for local use 3 to 4 thousand years ago (Logan and Andrea 2012). In the 19th century Nigeria had the first large scale production of palm oil responding to the European demand for the manufacture of candles and as a lubricant for the machinery of the Industrial Revolution (Corley and Tinker 2016). After the First World War industry-based palm oil shifted to South East (SE) Asia, with selection and breeding for short-statured and productive palms and a shift in business model from the African smallholder system to large-scale plantation concessions. In 1935 Indonesia became the worlds' top exporter, with a planted area of 0.075 M ha (Budidarsono et al 2012; Larson 1996). Seventy-five years later and with a 100 times larger planted area of over 8M ha, it regained the number one position that it had lost to Malaysia in the 1960's. Rapid expansion in Malaysia had started with Malaysian research and development leading to new planting material and technology, including the release in 1981 of the pollinating beetle (*Elaeidobius kamerunicus)* that removed a primary production constraint in SE Asia. A favourable policy and available investments led to an expansion of oil palm in the 1990s persisting until today in Indonesia (Rival and Levang 2014).

In 2013 the global net production value of palm oil was 23 M US Dollar. It is ranked 21st by value among commodity trades and is the second most important source of vegetable oil, after soybean (ranked 7); by volume it is the leading vegetable oil. FAO data for 2014 (FAOstats 2016) indicate a global production of 52.9 10^6 metric ton, with 50.9%, 35.5%, 3.4% and 1.6% for Indonesia, Malaysia, Thailand and other Asia/Pacific countries, respectively. The remaining 9% of global production comes from West Africa (3.8%) and Latin/Central America (4.8%). The main import regions and countries in 2011-2013 were the European Union, India, China and Pakistan (with 9.3, 8.4, 6.2 and 2.2 10^6 metric tons, respectively) (FAOstats 2016). The largest share of the European imports are entering through the Netherlands and Germany (3 and 1.5 10^6metric tons, 31% and 16% of total EU import, respectively). By September 2017 19% of all palm oil was RSPO-certified. The end markets

for certified palm oil are primarily European countries. The next largest importers India and China do not require certification.

3.2 Palm oil and healthy diets

The first palm oil issue that obtained major international attention was the human health effects of increased consumption. Based on research that started in the 1980's, the World Health Organization in 2003 stated that there is convincing evidence that palmitic oil consumption contributes to an increased risk of cardiovascular diseases (WHO 2003). Counter-evidence was published by scientists in Malaysia (Lam et al 2009) and according to a recent assessment (Fattore and Fanelli 2013) the evidence on the issue is not convincing. Meanwhile, an EU Food Information Regulation (No 1169/2011) requires specification on the label the types of vegetable oils used in food products, to allow consumers to make informed choices. Product quality in palm oil depends to a considerable extent on avoidance of unripe fruits from the process and the challenge to control quality of FFB not derived from a mill's own plantation has been an issue in restricting relations with smallholders in Indonesia. Technical options for FFB quality control have been in development for some time (Dinah et al 2015).

3.3 Value chain beyond the farm gate

Trade in palm oil and its products is relatively concentrated in a few major corporate groups in Malaysia and Indonesia involved in processing of CPO and PKO. A few international traders supply a relatively large number of consumer good companies and retailers in the end-consumer markets (Steinweg et al 2017). In both Malaysia and Indonesia oil palm was developed with a strong vertical integration between plantations and mills producing CPO. Major corporate groups source the raw material not only from their own controlled oil palm concessions, but also from a relative large number of associated companies and second- and third-party suppliers. Many smallholders are tied through partnership schemes to companies, others are independent smallholders. In Indonesia, official statistics suggest that, in 2013, 5.3 million hectares of planted oil palm was managed by private companies, 0.73 by state-owned companies, and 4.3 by about 2.2 million of smallholders (20% of which are tied and 80% independent).

In Malaysia licenses for palm oil mils are issued to a company only if it possesses its own (matured) plantation (or those belonging to its group or subsidiary companies) of at least 4,000 hectares (MPOB, undated). In Indonesia similar rules applied, but were abolished after the 'reformation' change in policies in the late 1990's when mills buying FFB from independent growers became feasible. A well-organised and maintained mill, typically with a capacity of 60 ton FFB per hour, should be able to process 300,000 tons of FFB per year, which translates to an area of 15,000 – 20,000 ha, based on the average Malaysian and Indonesian FFB yield of 20 and 15 tons per ha per year, respectively (Corley and Tinker 2016). While CPO and KPO can be stored and transported, the refineries as next step in the value chain are associated with higher-skilled labour, innovative technology and industrial progress. Integrating downstream activities provides opportunities for plantation companies to have direct access to customers.

While venturing downstream seems attractive, only the larger plantation companies have actually done so, mostly in Malaysia. In 2011, Malaysia counted a total of 426 palm oil mills but only 56

refineries. In Indonesia, according to official statistics there are about 40 refineries and 600 mills, yet other sources based on companies reported data on their traceability chains suggest about 850 mills (Pacheco et al 2017b). Infrastructure has been built in Indonesia to produce biodiesel from CPO for domestic use and as export product. Interest in biodiesel based on palm oil was fuelled by expectations of rapid expansion due to EU biofuel policies around 2008 (Banse et al 2011) even though interest decreased after the emission consequences of land use change (Searchinger et al 2008; Fargione et al 2008) were realized by the policy makers. Biodiesel for domestic use is still a growth market, supported by national blending targets and mostly independent of international regulation (Mukherjee and Sovacool 2014). Public biodiesel subsidies are justified by aims of energy security and reducing costs of energy imports.

Pacheco et al (2017b) based on data of indexmundi (https://www.indexmundi.com/) indicates that about 62 million tons of CPO were produced in 2015. 73% of which was used for food consumption and 27% for industrial purposes. According to ESPO (2017), 84% of the total global supply from palm oil originates from Indonesia and Malaysia. The EU-28, India, and China are the three main importers of palm oil, followed by Pakistan, Bangladesh and the US. According to this same source, of the total EU palm oil imports in 2016 (7.1 million tonnes), 52% was used in the food industry, and 48% in the energy sector. The latter imports comply with the EU Renewable Energy Directive (RED). Out of the 3.7 million tonnes used for food, 2.5 million (69%) was imported as certified sustainable palm oil (CSPO), but only 60% (2.15 million tonnes) was CSPO used by the European food industry. Thus, there is a gap between the imported volume of CSPO and the actual uptake of CSPO by the food industry.

3.4 Relations between smallholders and mills

The relationship between mills and FFB producers depends on the landscape context. In the Malaysian model and what still is common in Indonesia, mills have contracts with smallholders who are seen as ‘outgrowers’ or participants in a profit sharing model with various contractual arrangements either through the governmental agencies or private palm oil companies (Budidarsono et al 2012). Where oil palm expands into new forest margins, the ‘nucleus estate – plasma’ model became common as a way to combine the production factors land (local), labour (mixed local and migrant), capital, planting materials and know-how (company): the company obtained land from local communities, planted oil palm and managed part of this as its own crop, and part nominally for the smallholders, who would receive income after the plantation start to produce and the FFB sell to the mill. For example, 30% of the selling revenue is deducted by the company as reimbursement of the credit and the 70% of revenue goes to smallholder. These arrangements proved to be a frequent source of disputes while the contracts with farmers were unilaterally changed when the company changed hands (Colchester et al 2006; van Noordwijk et al 2008). A further complication for these settings is that local people have better options than becoming a labourer on an oil palm plantation, and migrant labour has to be brought in to get the plantation established and keep it operational, with further social conflict as a consequence (Budidarsono et al 2013; Galudra et al 2014). Yet, in some cases companies prefer migrant labour rather than hiring local people. During the ‘New Order’ regime of Suharto in Indonesia (before 1998), the nucleus-estate-plasma model was often combined with transmigration programs that brought labour into landscapes with low human population densities.

In contrast with this pattern in pioneer landscapes, in more densely populated areas there may well be multiple palm oil mills within reach of smallholders and thus more options to negotiate prices and contracts in a less-vertically integrated industry. In between plantations and smallholders a new category of medium-sized plantations has emerged (Ekadinata et al 2013) and that complicate the simple dichotomy used in most statistics. These medium-sized plantations operate below the radar screen of regulations, and have become noticed as they are responsible for part of the land clearing fires (Ekadinata et al 2013). Recent research indicates that smallholders tends to be a differentiated group, depending on landholding size, ethnicity and origin (Jelsma et al 2017). This is also associated with the fact that different smallholders embrace disparate livelihood and asset accumulation strategies (Baudoin et al 2015).

Most large mills depend for their operational efficiency on smallholders, as their own production is not constant throughout the year (especially in climates with seasonality of rainfall). Smallholders' FFBs are welcome in off seasons but not so much in peak seasons (Budidarsono et al 2013). Furthermore, the fields of mills tend to be planted within a few years and thus ageing together increasing in production, so that mills progressively have less need for smallholders to complement their own production. Only at the end of their production cycle when production of the nucleus declines intake of smallholders FFBs become important again. Whether risks and benefits are fairly distributed in such a situation is debatable and deserves further research.

