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To cite this article: Somjai Npueng, Peter Oosterveer & Arthur P. J. Mol (2022) Governing sustainability in the Thai palm oil-supply chain: the role of private actors, Sustainability: Science, Practice and Policy, 18:1, 37-54, DOI: [10.1080/15487733.2021.2021688](https://doi.org/10.1080/15487733.2021.2021688)

To link to this article: <https://doi.org/10.1080/15487733.2021.2021688>



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Published online: 13 Jan 2022.



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Governing sustainability in the Thai palm oil-supply chain: the role of private actors

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ABSTRACT

Private actors are essential partners in the sustainability governance of commodity-supply chains such as palm oil. However, their actual contribution to promoting sustainability is also contested. This article assesses the role of private actors in the governance of the palm oil-supply chain in Thailand by comparing supply-chain actors that are certified with the Roundtable on Sustainable Palm Oil (RSPO) standards and non-certified supply-chain actors. The comparison entails input supply and production, collection and sales, processing and storage, and distribution. Building on the concept of (global) value chains, we examine the following governance dimensions in our comparison: the management of contracts and agreements, the role of trust in transactions, the relative power of various actors, and the control over smallholder farmers' access to the market. Primary data were collected in the Surat Thani and Krabi Provinces in southern Thailand. We found that the RSPO-certified palm-oil chain was shorter, more transparent, and that farmers received higher prices than the non-RSPO-certified chains.

ARTICLE HISTORY

Received 6 July 2020
Accepted 19 December 2021

KEYWORDS

Palm oil; Roundtable on Sustainable Palm Oil (RSPO) certification; value chain; governance; sustainability; private actors

Introduction



Sustainability is becoming a mainstream issue in the global economy, encouraging both private and public actors to develop policies and practices to promote their activities in economic, environmental, and social respects (see Basiron and Weng 2004; Benites-Lazaro, Giatti, and Giarolla 2018; Chkanikova and Sroufe 2021; D'Amato and Korhonen 2021; Pacheco et al. 2017; Tan et al. 2009). Since the 1980s, when the Fairtrade and organic food labels were introduced, private voluntary sustainability standards and certification schemes have been used as instruments to promote sustainability in supply chains (Oosterveer et al. 2014).

The Roundtable on Sustainable Palm Oil (RSPO) is a multi-stakeholder initiative established in 2004 and intended to promote sustainability in palm-oil production and use. The RSPO aims to “transform the markets by making sustainable palm oil the norm” (Robobank 2016). The initiative was developed by several non-governmental organizations (NGOs) in collaboration with private firms (Schleifer 2016) and introduced as a standard to address sustainability challenges in palm-oil supply through certification (Nikoloyuk, Burns, and de Man 2010; Schouten and Glasbergen 2011).

Certified sustainable palm oil (CSPO) and palm-kernel oil (CSPKO) are produced on oil-palm plantations that have been independently audited and found to comply with the RSPO standards. In 2018, 13.47 million tonnes of CSPO and 3.09 million tonnes of CSPKO were produced, equivalent to 19% of global palm-oil production, while the certified production area covered 3.97 million hectares.

In 2019, Indonesia and Malaysia were the countries producing the largest volume of RSPO-certified palm oil with 8.20 and 4.42 million tonnes of CSPO, respectively. RSPO certification is a voluntary standard from the top of the value chain that creates slightly higher prices; a side effect of the certification process is that it has been found to improve production methods and agricultural practices (Glasbergen 2018). However, there are limitations for smallholders to access the certification since this process requires farmer groups, land titles, and pesticide storage (Brandi et al. 2013).

Saswatecha et al. (2015) confirmed that the process of certifying palm oil would reduce the environmental impacts of oil-palm plantations in terms of carbon emissions. Therefore, organizing sustainable palm-oil supply chains with the help of RSPO certification practices is an interesting option to reduce the environmental impact of palm-oil

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production and consumption. The certified palm-oil chain should operate under the RSPO Principles and Criteria (P and C) that lead to the reduction of environmental impacts.