A diagnostic study of Indonesian oil palm smallholders in 2013 commissioned by the International Finance Corporation (IFC 2013) aimed at developing a better understanding of their performance and potential. It found that the smallholder share in total Indonesian palm oil production increased between 2000 and 2011 from 27 to 38%. Data for 2009 indicated 3 million ha of smallholder oil palm (81% Sumatra, 15% Kalimantan, 2.5% Sulawesi). Using a 'Smallholder Diagnostic Survey Instrument' with 1069 respondents in various locations, the report distinguished 'tied' and 'independent' smallholders. Tied smallholders have a long-term contract with a nucleus plantation and its mill and are elsewhere described as 'supported'. With 3 ha of oil palm plantation on average, smallholders reported average yields of 13.1 t/ha FFB per year. Taking into account the age of the palm trees, tied smallholders produced 1.5 t of FFB more per hectare than independent smallholders, equivalent to 10–15% higher production. The yield gap was particularly wide in the early years of cultivation, with smallholder yields not catching up until about year 16, by which time the most productive phase of the palms had passed. Contributing to this lower performance was the fact that one-fifth of independent smallholders mainly had non-hybrid palms (i.e. *dura* instead of *tenera*) on their plots. Most smallholders also underperformed when measured against a selection of RSPO sustainable practices, included in the survey. Analysis showed that smallholders who performed well on these requirements had 25% higher yields than those who performed poorly. Further diagnostics of technical issues in smallholder production are under way (Woittiez et al 2017; Hutabarat et al submitted), with special attention to the apparent success of the cooperative model (Suharno et al 2015).

3.5 Land acquisition and FPIC

The dominant ways for large-scale operators to acquire land in forest margin, pioneer settings came to the fore towards the end of Indonesia's New Order regime when the lack of recognition for customary

laws and people self-identifying as ‘indigenous’ became the basis for violent conflicts, as did the conflicts between migrant labour and local communities in several parts of Kalimantan (Colchester 1994; Colchester et al 2006; Colchester and Ferrari 2007; Sirait 2009). This is a main contentious issue in standards compliance. The Roundtable on Sustainable Palm Oil has adopted free prior informed consent (FPIC) of indigenous people as a principle, with attendant criteria and indicators, which must be met prior to any new plantings by RSPO members. FPIC must be "dealt with through a documented system that enables indigenous peoples, local communities and other stakeholders to express their views through their own representative institutions” thereby respecting existing decision-making structures. Efforts were made by the oil palm industry to shift from an outcome requirement of “consent” to a process requirement of “consultation”, but these met with strong resistance.

3.6 Exporting the Asian model to other parts of the tropics?

The shift in production from Malaysia to Indonesia initiated in the 1990’s had multiple causes, but the restrictions on Indonesian labourers working in Malaysia and rising salary expectations of Malaysians made it attractive for Malaysian companies to use their management and technological expertise in locations where land and labour had a lower cost, while social and environmental scrutiny were less developed. However, expanding the know-how for developing and running plantations has not been as easy as it was originally thought. This since companies have to face different legal and institutional contexts, local cultures, and were on the eyes of environmental NGOs, which were looking at closely at likely social and environmental impacts.

After the price hike following the biofuel boom in 2007 further expansion to West Africa and Latin America seemed to be attractive, using the Malaysian and Indonesian company skills (Butler et al. 2009). Other reasons to go to African countries or to for instance Cambodia and Laos were that those countries still had land available and were not yet accused of massive deforestation by the international palm oil buyers. Governments generally welcomed the businesses without environmental constraints. The total oil palm area in South America is, however, still relatively small when compared to those in Malaysia and Indonesia. West Africa, despite being the cradle of oil palm, has a less favourable climate for production of the current germplasm that has been selected in locations (North Sumatra, Peninsular Malaysia) with hardly any dry season. Potential yields are highest where ample water is available throughout the year but skies are not clouded (Hoffman et al 2014). Furthermore, lower radiation in high-rainfall zones has less negative effect than dry periods elsewhere (Corley and Tinker 2016; Woittiez et al 2017).

The strongest expansion in Africa was in Cameroon, with government-sanctioned expansion into primary forest interacting with a small and medium scale enterprises in already converted landscapes (Nkongho et al 2014). Availability of cheap land for large-scale actors coincides with political stability and the interest of the Cameroonian government to develop the agricultural sector as engine for development. Future expansion is expected in the sparsely populated rainforest areas of Africa e.g. in Congo and Angola where governments are expected to favour economic development over environmental issues (Wich et al 2014) Expansion is also taking place in countries such as Benin, Ghana and Liberia. In Ghana large plantations exist next to smallholders. Despite early accounts of emerging oil palm opportunities in West Africa (Gyasi 1994), the seedling supply systems for

smallholders declined rather than improved (Akpo et al 2014). In addition, while some Malaysian companies have tried to expand operations or build partnerships in Latin America, those attempts have not materialized and there are no reported investments of Asian-based companies in the palm oil sector in this region. Most of oil palm investments have expanded linked to national investors and to a large extent to meet domestic markets, including the biodiesel market as in Colombia (Rueda-Zarate and Pacheco 2015) and Brazil, where the government plans did not meet the original expectations (Brandão and Schoneveld 2015). While some of the CPO produced in the region is traded regionally, the regional production cannot compete with cheaper CPO shipped from Indonesia and Malaysia. As the costs of land and labour are comparatively higher in Latin America, production in Latin America is less competitive and vegetable oil comes primarily from mechanized soybean production with much lower yields per ha, but higher economic returns (Pacheco 2012). Nonetheless, the fact that there is more available land in the region could potentially trigger some developments. In Brazil and Colombia, smallholders are involving in processing operations in alliance with companies, while in Peru some smallholder associations are the owners of their palm oil mills (Potter 2015).

4. Management swing potential on environmental issues linked to oil palm production

4.1 Management swing potential

In the context of the biofuel debate Davis et al. (2013) introduced the term 'management swing potential'. It considers the consequences of the diversity of production systems that can lead to a single (or set of equivalent) products and shifts the emphasis from comparisons across products (e.g. biofuel feedstocks each characterized by a single number as in the EU Biofuel Directive), to the difference between best and worst current production systems, with a specified performance criterion. In the debate on biofuel the net emission savings for substituting fossil by biofuel is a relevant criterion, but the management swing potential concept can also be used for social or biodiversity-related footprint characteristics. In the comparison by Davis et al (2013) palm oil was both the best and worst biofuel feedstock and had, by implication, the widest management swing potential. The wide variation in performance was linked primarily to three aspects of the production system: 1) the preceding vegetation (and hence initial 'carbon debt' of the plantation), 2) the fraction of drained peat soils in the production system (when assessed at the level of a plantation or (sub) national accounting unit) and 3) characteristics of the mill, especially in its handling of mill effluent and capture of emerging methane (van Noordwijk et al 2016). The management swing potential is also evident in the wide range of opportunity costs for avoiding C emissions in oil palm production, where the ratio of economic benefit and environmental costs is considered (Dewi et al 2012).

4.2 Conversion of forests, grassland or agricultural croplands?

For new plantations the management swing potential depends on the preceding land use, with debate on how far in history accountability extends. Most certification schemes, discussed below, chose a date that 'grandfathers' (accepts as no longer open to management choices) historical conversion. With the time-averaged carbon stock of oil palm estimated at around 40 ton C ha^{-1} (Khasanah et al 2015a), the carbon debt of a plantation can be directly calculated (Murdiyarso et al 2002; Tomich et al

2002; Agus et al 2013a,b). It can be negative where grasslands or fields currently used for open-field crops (including rice paddies) with an aboveground C stock below 40 ton C ha^{-1} are converted, while it is positive where agroforests or logged-over forests are converted. Whether or not it can be paid back, depends on the size of the carbon debt and subsequent productivity (van Noordwijk et al 2016); it is certainly beyond reasonable payback periods where natural forest is taken as preceding vegetation (Searchinger et al 2008; Fargione et al 2008). With peat soils recurrent emissions can exceed production-phase C sequestration and the pay-back period is near infinite (van Noordwijk et al 2016). The role of logging in the sequence of logging and conversion is clearly problematic and controversial in these accounting methods (Agus et al 2013b). The conversion of rice paddies to oil palm, as described in Riau, Sumatra (Susanti et al 2012) is a red flag for the Ministry of Agriculture; as mainstream guardian of national food security they suggest to limit farmers' choice in seeking profitable land use patterns. With a typical oil palm plantation lasting 25 years, plantations of the early nineties are up for replanting. The increasing incidence of a soil-borne fungus (*Ganoderma*) is the primary technical sustainability issue in replanting (Corley and Tinker 2016).

4.3 Mineral versus peat soils

On mineral soils a life cycle assessment of 25 oil palm plantations and their soil C content in Indonesia suggested that soil organic matter content can be approximately stable with good management practice (Khasanah et al 2015b). Van Straaten et al (2015) compared soil C stocks till 3 m depth in oil palm, rubber or cocoa plantations in Sumatra, Cameroon and Peru with those of nearby forest sites and found strongest effect in the top 10 cm, but also some indications of deep soil C loss in older plantations. This study did not have sufficient data points to consider a time-averaged of life cycle assessment, however. The data indicate stronger effects in Cameroon than in Sumatra, but it may suffer from the non-random nature of land use change, where remnant forests may differ in properties from the sites where forest was converted. Guillaume et al (2015) inferred from $\delta^{13}C$ profiles that erosion may have removed 35 cm of topsoil from oil palm plantations in their study site, but this observation does not seem to match other evidence, and deserves further scrutiny. Frazão et al (2013) concluded for the Brazilian Amazon that the soil carbon stocks in oil palm areas, after adjustments for differences in bulk density and clay content across treatments, were 35–46% lower than those in pastures, but 0–18% higher than the native forest soil C content.