This article is divided into seven sections. It starts by introducing background on RSPO certification in Thailand and compares the processes for CSPO and the non-certified palm oil. The article then introduces the (global) value chain (GVC) concept and presents the methodology. This is followed by analysis of the structure and function of the Thai palm oil-value chain and consideration of its governance dimensions. The final section presents the conclusions of this study.

Background on RSPO certification in Thailand

Most oil-palm growers in Thailand are smallholders who represent approximately 70% of total Thai oil-palm growers (Npueng, Oosterveer, and Mol 2018). In contrast to Malaysia and Indonesia, Thailand has no national certification scheme for the sustainable production of palm oil (Ivancic and Koh 2016). The first RSPO pilot project for smallholder farmers in the country was supported by the German Organization for International Development (GIZ) and several private crushing mills. In 2012, this initiative led to the successful RSPO certification of 412 farmers as the world's first independent smallholder group supported by two private companies. Shell Thailand and the Patum Vegetable Oil Company have collaborated with five palm oil-crushing mills in southern Thailand to encourage an additional 797 smallholder farmers to become RSPO-certified (RSPO 2014). By early 2017, there were approximately 1,150 certified smallholder farmers in Thailand, with a production area of 6,626 hectares, accounting for 31,995 metric tonnes of certified palm oil.

The certification of palm oil can contribute to sustainability and improve the reputation of the Thai palm-oil industry on the international market (Henson and Reardon 2005). To achieve these objectives, collaboration between private and public stakeholders in the palm oil-supply chain is required (Oosterveer 2015; Lyons-White and Knight 2018). The relevant private actors include nongovernmental organizations (NGOs) and companies such as millers, refinery facilities, biodiesel plants, collectors, certification bodies, and local cooperatives.

The Thai government limits its engagement with the palm-oil sector to the imposition of price controls and the usage of final products through its regulatory policies on the market price of cooking oil and the required percentage of biodiesel blending

in fuel. Despite different certification initiatives, conventional non-certified palm oil (NCPO) remains dominant in Thailand because the majority of its production is used for domestic consumption in the form of cooking oil or biodiesel. The NCPO farmers are more independent than their counterparts in choosing their production and marketing practices because they do not have to follow the strict RSPO guidelines. Key challenges, therefore, include traceability in the palm oil-supply chain and its derivatives and how to encourage sustainability within this supply chain. New innovation management has been developed as an attractive pathway to increase sustainability through a global certification as RSPO.

CSPO and NCPO chains

The palm oil-supply chain in Thailand is relatively complex. Since the Thai smallholder groups received RSPO certification in 2012, the palm-oil sector in the country created a certified chain with qualified areas producing CSPO. When RSPO-certified, the produced palm oil can be traded using one of four different models (RSPO 2014):

- *Identity Preserved (IP)*: All RSPO-certified palm oil and its derivatives are physically separated from all other palm-oil products throughout the supply chain.
- *Segregation*: Similar to the IP model, but the RSPO-certified palm oil and its derivatives may be mixed with certified products from other sources.
- *Mass Balance*: Allows the mixing of certified and non-certified palm oil when being traded throughout the entire supply chain.
- *Book and Claim (B&C)*: Offers the trade of certificates of RSPO-certified sustainable palm oil separate from the physical flow of palm oil. Companies can purchase these certificates from growers or mills.

The conditions and requirements for producers and processors involved in each of these models differ and in Thailand mass balance and B&C are dominant. The qualifying level of 500 RSPO credits (an RSPO credit represents one tonne of certified sustainable palm oil) has been claimed by certified crushing mills and independent smallholder-farmer groups through the B&C supply-chain model from GreenPalm¹ to RSPO PalmTrace² since January 2017 (RSPO 2020).

The research reported in this article compared the certified and non-certified palm oil-value chains with respect to the roles of private actors. We also

studied sustainability governance in the palm-oil chain with the intention of identifying options to contribute to and enhance its sustainability. Our main research question focused on how RSPO certification changes the governance arrangements within the Thai palm oil-value chain? Accordingly, we analyzed the following factors:

- The differences between the certified and non-certified palm oil-value chains with respect to the position of smallholders.
- The involvement of private actors in contributing to promoting RSPO certification in the palm oil-value chain.
- The organization and functioning of governance arrangements in terms of the issuance of contracts and agreements, the role of trust in transactions, the relative power of different actors, and the access of smallholder farmers to the market.