Fujisaki et al. (2015) summarized 21 studies with the $\delta^{13}C$ method comparing soil C between forests, pastures and agricultural land uses, and found pastures to be consistently higher in soil C content than forests, with agricultural systems (including oil palm) with lower values. On peat and other wetland soils with peat layers that are not deep enough for the soil to be classified as peat soils, C losses tend to be much higher.

Thanks to its origin in African inland valleys and fairly high tolerance of water logging, oil palm can grow on peat. Without active water management, however, the plants topple over and are difficult to manage. Thus, water management (drainage) has become the norm (Othman et al 2011), with a drainage design (distance between canals, water table in the canal) calculated to be sufficient in the wettest conditions (Wösten et al 1997; van Noordwijk et al 2014). Between 2007 and 2010, the total area of industrial oil palm on peatland increased sharply by well over half a million hectare, from 1.6 to 2.15 M ha, at a rate of 0.19 M ha/year. Some 0.2 M ha of this most recent expansion was in

Malaysia—nearly all of it in Sarawak—and the remainder is divided more or less evenly between Sumatra and Kalimantan (Miettinen et al 2013). A major contributor to this trend was the complexity of tenure relations and ensuring conflicts where forests on mineral soils were targeted, while peatlands tend to have low human population densities and less complex settlement histories (Galudra et al 2011).

Establishing palm oil on peat land is, however, more expensive than on mineral soils, as hydrological engineering is required to drain the land and to prevent salt water intrusion (Budidarsono et al 2012). Expected yield and economic prospects of oil palm on peat depend on the inherent characteristics of the peat in predictable ways, that have until recently not been followed, leading to a wide range in performance (Veloo et al 2015). Drainage of peat is a major factor in the escape of fires where these were set to clear land in years with long dry seasons, with all consequences for public health, economic activity and greenhouse gas emissions (van Noordwijk et al 2014, Dewi et al 2015, Tata et al 2015).

4.4 Water pollution

The first environmental issue to get broader attention was water pollution caused by the mills. Oil extraction rates are 20-25% of the dry weight of FFB, with the rest part fibre, part nutrients and soluble organic compounds that support algal blooms. Khalid and Braden (1993) discussed the welfare effects of environmental regulation in an open economy based on the case of Malaysian palm oil. In those days the primary issue was water pollution by the mills and the investments needed to reduce the pollution from palm oil mill effluents (POME) were challenged. Most oil palm plantations now use Palm Oil Mill Effluents (POME) for increasing soil fertility or as nutrient enrichment of organic fertiliser derived from composting of FFB, reducing water pollution in the process.

Water pollution in the primary production stage is related to the high rates of fertilizer use, excess of nutrient supply over current demand during replanting, and use of other agrochemicals. Good agronomic practice (Comte et al 2012, 2015) can reduce the severity of these issues to the levels common in annual agricultural crops, but compared to rubber (where the products exported from the field have very low nutrient contents and fertilization is not needed after the establishment phase) the non-point source pollution of groundwater is higher. Effects on streams that affect water life include an increase in stream temperature after forest clearing (Carlson et al 2014). Maintaining riparian buffer zones (as mandated in regulations) helps reduce such effects.

4.5 Orangutans and other biodiversity

In Indonesia Wicke et al (2011) documented a forest cover loss of 40 million ha in the period that oil palm area grew to 8 M ha. Yet, in the public perception oil palm is seen as the primary cause of habitat loss. Dislich et al (2017) reviewed the literature on ecosystem services and biodiversity in oil palm and found major losses in nearly all aspects considered, other than productivity. Orangutans (with separate species on Sumatra and Borneo) and tigers (on Sumatra) have become the most visible and debated focal point for concerns over the loss of globally unique biodiversity from the lowland forests converted to oil palm (Curran et al 2004; Fitzherbert et al 2008; Nantha and Tisdell 2009). Ancrenaz et al (2015) concluded that as long as there are natural forest fragments in the landscape, orang-utan presence in mature oil palm landscapes is possible without major negative effect on oil

palm productivity. Abram et al (2014) concluded for an oil palm landscape in a floodplain environment in Sabah that one-fifth of the oil palm was under producing due to flooding and could be reverted to forest and orangutan habitat without negative effect on company income. A more careful spatial planning for mosaic landscapes can help avoid lose-lose scenarios and find solutions where conservation and local livelihoods are compatible. Beyond large-scale oil palm expansion, orangutans are primarily threatened by increased proximity of human settlements in Kalimantan (Abram et al 2015).

4.6 Documenting forest conversion

The rapid rates of tropical forest change (Achard et al 2002) have been widely debated as being caused by three drivers: logging, smallholders and migrants expanding agriculture, and the development of commercial plantations, that include rubber, oil palm and industrial timber. Carlson et al (2012) documented oil palm expansion on coastal peatlands in West Kalimantan that started relatively late. Using data for a landscape with direct threat to a remnant orangutan population, Lee et al (2016) reported progress with development of accessible and low-cost tool for independent bodies to detect and monitor the expansion of oil palm plantations.

Depending on the forest concepts and definitions used, part of the change in land cover is described as deforestation and the remainder as degradation (from an environmental perspective) or conversion (a more neutral term) (Sodhi, et al 2004; van Noordwijk and Minang 2009). As a common forest definition refers to tree cover, subsequent debate has been on whether or not (oil or all) palms are trees, and by inference palm oil plantations forests, in the same way as industrial timber plantations are included in the forest category. Koh and Wilcove (2008) suggested that of all oil palm expansion between 1990 and 2005 in both countries, at least 50% has been through direct conversion of natural rainforest. Abood et al (2015) concluded from a study of Kalimantan, Sumatra, Papua, Sulawesi, and Moluccas between 2000 and 2010 that logging and conversion to tropical timber plantations dominated over oil palm as direct cause of deforestation.

Marlier et al (2015) concluded for the 2006 burning season, that timber concessions from Sumatra (47% of area and 88% of emissions) and oil palm concessions from Kalimantan (33% of area and 67% of emissions) contributed most to concession-related fire emissions from each island. Although fire emissions from concessions were higher in Kalimantan, emissions from Sumatra contributed 63% of concession-related smoke concentrations for the population-weighted region because fire sources were located closer to population centres.

The contribution of logging income to the establishment costs of oil palm was estimated by Budidarsono et al (2012) to be generally less than 10% of the Net present Value of an oil palm plantation, and lack of such income should not be an obstacle to converting land already logged-over before to oil palm.

A clean separation of the drivers of forest change is hard, however, as extraction of commercially interesting timber is a step in planned conversion. In fact, permits for conversion to oil palm plantations became a major way to legalize logging in Indonesia and feeding the paper mills with overcapacity as plantation forestry stayed behind on its targets, even when the area actually planted stayed far behind on the area cleared in name of the crop. Specific issues of orangutans and oil palm expansion on peat along Sumatra's north-west coast were discussed by Tata et al (2014). Meanwhile,

functional aspects of biodiversity at landscape scale have received some scientific attention (Foster et al 2011), but play little role in the overall debate.

4.7 Biofuel, CO_2 emissions

Following debates on the Kyoto protocol whether or not deforestation and other land use change should be included in international agreements, the United Nations Framework Convention on Climate Change (UNFCCC) commissioned in 1998 a special report examining the scientific and technical state to understand carbon sequestration strategies related to land use, land use change and forestry activities. The ASB data helped quantify the differences in time-averaged C stock in comparisons between land use systems (Tomich et al 2002). Spearheaded by Germany's Renewable Energy Sources Act (EEG 2000) mandatory targets for 'renewable energy' in the transport sector started in several European countries and expanded rapidly the following years (Renewables Directive (2009/28/EC)) and triggering a frenzy of investment and expansion in the palm oil sector across Southeast Asia and beyond. The papers by Searchinger et al (2008) and by Fargione et al (2008) in Science pointing at the large carbon debts related to deforestation or indirect land use change contributed to reduction in (the speed of) EU mandatory blending standards and a negative image of palm oil based biodiesel. With its large potential oil production per ha oil palm was first part of the solution of climate change as component of biodiesel but rapidly became depicted as contributing to causing the problem.

For the EU the main regulatory instrument is the Renewables Directive (Directive 2009/28/EC). Only biofuels that are considered to lead to a 35 or 50 percent greenhouse gas reduction (before and after January 1st 2017, respectively) are allowed. When all palm oil is considered as a single feedstock source, methane capture at palm oil mills is essential to reach the 35% emission reduction claim (Klaarenbeeksingel 2009). If the wide diversity of land use histories and variation in peatland use is included, substantial variation exists in products of different mills and companies (Khasanah et al 2012; Dewi et al 2012). In November 2012 the European Commission ruled that a Renewables Directive compliant version of RSPO (i.e. with a greenhouse gas component) would be recognized as a Renewables Directive voluntary certification scheme. There has been considerable resistance at the annual RSPO meeting in 2013, however, to augment RSPO rules to include explicit C accounting rules, even when technical information on how to do that was made available (Agus et al 2013a,b).

Boons and Mendoza (2010) analysed how the strategies and value definitions of actors involved in the production and consumption of biofuels lead to specific definitions of sustainability, comparing opinions on palm oil production in Colombia and electricity generation in the Netherlands. While the current growth in production of palm oil is definitely buyer driven, the analysis of various activities in the chain shows that several aspects of sustainability are defined in more complex actor fields throughout the product chain.

Oil palm also played a role in the food versus fuel debate (Sanders et al 2014), but in contrast to other fuel feedstocks where new uses were seen to compete with use as food, in palm oil the overall expansion, for either use, is the main issue of debate.