Governance of (global) value chains

This study deployed the concept of governance of global value chains (GVC) to analyze the role of private actors in the palm oil-value chain (Bush et al. 2015; Dermawan and Hospes 2018; Gereffi and Fernandez-Stark 2011; Tran et al. 2013). We focused on the roles of oil-palm farmers, ramp³ owners, crushing mills, refinery plants, NGOs, farmer and business associations, and RSPO-certification bodies while comparing certified sustainable palm oil (CSPO) and non-certified palm oil (NCPO) value chains in Thailand.

The GVC concept was introduced in the early 2000s and focuses on the upstream and downstream movements of commodities in order to analyze the relationships between different suppliers and buyers. This framework allows researchers to assess how industries are organized by examining the structure and dynamics of the relationships among the various actors. The GVC approach explores four key domains: production chains, geographical characteristics, governance structures, and institutional contexts (Gereffi and Stallings 1995), all of which we considered in this study. The GVC method has been applied extensively to manufacturing, service sectors, and agricultural commodities (Tran et al. 2013) and scholars have also used this approach to examine a full range of activities required in the process of value creation and the governance of commodities such as palm oil (Schleifer and Sun 2018; von Geibler 2013), shrimp (Tran et al. 2013), and coffee (Grabs and Ponte 2019). The framework offers in particular tools for analyzing the governance dimensions of value chains, with governance being defined

as the “authority and power relationships that determine how financial, material and human resources are allocated and flow within a chain” (Gereffi and Fernandez-Stark 2011; see also von Hagen and Alvarez 2011; Tran et al. 2013; Lee and Gereffi 2015; Blind et al. 2018; Degli Innocenti and Oosterveer 2020).

Within this governance dimension, we analyzed the coordination and power (im)balances within the value chain (Gereffi 1994). We were particularly interested in the roles of and the relationships between key situated private and public actors in controlling and coordinating the CSPO and NCPO value chains (Gereffi and Fernandez-Stark 2011; Oosterveer and Sonnenfeld 2012). In this article, we outline the roles played by these actors in steering the production, processing, and marketing of Thai palm oil by comparing the contracts and agreements in the various production and marketing networks, the levels of trust in the transactions, the relative power of the actors, the mechanisms by which millers and refineries control smallholder farmers, and the core issues related to smallholders’ access to markets (consistency, negotiating power, and transparency of access to mills).

Methodology

The primary data were collected through semi-structured interviews with actors throughout the Thai palm-oil sector. We focused especially on representatives from two groups of farmers (both RSPO-certified and non-certified farmers) and sought additional input from suppliers, middlemen, and ramp owners as well as millers (including crushing millers, refinery millers, and biodiesel-plant owners). Furthermore, interviews were held with members of cooperative groups, committee members from the four major national palm-oil associations (the Thai Oil Palm and Palm Oil Association, the Thai Palm Oil Crushing Mills Association, the Thai Palm Oil Refinery Association, and the Thai Palm Oil Biodiesel Producer Association) and members from the certification body and representatives from GIZ. Furthermore, we held two focus groups with different stakeholders to discuss the findings from the first research phase. The focal research areas were Surat Thani and Krabi Provinces, where larger-scale oil-palm plantations are engaged in the RSPO-certification scheme in Thailand. Non-probability sampling was considered preferable for this study, and therefore respondents were encouraged to identify other potential participants in this research project. Similarly, we asked lead stakeholders for names of additional interviewees. The judgmental sampling approach was conducted with each stakeholder

group to identify who could provide useful information with respect to our research objectives. Besides this strategy, the sample was guided using the following criteria: “1) have absorbed the information meaningfully, 2) be willing to communicate their knowledge to the interviewer, 3) be able to communicate their knowledge in an intelligible manner, and 4) be objective and unbiased” (Marshall 1996, 92).