4.8 Emerging standards

The first voluntary sustainability standard, SAN, was developed in 1987, aiming to change land use and business practices to reduce their impacts on both biodiversity and local people (10 principles, 100 criteria). Products that meet the sustainability requirements set out by SAN receive the Rainforest Alliance certification seal. Twelve years later the World Wildlife Fund engaged palm oil processing and trade companies, financial players, NGOs, and retailers and food manufacturers to found the Roundtable of Sustainable Oil Palm to develop the first palm oil specific sustainable criteria and principles (Nikoloyuk et al 2010; Schouten and Glasbergen 2011) (41 criteria, 126 indicators). RSPO aims to provide a guarantee that standards are met and that products can be sold in market segments that care about production impacts. Governments were not among RSPO members and claimed, at least to domestic audiences, that their sovereignty was infringed by such rule-making bodies (Wong and Hezri 2015), similar to the experience with REDD+ (Ghazoul et al 2010). Governments tend to see themselves as the only ones that can provide license to produce within their territories. Malaysia and Indonesia therefore followed suit with their own national standards, MSPO and ISPO, stressing the need for a standard that addresses growers needs, especially smallholders, rather than that of consumers (Basiron 2015). In parallel the European biofuel industry developed its own standards, with the Roundtable on Sustainable Biofuels (RSB) and the International Sustainability and Carbon Certification (ISCC; 6 principles). The RSB (12 principles, 37 criteria) has two sets of principles and criteria for certification – one which applies to any type of feedstock on a global scale, and one which is specifically consolidated to comply with the EU Renewable Energy Directive (EU RED) (Hennecke et al 2013). In 2009 ISPO was the first national level mandatory palm oil sustainability standard in the world (39 criteria, 139 indicators (65 major and 74 minor)). Recently producers selling into Indonesia's biodiesel supply chain were exempted from meeting the ISPO certification standard (Aurora et al 2015).

McCarthy et al (2012) considered how policy models, regime interests, and agribusiness strategies shaped local production networks, generating local outcomes, and affecting the possibilities of tackling issues associated with the oil palm boom. To reduce the costs of monitoring streams of certified and non-certified palm oil from a region, a 'commodity shed' approach is promoted by parts of the private sector[6]. This means that all producers providing palm oil to a bio-refinery in a geographically area defined need to become certified, with a role for local governments in a jurisdictional approach. A similar emergence of an intermediate scale between 'project' and national government has emerged in the REDD+ debate (Meyer and Miller 2015). Such an approach may have benefits for smallholder farmers as it makes certification from an option into a responsibility of companies as well as governments. The approach can lead to a model of rural development that is aimed at reducing deforestation and greenhouse gas emissions while also improving the welfare of society and recognizing the rights of smallholders and indigenous communities. In Malaysia all palm oil production in Sabah on Borneo is due to be RSPO certified in 2025.

[6] https://www.idhsustainabletrade.com/sectors/palm-oil/

Table 2. Overview of certification standards dealing with key negative environmental and social impacts of palm oil (modified from Yaap and Paoli 2014: 1 = strong and clear requirements; 2 = addressed, but requirements less clear; 3 = issue not directly addressed); shading indicates primary areas of concern

Environmental and social impacts	Issue across initial stages of the value chain:			Certification standards:			
	Planting, conversion	FFB production	CPO production	SAN	RSPO	ISPO	ISCC
Environmental issues							
Environmental Impact Assessment (EIA)	Deforestation, biodiversity loss, GHG emissions			1	1	2	3
Peatlands		Drainage		1	2	1	1
High Conservation Value (HCV) lands (inside and outside of protected areas)				3	1	2	3
Forest clearance (incl. use of fire as tool)				1	2	2	1
Riparian forests and buffers around water bodies				1	1	1	1
Biodiversity conservation outside of HCV				1	1	2	1
Greenhouse gas emissions	CO_2 from conversion	N_2O from fertilizer, CO_2 on peat	Methane (CH4) at mill	1	1	1	1
Soil (other than peat)		Erosion in early stages; compaction	Recycling EFB, POME	1	1	1	1
Water and waste management		Agroche-micals	POME (mill effluent)	1	1	1	1
Social issues and employment							
Social Impact Assessment (SIA)	Government – company agreements don't respect local rights			1	1	2	1
Community consultation				2	1	2	2
Free and prior informed consent (FPIC)				3	1	3	3
Land rights and acquisition				2	1	2	2
Compensation				2	1	1	1
Community benefits				2	1	1	2
Conflict resolution				1	1	1	1
Contracts (local, migrant)		Labour – company relationships in plantation and at the mills		1	1	3	1
Wages				1	1	1	1
Other conditions and benefits				2	2	3	2
Freedom of association and bargaining				1	1	1	1
Health services				1	1	2	1
Living conditions				1	1	2	1
Human rights				2	1	2	1
Forced labour				1	1	1	1
Child labour				1	1	3	1
Child access to education				1	1	2	1
Discrimination				2	1	2	1
Women				3	1	3	3
Indigenous people				3	1	1	3

In Indonesia Central Kalimantan and South Sumatra have committed to a jurisdictional approach meaning that they will support certification under RSPO of growers located within their territorial boundaries (RSPO 13th roundtable, November 2015). Furthermore it becomes slowly recognised that zero-deforestation claims have to be part of a cross-commodity, jurisdictional approach to have credibility and reduce leakage. The key to stopping deforestation is in land use planning not just focussing on one commodity (oil palm) but also looking at the development of other tree-crops such rubber, cocoa, coffee, and tree plantations for paper and pulp, agricultural crops for food production, and production and conservation forests (Minang et al 2015). Hence the recent popularity of a landscape approach with the palm oil producers as one of the landscape users (IDH, Oxfam-Novib). However, landscape approaches can have both positive and negative effects. On the positive side, for instance it can more easily facilitate identification, conservation and adding value to High Conservation Value (HCV) areas and account for proper water management based on river basins and watersheds, and on the negative side, it can allow for free-riders (beneficiaries not actively contributing to the collective action) and reduce incentives for good performers.

Despite large growth in membership, industry commitments and market share of sustainable palm oil the issues in the sector have not been solved: there are still huge forest fires, peat lands are still being deforested for oil palm, land conflicts continue in frontier areas in Kalimantan and Papua and benefits of certification to smallholders livelihoods is far from clear. Austin et al (2015) examined the extent to which land management policies can resolve the apparently conflicting goals of oil palm expansion and GHG mitigation in Kalimantan. They estimated that emissions can be reduced by 9-10% by extending the current moratorium on new concessions in primary forests and peat lands, by 35% by limiting expansion on all peat and forestlands (including those with existing permits), by 46% by limiting expansion to areas with moderate carbon stocks, and by 55–60% by limiting expansion to areas with low carbon stocks. A carefully designed and implemented oil palm expansion plan, beyond current rules and means of implementation, could contribute significantly towards Indonesia's national emissions mitigation goal, while allowing oil palm area to double (Afriyanti et al 2016).

5. Issue cycle responses in expansion and production phase

5.1 Oil palm dynamics in the Sentinel Landscapes

5.1.1 Indonesia

Currently, oil palm is a prominent part of the landscape in the Sumatra and Borneo FTA-SL's, representing a substantial part of the strata distinguished by Khasanah et al (2015). Murdiyarso et al (2002) compared oil palm with other land uses in Sumatra (especially rubber) and derived an 'equilibrium human population density' of 30-40 km^{-2} as characteristic for oil palm (5 ha per person, 25% of land for other uses and 50% of population in workforce implies 30 km^{-2}), while the corresponding value for intensified rubber production is around 60 km^{-2}. Thus, a shift from rubber to oil palm implies further expansion into remaining forests or a shift to more urban and service-oriented jobs. Actual conversion was focussed on remaining forest before 2000 and later became focussed on conversion of rubber agroforest (Villamor et al 2014). Ketterings et al (1999) had clarified that

smallholder land clearing depends on fire where food crops are to be grown as part of a new tree crop cycle, but has no-burn options otherwise.

In the first analysis of economic profitability and incentives for independent smallholders to invest in oil palm, Papenfus (2000) found that the returns to land and labour were high relative to other smallholder activities, but that significant sunk costs and uncertainty in returns may create an option value to waiting to invest in oil palm. An econometric study in 2012 found only a slightly higher profit for oil palm than for rubber in Jambi (Dewi 2013), but rubber prices have since declined. Rist et al (2010) and Feintrenie et al (2010) analysed the shifting perceptions of oil palm and rubber, while Villamor and van Noordwijk (2011, 2016) documented a gender-differentiated willingness of local farmers to engage with oil palm agents. Cramb and McCarthy (2016) analysed the differentiated and complementary development based on differential access to land, labour and political support in the five main oil palm producing regions of the world: Sumatra, Peninsular Malaysia, Sabah, Sarawak and Kalimantan. There is increasing attention to the social and economic impacts of business arrangements between smallholders and companies vis-à-vis independent smallholders who sell their FFB freely along the road. Partnership agreements provide stability and support intensification of the production (Suharno et al 2015). Further typologies of smallholders' social differentiation are emerging (Baudoin et al 2015, Hidayat et al 2016, Jelsma and Schoneveld 2016, Jelsma et al 2017)

Even at finer scale the story of successes and failures of oil palm development from a social perspective across different situations is nuanced, as evident from the contrasting experiences with oil palm in three villages in the same zone in Jambi, Sumatra (McCarthy and Zen 2016), with key positive and negative roles for local elites and administrators. Gatto et al (2015) analysed village survey data for Jambi covering the 1992-2012 period and found that smallholder oil palm expansion was mostly based on conversion from rubber agroforests, while the government sponsored transmigration program played a key role for the start and expansion of oil palm in Jambi. Data from a village survey in Jambi (Sumatra), spanning a time period from 1992 to 2012 (Gatto et al 2017) show that company-community contracts signed before 1999 contributed more to wealth accumulation than contracts signed afterward, due to more public sector support and infrastructure investments. Contracts contributed to decreasing inter-village inequality, as poorer villages were more likely to adopt a contract, but also because they benefited more from contract adoption than richer ones. Nutritional studies in Jambi found that oil palm producers generally progressed (Euler et al 2017).