We obtained introduction letters and sent them to participants and conducted the interviews (ranging from one to two hours) in a conversational style to allow for an open atmosphere. The interview questions focused on input supply and production, collection, processing and storage, and distribution. The governance perspective consisted of the contract and agreement, trust in transactions, power of involved actors, and market access by smallholders. An introduction letter for the research project was also obtained and sent to RSPO millers. Initial field visits were made with RSPO smallholders and NCPO farmers while working with other stakeholders and involved government agencies. Details on the number of participants are shown in Table 1.

Secondary data were collected through a literature review that informed the mapping of the production system and the palm-oil network and the positioning of certified and non-certified products within the present market system. In addition, secondary data from government and non-governmental sources were used.

Table 1. Numbers of interviews with different categories of palmoil stakeholders.

Stakeholders	Total interviewed
Farmer groups	
• RSPO certified farmers	10/province
• Non-RSPO certified farmers	10/province
Middlemen or ramp owners	
• Private middlemen who collect the product to the ramps	10/province
• Ramp owners	10/province
Millers	
• Crushing millers not promoting RSPO to smallholder groups	Sample of 5 mills/province
• 15 crushing mills in Surat Thani province	
• 18 crushing mills in Krabi province	
• Crushing millers promoting RSPO to smallholder groups	3 mills total
• 1 crushing mill in Surat Thani province	
• 2 crushing mills in Krabi province	
• Refinery millers	Sample of 3 mills
• 15 refinery mills in Thailand	
• Biodiesel-plant owners	Sample of 3 mills
• 15 biodiesel plants in Thailand	
Cooperative committee members and leaders	5 interviewees /province
RSPO-certification bodies	3 interviewees
Members of national level government agencies:	5
Members of local level government agencies	5/province
Retailers	2
NGOs (GIZ)	2
Associations	2

The Thai palm oil GVC: structure and function

The Thai palm-oil sector involves multiple actors along the value chain, which can be divided into four functional stages. Beginning at the upstream end, the palm oil-value chain starts with input supply and production and then continues to collection, processing, and storage, and, finally, to distribution at the downstream end. Each of these stages involves relationships between an array of private stakeholders, as well as with governmental and non-governmental actors such as community leaders, government agencies, certification bodies, NGOs, associations, and cooperative committees.

In this section, we describe the role of the private actors in the governance of this complex palm oil-value chain. The relationships among these private actors are outlined in Figure 1.

Input supply and production

The main inputs for oil-palm cultivation are seedlings, fertilizers, and herbicides. Most of the seedlings are produced by private companies and oil palm-research centers in Thailand, especially in Surat Thani Province, while some seedlings are imported. Most oil-palm smallholders in southern Thailand plant the Tenera variety, and they purchase their seedlings from private oil palm-nursery operators and smaller individual nurseries. Some farmers have bought seedlings from cooperatives or the Oil Palm Research Center at low prices (THB55 = US\$1.57), but they need to wait nearly a year before obtaining them. The quality of the seedlings is an important input for the initial investment of oil-palm cultivation. The main factors affecting the smallholder's decision to buy seedlings from private suppliers are: (1) the quality of the seedlings, (2) the reputation of the producers, (3) whether the producer has the required licenses, and (4) convenience of access. Most smallholders use six- to ten-month-old seedlings on their plot, with an average of 22 trees per rai (1 rai = 0.16 hectare) (Thongrak and Kiatpathomchai 2012).

Although the smallholders ranked the possession of licenses only as third in the list of four factors, a seedling license is important in controlling the quality of the oil-palm tree. During the nursery period, the operators play a central role in assuring the quality of seedlings as this depends on good soil, seed, water, and fertilizer management. Private nursery operators are supposed to obtain a license from the Department of Agriculture in the Ministry of Agriculture and Cooperatives and follow their instruction manuals and recommendations. An example of such guidance is the requirement that not more than 80% of the nursery's seedlings may

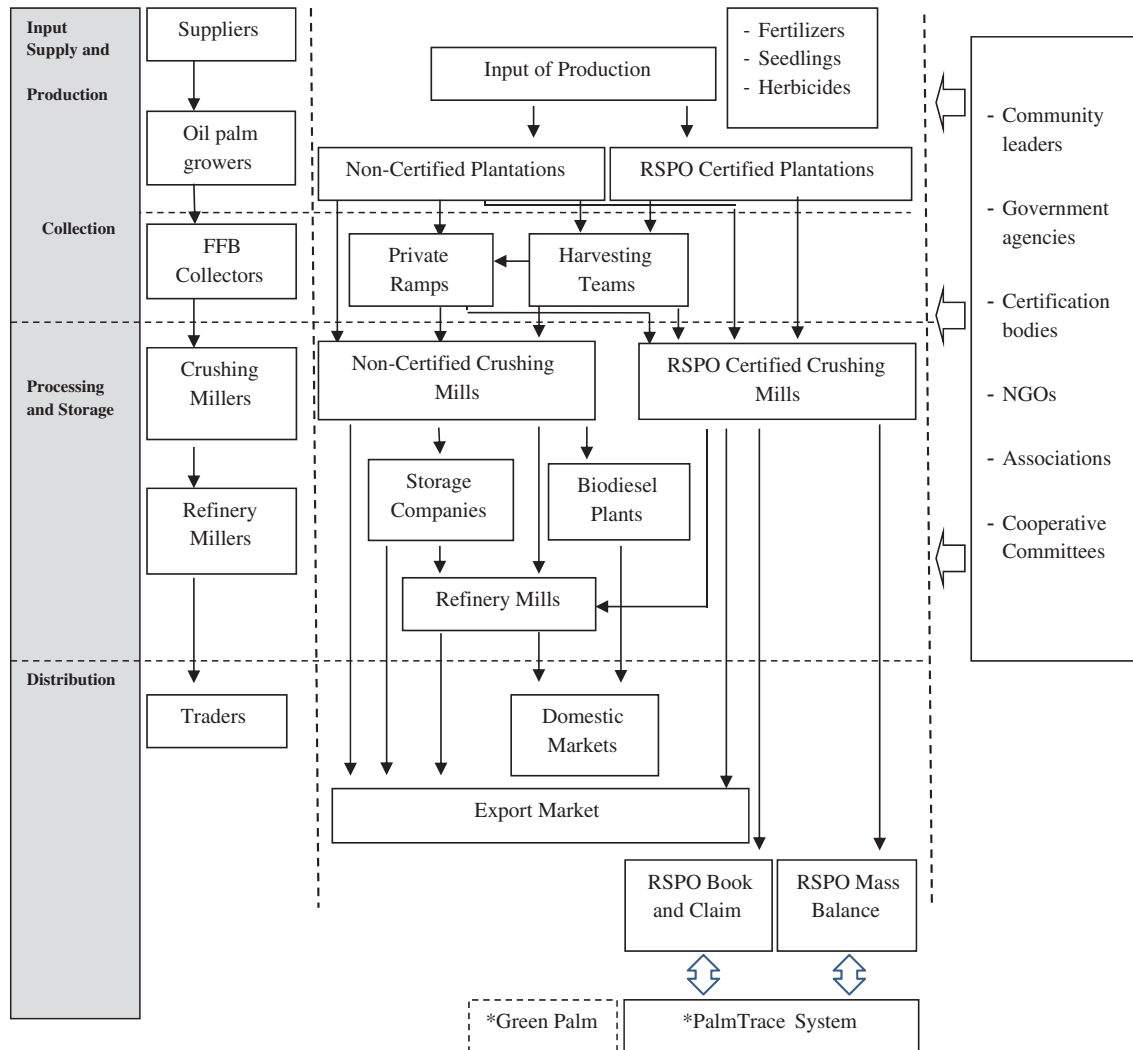


Figure 1. Palm oil-value chain and network in Thailand. *Note:* The Green Palm program started trading RSPO certifications during August 2008. The system ceased trading on March 31, 2017. The trading of CSPO was transferred to RSPO PalmTrace with RSPO credits in January 2017 (Green Palm 2017) and that system has been technically developed and managed by UTZ. RSPO PalmTrace is the RSPO's traceability system for certified oil-palm products. *Source:* authors' fieldwork and literature review.

be sold, with the lowest-quality 20% being discarded. If all seedling producers had a license and followed these instructions, quality problems would probably not exist. Unfortunately, some seedling producers are unlicensed but nevertheless find customers by selling seedlings at a low price. Although there is a high risk of low productivity with such seedlings, farmers still decide to purchase them from these operators because of their trust in and their good relationship with these local seedling producers.