In a comparison of livelihood impacts, costs and benefits of participation in sustainability certification by ted/supported and independent palm oil smallholders in Sumatra, Hidayat et al (2015) found evidence that participation in the RSPO positively contributes to all smallholders' livelihoods. The main effects, however, are through organizational changes and capacity building rather than direct changes in the costs and benefits of their production system. If they would have to pay realistic costs of certification, the monetary bottom line might be negative. Participation of smallholders in the RSPO does, however, contributes to non-monetary benefits, such as safety, better health and better environmental quality.

In contrast with the experience in Sumatra, most of oil palm expansion in Kalimantan (Indonesian part of Borneo) has been of a pioneer type primarily triggered by companies expanding into recently logged and deforested areas, with as yet less participation by smallholders than is common in

Sumatra. Here issues over land rights emerged in strong force (Sirait 2009, White and White 2012) and associated conflicts are common (Abram et al 2017) with rural struggles around land and dispossession may simultaneously serve as sites of struggle over gender as well (Morgan 2017). Intergenerational displacement is an issue in at least part of Indonesia's oil palm plantation zone (Li 2017). As oil palm offers very different business models than preceding rattan and rubber-based agroforestation had shown (Belcher et al 2004; van Noordwijk et al 2008, 2014), a clash of norms and expectations is profound. Visions of sustainability and perceived challenges vary greatly among growers and other stakeholders involved in the palm oil sector, with diverging conceptions likely to complicate the definition and implementation of good practices and refinement of sustainability criteria (Bessou et al 2017). Even in the most successful smallholder oil palm production systems in Sumatra, children have other ambitions than farming and the generation shift does not retain the initial success factors (Jelsma et al 2009).

The scale at which RSPO standards apply, producing areas and mills, is still an issue. As documented in Tata et al (2014) the initial response of large oil palm producers when areas where they had a concession became contested was to sell off their holding to other companies that operate in a different (domestic) market segment. Nothing in the RSPO standards forbids companies to do so; the certification audits focus on an existing company-level portfolio, not on a historical one. Where the primary issues contested in oil palm production are the initial conversion of other land covers to oil palm plantations, a direct role for the government level where land use conversion permits are issued is logical. In this case a District or Province would become the scale of standards, compliance monitoring and certification. Following the terminology developed in the REDD+ arena, this is described as 'jurisdictional' approach (implying subnational levels of government, within the hierarchy that applies to the country).

Table 3. Highlights from recent changes in the legal framework for oil palm expansion in Indonesia (Aurora et al 2015)

	Land	Production	Standards
Constitutional Court decision no. 35/2012 (MK35) on customary forests and associated regulations and decrees ruled that forest with claims by communities that assert rights over customary forest shall not form part of the State forest estate, and shall come under control of customary communities.	X		
Law No. 6/2014 on Villages and Ministry of Home Affairs Regulation No. 52/2014 on the guidelines for the recognition and protection of adat communities opened the way for the formation of customary (adat) villages, centred on adat law communities. The regulation offers guidelines on how to recognize their rights. While clear implementation procedures for recognizing rights are still lacking, these instruments provide a broad framework for doing so. The law also creates a stronger governance function for villages, and mandates creation of a village fund fiscal transfer mechanism to support millage development, estimated to be valued at USD70,000 to USD100,000 per village each year.	X		
Law No. 23/2014 on Regional Governments specifies that district governments retain the licensing rights for oil palm plantations, but, those for mining and forestry are reallocated to the provincial governments. Provincial governments are also empowered to	X		

	Land	Production	Standards
oversee district official's performance and take action to remediate poor performance.			
Law No. 39/2014 on Plantations, replacing the 2004 Law on Plantations, and reaffirming principles of sustainability, the key role of local authorities in governing the sector and requirement for companies to negotiate partnership agreements with communities. While the recognition of adat communities in the forestry law still awaits operationalization, local authorities are prohibited by the plantation law from issuing permits where adat communities have customary rights. Noticeably, however, under the law companies are effectively prohibited from retaining forest within their plantations.	X	X	X
Government Regulation No. 11/2015 on ISPO standard (replaces the previous Minister of Agriculture regulation No.19/2011). It no longer references high conservation value lands and prohibits forest conservation within plantations where such land is suitable for oil palm. It defines land to be allocated for conservation as those required for protection by law. CPO producers selling into biofuel supply chains are exempted from ISPO certification, but no guidelines are provided for how producers qualifies for the exemption. Plasma farms (smallholders associated with a state or private company), and independent smallholder oil palm farms (independent farmers) are not required to pursue ISPO certification, but may choose to do so voluntarily.	X	X	X
Government Regulation No. 71/2014 on Management and Protection of Peatlands outlines a process for mapping, land use zonation and management of peatland hydrological units throughout Indonesia. A minimum of 30% of each unit must be protected, with potentially larger areas based on presence of defined criteria. Provisions of the regulation create opportunities for regional, progressive leadership to propose larger areas for conservation, balancing production and protection goals for peatland based on local aspirations.	X		

5.1.2 Cameroon

While oil palm has remained a relevant part of the West African landscape in which it was first domesticated, usually as part of mixed agroforestry systems and tapped for palm wine as well as fruits for local processing and oil production, industrial scale plantations are restricted in area. Production of oil palm in the Central African FTA-SL, specifically in Cameroon, is based on the co-existence of artisanal systems managed by the local population that target domestic food markets, and industrial Asian-style plantations with government-derived rights. These two markets, however, tend to compete, as influenced by seasonality in production and CPO imports.

Palm oil expansion competes with cacao-based agroforest and natural forest (Hoyle and Levang 2012). Six industrial companies operate in Cameroon, and produce over half of total palm oil supply (Ordway et al 2017). Most of the existing industrial palm oil mills are located close to the coast. According to Potter (2015), there is no definitive figure for the total area of oil palm in Cameroon, as the area under "village groves" or "non-industrial holdings" is only a rough estimate. Total planted areas were estimated in 210,000 ha in 2013, about 70,000 ha corresponding to agro-industrial companies, and about 140,000 ha to village groves (Ndjogui et al 2014). The industrial sector was originally developed through parastatal companies (Socapalm and Cameroon Development Corporation, CDC), privatized in the 1990s. Expansion of smallholder growers through state support in the 2000, along with donor-sponsored programs to link smallholder and companies. This also

triggered investments from local elites (Nkongho et al 2014). In the early 2010s, there was growing interest of investors, especially from established companies in Asia, in trying to secure forested land in the oil palm zone (Hoyle and Levang 2012). In Cameroon, an estimated 17% of total oil palm plantations expanded over forest areas between 1989 and 2013 (Vijay et al 2016). An important portion of this expansion was driven by larger-sized non-industrial producers engaged in informal supply chains (Ordway et al 2017).

There is unsatisfied demand for palm oil in Cameroon, which is fulfilled by imports. Smallholders are more inclined to produce for the domestic market, despite the presence of agro-industrial mills in the vicinity of their plantations (Nchanji et al 2015). When FFB are processed in artisanal mills rather than sold to industrial mills, this increases the value captured by local producers, artisanal mills' operators, and intermediaries, and also generates local employment, mainly for women. Smallholder palm oil yields tend to be slow, since there producers are confronted with several constraints, such as high costs of inputs, limited access to affordable loans and use of low production varieties. In this context smallholder yield levels are low (Nkongho 2017), but oil palm farmers still enjoy a higher standard of living than the average worker employed in the commercial plantations. Since salaried workers have challenges accessing market-based food, they still tend to engage in food cultivation (Hamann 2017). Elsewhere in the humid forest zone of West Africa, Vissoh et al (2017) analysed ways production and distribution of hybrid oil palm seedlings to small-scale farmers can replace the existing seed system in Benin that has become so corrupted that the seedlings actually planted are largely of unimproved kinds.

5.1.3 Peru

The total planted area of oil palm in the Western Amazon FTA-SL amounted about 60,000 hectares in 2013, particularly in the Peruvian Amazon, in the departments of San Martin, Loreto and Ucayali. Oil plantations developed in the 1980s, driven by a strategy of import substitution in the 1970s (Eguren 2006), which led to the establishment of a state-owned company in San Martin, which by mid-1980s had a planted area of 5,273 ha., time on which faced an administrative crisis due rising labour and administrative costs. In 1993, EMDEPALMA suspended its operations, following the passage of a law to privatize state firms, and was transferred to the local producer association (Ministerio de Agricultura 2000, DGCA 2012). A Further development of oil palm was associated to the UNODC coca substitution program in Ucayali through projects stimulating oil palm plantations in farmers lands, and associative schemes for the provision of inputs and services (Parra y Guerra 2014). This model resulted in the formation of four associations operating their own mills, and sourcing from their members (Zegarra et al 2004). While, international cooperation funds decreased since 2004, the governments' financial contribution tended to increase through the National Commission for Development and Life without Drugs program (UNODC 2011, DEVIDA 2009). In 2016, the government issued a plan for supporting the sustainable development of oil palm in Peru (2016-2026) including actions for improving yields and market access (MINAGRI 2016).

According to Hajek et al (2015), the smallholder mills play an important role on the domestic supply of palm oil in Peru. The oil palm plantations increased from 23,771 ha in 2006 to 60,000 ha in 2013. The CPO production reached about 245,211 tons in 2013. About 48% of the planted areas corresponded to cooperative farmers, 4% to contract farmers, 5% to independent farmers and 43% to industrial plantations (33% correspond to Grupo Romero and 19% to other medium- and small-scale

investors). The Grupo Romero, one of Peru's larger corporate groups, with investments in the vegetable oil sector, also invested in developing its oil palm plantations in the the provinces of San Martin and Loreto. This group has become one of the largest producers of palm oil with about 25,000 hectares planted (Hajek et al 2015). Most of the mils owned by cooperatives sell their CPO to mainly two companies (Alicorp and Grupo Palmas), which are companies controlled by the Grupo Romero. Among the other medium-size groups investing in oil palm, Grupo Melka (owner of two companies with oil palm plantations), had plans to expand 5,000 ha of oil palm in the region (Potter 2015). Nonetheless, due to lack of compliance with Peruvian regulations, this group operations were halted (MINAGRI 2016).

Much of the large-scale plantations have tended to convert primary forests for the development of their plantations, and in some cases have put some pressure on indigenous lands. Recently, the complaints panel of the RSPO (Round table on Sustainable Palm Oil) issued a preliminary 'Stop work order' to *Plantaciones de Pucallpa*, one of its Peruvian members, whose operations are affecting the territory of the Shipibo community of Santa Clara de Uchunya in the Ucayali region of the Peruvian Amazon[7]. In contrast, oil palm in smallholder lands has developed primarily taking over forest regrowth and agroforestry systems, with only a third part of oil palm expansion leading to forest conversion (Gutiérrez-Vélez et al 2011). In the locales where oil palm has developed in smallholder lands, these farmers still maintain relatively diversified production systems combining annual, perennials and livestock, thus oil palm constituting a complementary source of cash-income, depending on land and labour availability, particularly in Ucayali. There is a smaller group of more specialized oil palm smallholder in San Martin, mainly those maintaining direct ties with companies, who also obtain comparatively higher yields.

The pattern found in Peru may not be typical of that in Latin America as a whole, particularly not when comparted to Colombia or Brazil. Furumo and Aide (2017) found that most oil palm expansion in Latin America occurred onto grazed land with 79% of oil palm plantations came from 'previously intervened' land. Cattle ranching and infrastructure development are important precursors for oil palm and other commodity crops in Latin America. Nearly 20% of Latin American oil palm is certified, comparable to the global average, and it can readily demonstrate not to be involved in primary deforestation. This is in fact similar to the role rubber played in peninsular Malaysia and most of Sumatra, with the difference in overall pattern between Latin America and SE Asia less than interpreted by Ramankutty and Graesser (2017).

5.2 National: producer countries trying to regain the initiative

Between 1980 and 2015 there have been various attempts to regulate the palm oil sector through national regulatory bodies (Malaysian Palm Oil Board, Indonesian Palm Oil Committee), voluntary initiatives in the private sector such as the Palm Oil Innovation Group (POIG) and the Sustainable Palm Oil Manifesto (SPOM), the RSPO as multi-stakeholder platform and mandatory national standards, such as the Indonesian Sustainable Palm Oil system (ISPO) (Table 2). The Malaysian Palm Oil Board (MPOB) is the governing body of the voluntary Malaysian Sustainable Palm Oil (MSPO) certification.

[7] https://es.mongabay.com/2015/06/bosque-virgen-deforestado-por-un-enorme-proyecto-de-plantaciones-de-aceite-de-palma-en-peru/

The Indonesian Sustainable Palm Oil certification (ISPO) came as reaction on RSPO, playing the card of sovereignty. Initially ISPO was primarily an attempt to bring all applicable regulations under a single umbrella, so that compliance with existing rules could be more easily documented. For a mandatory scheme, aimed at creating trust in the brand 'Indonesian palm oil', it is not easy to go beyond existing rules, without extensive review of what already exists (but is not systematically implemented and enforced). If indeed all existing rules and laws on land acquisition, land use change and environmental impact assessments would have been followed, many of the social and environmental issues might never have arisen. ISPO, however, may lead to increased efforts in law enforcement (Hospes 2014b), but all depend on policy priorities. For example, government Regulation No. 11/2015 exempts plantations from ISPO when they produce CPO for bioenergy for the local market (Table 3). In 2013 a voluntary Malaysian Sustainable Palm Oil (MSPO) certification scheme was launched with 7 principles, 116 criteria and 239 indicators. The scheme distinguishes between independent and organized smallholders, plantations and mills.

In their review of Indonesia's Evolving Governance Framework for Palm Oil, Aurora et al (2015) found that Indonesia's laws and policies governing palm oil are comprehensive, but often confusing and contradictory with respect to environmental management and that they sometimes undermine progressive business lead efforts at self-regulation. In addition, palm oil governance involves multiple bodies of law and government agencies related to land, forests, plantations, spatial planning, environmental management, and regional government. Alternating phases of de- and recentralization shift power among the various layers of government, while provisions of various laws are not harmonized. There is no overarching national policy yet that guides palm oil development and deforestation reduction (Aurora et al 2015). Domestic biodiesel production has been stimulated as a way to increase savings on fuel imports while creating energy security (Indonesia, Thailand) and to provide a safety net to stabilize the price of palm oil by removing surplus stock (Malaysia, Indonesia). Efforts were made to declare palm oil grown for domestic biodiesel not to be burdened by mandatory compliance with ISPO, undermining the credibility of the scheme.

The certification agenda has lately been complemented with the self-regulatory pledges of companies to zero-deforestation. Momentum picked up in 2010 when the Consumer Goods Forum (CGF) and its members committed to zero net deforestation by 2020 (Brown and Zarin 2013). On May 20, 2011, Indonesian President Susilo Bambang Yudhoyono signed a Presidential Instruction putting into effect a two-year moratorium on issuing new permits for use of primary natural forest and peatland. The moratorium was part of a broader $1 billion Indonesia-Norway partnership to reduce emissions from deforestation and degradation (Murdiyarso et al 2011). Ex ante impact predictions for the moratorium suggested it to be effective in reducing emissions from forest conversion (Busch et al 2015). A recent publication explored future scenarios and argues that future oil palm demand (in 2050) can be met by Indonesia keeping its market share without further deforestation or use of peat land (Afriyanti et al 2016) when yields per ha increase. This study may provide an argument to extend the moratorium. Since 2011 there have been various individual company policy commitments towards deforestation free supply chains either through group pledges or development of independent cooperate standards. The movement was largely driven by activist campaigns, but also by companies needs to cater their standards to their business model and differentiate themselves from their competitors and identifying themselves as industry leaders, developing a unique brand, and building customer allegiance. These

different pledges are Indonesia Palm Oil Pledge (IPOP), the sustainable palm oil manifesto (SPOM) and the New York Declaration on Forests. Example of and independent cooperate standards are Golden Agri Resources Limited and its subsidiary PT SMART Tbk (SMART), new Forest Conservation Policy (GAR HCS).

The Indonesian major palm oil corporate groups subscribing to the zero-deforestation agenda issued the Indonesian Palm Oil Pledge (IPOP), as an attempt to distance themselves from companies engaged in deforestation and peatland use practices. In addition, the pledge included farmers' empowerment and tenure reform as goals; the pledge was signed at the UN Climate Summit. IPOP was strongly criticised by Indonesian officials as a cartel dominated by foreign interests, undermining the government's authority (Saturi and Nugraha 2015). It was formally dissolved in July 2016 by declaring victory: "Since 1st July 2016, IPOP signatories have decided that recent ground-breaking policy developments in Indonesia have fulfilled the purpose of IPOP to help accelerate and promote this transformation toward sustainability and therefore its presence can be dissolved" (http://www.palmoilpledge.id/en/). In addition, it was assumed that the commitments made by the groups involved would continue to be pursued individually by them. Whether or not global certification of agricultural products is a curse or blessing from a government or smallholder perspective in Indonesia remained contested (Ibnu et al 2016; Hidayat 2017).

In a complementary move, the Government of Indonesia, as a way to show the state power in regulating palm oil expansion, established the Council of Palm Oil Producing Countries (CPOPC) in September 2015. It was a response by Malaysian and Indonesian government to regain control over the issues linked to promises to develop and harmonized set of standards, but also as an attempt to develop mechanisms to stabilize palm oil international prices. Other oil palm cultivating countries, including Brazil, Colombia, Thailand, Ghana, Liberia, Nigeria, Papua New Guinea, the Philippines and Uganda have been invited to join, in order to manage CPO stocks and prices, while developing a new sustainability framework ("e+POP"), sensitive to the needs of smallholders (Reuters 2015). In addition, the Government of Indonesia under the leadership of the Coordinating Ministry of Economic Affairs has put in place a process, and a working group, to strengthening ISPO, in order to improve its credibility and legitimacy to international players.

In 2016, the Africa Palm Oil Initiative (APOI) was agreed under the Tropical Forest Alliance (TFA 2020)[8], with the major goal to progress towards the sustainability of oil palm production, with forest protection and improved social benefits in West and Central Africa. While current focus is on Ghana and Côte d'Ivoire, the expectations are to embrace ten countries in the two mentioned regions. In addition, some of these countries, such as Cameroon, are developing their own national strategies for sustainable palm oil production, but that has been a slow process. This brings again debates on what are the regulations and incentives for including smallholders and artisanal mill producers, in ways that are being seen as fair and legitimate for all stakeholders.

There has been less progress in Peru to adapt sustainability standards for oil palm production. The Peruvian government declared oil palm expansion of national interest in 2000 (MINAGRI 2000), in order to avoid the import substitution of edible oils, to recover land used from illegal crops and reduce shifting cultivation agriculture, as well as to contribute to the development of the Amazon Region.

[8] https://www.tfa2020.org/en/activities/african-palm-oil-initiative/

The Law of the Promotion of Biofuels, enacted in 2003, included the promotion of oil palm development in the Amazon as potential source for biodiesel supply. In 2016, a plan for the sustainable development of oil palm was approved. This plan, in addition to objectives of enhancing the sector's economic competitiveness, also aims at supporting smallholders yields increase while ensuring forest conservation (MINAGRI 2016). There is as yet no clarity how the national regulations link to the voluntary standards under RSPO.

5.3 International: industry self-regulation as alternative to, or primer for government action?

Formal government involvement may be a logical next step in a process of self-regulation that started with non-state actors defining voluntary standards and setting up certification procedures for regaining trust by consumers that products they buy are produced responsibly (Mithöfer et al 2017). The 'internalization' of efforts to reduce illegal logging through VPA's (Voluntary Partnership Agreements) between governments[9] suggests that government regulation might take the lead after a 'voluntary' start in the private sector. Widespread public concerns over 'illegal logging' as basis of international tropical timber trade have been partially resolved in the FLEGT (Forest Law Enforcement, Governance and Trade) efforts (Wiersum and Elands 2013). Nurrochmat et al (2016) and Setyowati and McDermott (2017), however, described that implementation of the legality verification standards in Indonesia amid multiple forest regimes caused a redundancy of administrative procedures in forest management and timber trade, especially in community forests, and a contest for a narrow legality concept. As we finalize this manuscript the European Parliament is discussing how palm oil import to Europe could be regulated in ways similar to what FLEGT did for timber[10]. Van Heeswijk and Turnhout (2013) in their analysis of FLEGT concluded that this would imply a 'narrow' interpretation of legality (enforcing existing laws), rather than one in which sustainability and participatory considerations (reforming laws) are prominent. This may reflect the limitations that respect for national sovereignty brings to international agreements, and does not preclude gradual improvement of national standards, as is currently discussed for the palm oil sector in Indonesia. The French parliament recently discussed options to ban palm oil imports, or impose high tariffs on it but found that there is no legal base to do so. Other private-driven initiatives such as the European Sustainable Palm Oil Initiative (ESPO) are emerging, targeting achievement of 100% sustainable palm oil consumption in Europe by 2020.

While boycotts (or threats thereof) of products by consumers or private companies are part of normal market feedbacks between market parties, existing global trade rules come into play if governments of importing countries get involved. The World Trade Organisation (WTO) guards against abuse of health and safety regulations as obstacles to trade. It allows regulations, such as labelling (allowing consumer choice) or exclusion only based on scientific evidence, and restricts those to measurable product characteristics, not the underlying processing or production methods. Companies are free to commit to buying certified palm oil, but when Western governments close their borders for non-certified palm oil the producing countries can bring a case to WTO. Bernstein and Hannah (2008)

[9] Six countries are implementing VPA's with the EU, nine others are negotiating; for Indonesia this now resulted in easier timber access to EU markets; http://www.euflegt.efi.int/vpa-countries

[10] http://www.europarl.europa.eu/news/en/press-room/20170329IPR69057/meps-call-for-clampdown-on-imports-of-unsustainable-palm-oil-and-use-in-biofuel

discussed the legitimacy of non-state global standard setting in relation to WTO agreements and suggested that it can be problematic if states explicitly adopt such social and environmental standards. On the other hand Western countries may complain against 'subsidizing' palm oil for biofuel production based on free destruction of natural capital in Indonesia and Malaysia whereas in Western countries such free natural capital is not available.

Schouten and Glasbergen (2011) analysed the RSPO history with its legitimization processes of private governance initiatives through a multi-dimensional approach to legality, moral justifications, and consent/acceptance. They analysed the tensions and trade-offs in the different ways in which non-state market driven governance arrangements can create legitimacy. Similarly, Gnych et al (2015) analysed uptake and implementation of sustainability standards and certification schemes in the Indonesian palm oil sector, focusing on two stages in the commitment process: motivations for adopting sustainable practices ("responsibility"); and factors or context-dependent variables that affect growers' ability to respond to these motivations ("response"). Motivations can be of different types: 1) instrumental motivations (driven by self-interest and subdivided into risks, understood as motives associated with self-preservation, and benefits, understood as motives associated with profit or gain; 2) relational motivations (relationships among groups or sector members) and 3) moral motivations (with reference to moral principles and ethical practices). These three relate to the primary governance instruments (rules, incentives, norms), as well as the bounded rationality, bounded willpower and bounded self-interest concepts of behavioural economics (Thaler 2015). According to Gnych et al (2015) the uptake of sustainability standards is influenced by several factors, among them: the risk perceptions of shareholders, some context-dependent variables (e.g. relationships between stakeholders, interactions with ethical motivations and cultural norms), the structure of the supply base, and the government roles in facilitating responsible investment.

Certified operations under RSPO have been met with severe criticism as in 2013, 2014 and 2015 large forest and peat areas were set on fire again and Greenpeace showed maps with fires occurring on land of RSPO members whereas RSPO did not take immediate action against these companies. Catteau et al (2016) found that fire activity was significantly lower on RSPO certified concessions than non-RSPO certified concessions when the likelihood of fire was low (i.e., on non-peatlands in wetter years), but not when the likelihood of fire was high (i.e., on non-peatlands in dry years or on peatlands). Criticism by consumer-related companies of the relaxed criteria and implementation of RSPO, has led to the development of RSPO NEXT, which consists on a new voluntary addendum to the core RSPO Principles & Criteria that brings the rigour of RSPO systems and audits to the claims of 'No Deforestation, No Peat Planting and strengthened Human Rights' commitments. This is pushed by a few consumer manufacturer companies which aim at improving their environmental performance, yet it is not clear to what extent these new set of standards will be embraced by oil palm growers. It is likely that creating and enforcing more stringent standards for oil palm certification can also lead to increase the divide between a small number of large-scale certified operations from major corporate groups, and the large number of non-certified operations, which lack the incentives to certify. In addition, it is not clear to what extent consumers will demand to producer companies the adoption of more stringent standards, which will lead to a higher market segmentation, and likely exclusion of smallholders who are less capable to adopt those stringent standards.

D'Antone and Spencer (2015) considered the complexity of palm oil from a market perspective: turning away from the simple, traditional production–consumers opposition. In fact in the oil palm debate, the international structure of the value chain has led to a situation where the food industry has identified with the consumer concerns that they perceived, while the CPO producers pleaded for the right to produce as and where they want. This distinction within the private sector played a major role in the RSPO dynamics of the past decade. A major reason for private sector agents to address sustainability concerns has become the possibility to maintain access to some well-established markets in more developed economies (e.g. European markets) while at the same time to be able to get access to lower-cost financial credit. Maintaining a good performance image helps to protect stock market value. Erian (2016) recently documented that while the haze crisis in 2015 had a significant negative impact to the stock return of palm oil companies listed in Singapore, Indonesia, and Malaysia, the report on their Environmental, Social, and Governance (ESG) issues had a weaker (and/or more delayed) impact. The publicity battle for public opinion continues. Interestingly, a recent survey found that after the recent haze episodes, consumers of palm oil products in Singapore indicated a willingness to pay 9% more for deforestation-free products (Giam et al 2015).

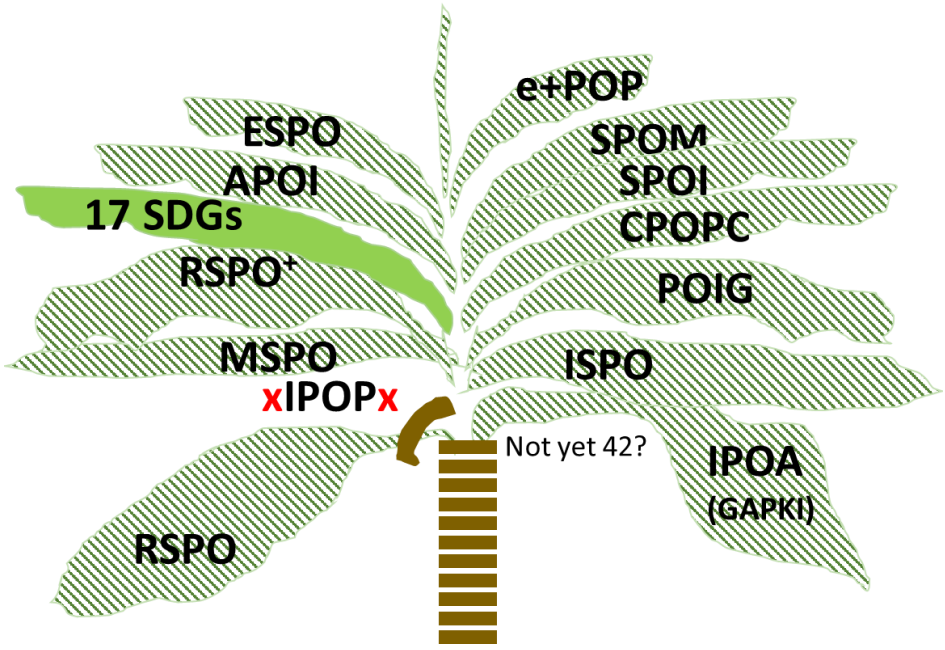

Figure 3. Cartoon comparing the continuous emergence of new palm oil institutions and acronyms to the development of an oil palm canopy

6. Discussion

6.1 Is trust being restored?

If the proof of the pudding is in the eating, the ultimate question of effectiveness is whether or not consumers are trusting certified products. The continued calls in Europe for 'palm-oil free' certification suggests otherwise[11], but major palm oil export markets don't require any certification yet (Hidayat 2017). The various environmental and social issues that emerged in palm oil production

[11] http://www.palmoilfreecertification.org/certification-2

over the past three decades met with a similar response, often starting with denial. Ulterior motives on the side of the messengers of the issues were often alluded to. Counter examples of well-managed plantations were presented in initiatives to sway the public opinion. Once both worst and best case examples were part of the debate, however, and had both to be accepted as part of a complex reality, the relevance of standards, certification and differentiation arose. That led in turn to the development of overlapping and competing standards and initiatives, all claiming to make oil palm production sustainable and free of the social and environmental stigmas. The legitimacy of these new forms of private governance is usually based on a supposed ‘‘regulatory vacuum” in producer countries (Nikoloyuk et al 2010). In practice, however, a large number of rules and regulations did exist, but these were not rigorously implemented by governments due often to contradicting interests. McCarthy and Zen (2010) compared the experience with the generic International Organization for Standardizations (ISO) 14001 series for environmental management systems and the oil-palm specific efforts of the RSPO certification system. They saw that despite the turn towards these new governance approaches, the underlying problems of lack of government enforcement of rules (potentially invoking illegal levies to private coffers rather than compliance) that have undermined bureaucratic regulation in the past continue to haunt attempts to make the sector more sustainable.

Looking back at this rapidly moving target of reforming the palm oil industry and regaining acceptance in the major markets, we can distinguish three phases in the way the three dimensions of governance (incentives, regulations and norms) interacted along the issue attention cycle. In *phase one* a diverse group of non-state actors from various steps in the value chain formed RSPO, excluding governments, and initiated voluntary self-regulation of the sector. Some producers joined to find ways to satisfy concerns of European citizens (moral licence to sell), by distancing themselves from the practices that had attracted negative attention. In *phase two* state-actors at national scale (ISPO and MSPO) emerged as government responses, aimed at reclaiming national sovereignty (licence to produce); they emphasized that existing rules need to be better enforced to (re)establish legality. As such this could synergize with rules such as those of RSPO (where legality is a basic concern), but in parts of the discourse the moral right for non-state actors to set rules of the game they want to adhere to was challenged. New ‘Southern’ standards emerged, responding to private standards established by developed country or ‘Northern’ actors (Schouten and Bitzer 2015); the standards target different audiences and rely on different sources of legitimacy, with different weights assigned to ‘environment’ and ‘economic efficiency’. The cognitive and moral distance between the standards is used to reclaim the issue areas occupied by Northern standards. Wong and Hezri (2015) pleaded for use of the subsidiarity principle in international sustainability discussions and decisions on the optimal use of lands. This implies in their view that nation states, rather than international bodies, decide on what is best for their citizens, balancing development and environment. Subsidiarity in their views, however, implicitly stops at the national scale, and does not apply to indigenous peoples and local communities. External concerns over the fate of such groups are seen as interference in national sovereignty. In *phase three*, local governments enter the scene in a ‘jurisdictional approach’ with commitments to comply with RSPO or ISPO principles and criteria in an entire province or district.

6.2 Jurisdictional approaches as new mantra?

The jurisdictional approach allows for a more direct connection to emerging climate change policy instruments (REDD+, NDC's), and nested accountability that links with national scale sustainable development targets. For the private sector primary interest may remain at the 'supply-shed' level of their commodities of interest, but geographic branding appears to be attractive due to lower transaction costs as compliance monitoring may be taken on as a public sector service.

On the social side initial attention was on 'indigenous people' and their rights during oil palm expansion (Sirait 2009). The articulation of free prior informed consent (FPIC) criteria in RSPO was expected to lead to fair contracts between parties. The recent rejection by RSPO of a member in Peru on such issues shows that breaching the norms can have consequences. Most of the debate, however, shifted to the difficulties for independent smallholders to obtain certification and for their exclusion by mills seeking certification. Lack of formal land titles makes it hard for smallholders to meet the legality standards. Other issues, such as setting aside HCV areas or correct water management (e.g. drainage) is impossible at the level of individual smallholder farms. Furthermore many smallholders lack access to proper seedlings (a criterion in ISPO), inputs and knowledge as well as the level of organisation required for certification (Brandi et al 2015). Certification will require many additional efforts in terms of record keeping and changes of practices and associated monetary and non-monetary costs from smallholders whereas benefits of certification may be low and not worth the effort. Certification does not necessarily involve price premiums that are sufficiently large to cover additional costs and often these costs have to be earned back entirely by increased yields or improved market access (Markne 2016, Kuit and Waarts 2014).

Barriers of cost for smallholder certification were discussed by Colchester and Chao (2011). Based on interviews in Riau, Markne (2016) found evidence of a knowledge gap between the technical knowledge and prescriptions that underlie the RSPO indicators, and the way local farmers understand and manage oil palm that builds on earlier experience with other tree crops such as rubber. On one hand in the process of certification technical knowledge is shared that can improve production efficiency; on the other hand, potentially valuable smallholder innovations to increase ecological efficiency and returns to labour are lost, such as the 'sisipan' gradual way of replacing tree crops used in rubber (Joshi et al 2003). Hidayat et al (2016) concluded that for independent smallholders in Riau and South Sumatra the current costs of certification outweigh the expected benefits, but the economic analysis strongly depends on price differentials for the FFB sold with or without certificates, which may increase in future.

Sustainability standards are implemented by farmers who are already among the ones with better management while for other farmers standards are too costly and too difficult to implement. In future certification may therefore become a barrier to the latter and lead to their exclusion from markets. A serious problem of the implementation of RSPO certification is that audits consist of checking compliance and administrative evidence for the latter, but that assessment of environmental outcomes and social impacts of certification in actual field practice lag behind. While standards should ideally refer to actual environmental outcomes rather than prescribing specific practices, in order to stimulate innovation and continuous refinement, the administrative side of certification prevails in practice.

6.3 Moral high ground and/or business tactics

Across the three phases identified, multiple issue attention cycles interacted, with negotiated standards rebalancing between environmental, social and accountability issues. RSPO developed a 'RSPO Next' branding for those companies making zero deforestation commitments (Greenpeace 2016), while ISPO worked with RSPO to find policy alignments (RSPO 2016). The divide between northern and southern actors, however remains. Recent zero-deforestation and no-peat pledges are largely supported by climate change motives and a disappointment by key stakeholders in RSPO results and a reduced opportunity to find common ground between parties compared to the formative years. Civil society parties attacking RSPO are Greenpeace, Forest Heros, RAN, and EDF blaming the multi-stakeholder processes to supporting compromises. Although several pledges such as Indonesia Palm Oil Pledge (IPOP) also mentioned human and community rights they seem to be less socially oriented. This dominance of environmental issues incited Indonesian and Malaysian governments to join forces in the Council of Palm Oil Producing Countries (CPOPC) focussing more on the smallholder poverty alleviation aspect. The issue of environment versus economic development continues to be associated with a North South divide.

The debates that accompany these phases seem to be on rules and incentive based instruments but in the background the moral high ground of norms, principles and legitimacy continue to play an important role in the contest. As an experiment in public (state and non-state) - private governance the oil palm debate offers a rich basis for comparisons with what happened in other commodities, often at much lower levels of public scrutiny and in debates that were less emotionally charged. Compared to other crops, the management swing potential in the production phase of oil palm is relatively small; most of the attention, in both environmental and social dimensions, has been on the acquisition of new land for oil palm plantations. The sustainability concept had to be broadened to allow this. Meanwhile, local translation of emerging international trends added layers of complexity to what was already complex.

In summary, palm oil has offered a rich arena to study the relationship between voluntary (private-sector led), mandatory schemes in producing countries (protecting public goods and interests in their country) and government policy involvement in importing countries, restricted by WTO rules from discrimination based on area of origin. Both fairness and efficiency may be enhanced by the currently emerging jurisdictional (local government entities) and landscape approaches. These focus less on strict implementation of the standards as the means but aim more to reach the sustainability goals through local multi-stakeholder processes including governments, industries and NGOs, with higher local ownership, clear roles, responsibilities and accountabilities. Such an approach can be more inclusive to all smallholders living in the area. The dynamics in the public-private governance learning curve on oil palm have been much richer than this account could capture and deserve further analysis as successes and setbacks alternate and may colour the shifting opinions of those directly involved. Rather than reducing the complexity into a simple set of 'best management practices' with compliance monitoring, there will have to be further efforts (listening rather than preaching) to bridge the communication gaps between farmers, industry, consumers, NGO's and governments.

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