Fertilizer is another major input, accounting for nearly 42% of the variable costs in oil-palm production (Office of Agricultural Economics 2016). The three major categories of fertilizer suppliers are local retailers, cooperatives, and millers. Local retailers are the main suppliers to non-RSPO-certified oil-palm smallholders. These retailers control the local market and set the price for fertilizer, which is not fixed but depends on relationships with the

individual farmer. Most smallholders typically buy their fertilizer on credit and pay their debts to the local retailers every 1–2 months. Oil-palm cooperatives sell fertilizer at a lower price to their members, saving them about 3–4 THB per kilogram (kg). In this case, the repayments are made at the end of the year. Millers who support RSPO-certified smallholder groups purchase fertilizer at the wholesale price from fertilizer factories and use it on their plantations as well as sell it to the smallholder farmers. One of the RSPO-certified farmers said, "I got a reduction of about 1 THB/kg of fertilizer from the mill, it was not easy to access this benefit, because I don't have enough cash. I still need to buy on credit although this means a higher price."

There are two ways of controlling weeds in oil-palm plantations, using herbicides and manual control. In the case of herbicide usage, the majority of CSPO and NCPO smallholder farmers obtain their herbicides from the agricultural shop in their village.

The most common herbicides used are Paraquat (Gramoxone), Glyphosate, and Carbofuran (Furadan). From the interviews, most farmers use herbicides when their oil-palm trees are between one and five years old, on average once or twice per year with a quantity of about 1–2 liters per rai (approximately 5.88–8.82 liters per hectare). The price of herbicide is approximately 100–150 THB per liter and the hired labor around 150–300 THB per hour depending on the location of the plantation. Herbicide usage decreases when oil-palm trees are five years old because the size of both the leaves and the tree reduces weed growth. Smallholder farmers can access inputs more easily through the use of a special credit card that was introduced by the Thai government and the Bank for Agriculture and Agricultural Cooperatives in 2015. Large-scale oil-palm plantations have bought fertilizers and herbicides from suppliers with a reduction of around 5–10% on the retail price. Large-scale farms tend to manage their herbicide spraying and manual weed-controlling methods with full-time workers.

Local retailers and cooperatives have a large influence on the price and marketing of the inputs for both certified and non-certified plantations. Millers support the supply of cheaper fertilizers to RSPO-certified farmers, although some of them still buy fertilizers and herbicides from local retailers because access is easy and they can make use of informal credit mechanisms.

Smallholders and RSPO-certified palm oil

RSPO certification has become increasingly important when competing in the global palm-oil market. However, as this standard intends to promote palm-oil sustainability overall, it may also serve as an instrument in domestic chains like the Thai palm-oil sector. Currently, RSPO-certified palm oil in Thailand is mostly produced from large corporate estates owning plantations larger than 1,000 hectares and by plantations that are managed by a crushing mill, including private company-managed plantations that were RSPO-certified in 2013. RSPO certification of the owned plantations and crushing mills allowed the first export of CSPO from Thailand to premium markets in Europe. Presently, there are no family-owned large estates in Thailand that have received RSPO certification.

Since its inception in 2008, the RSPO and its member organizations have been supporting independent smallholders to engage with sustainable oil-palm cultivation next to the larger plantations. Since 2009, GreenPalm – in conjunction with the RSPO, BSI (Certification Services Company Ltd), and GIZ – has been working to attain RSPO certification for

Thai oil-palm farmers. At present, GIZ and the millers have been supporting smallholders to receive more extensive RSPO certification. These smallholdings are often family-owned and have small plantations while having access to only limited resources. Their harvest is sold to the nearest mill, which usually mixes the oil-palm fruits from all local farmers, and so there is no segregation on the basis of quality or sustainability.

In 2012, four groups in Thailand became the first smallholder groups worldwide to be certified under the RSPO smallholder group certification scheme. The names of the groups and their supporters were: the Community Enterprise Group for Sustainable Palm Oil Production (Chonburi) supported by the Suksomboon Palm Oil Company, Chonburi Province; the Community Enterprise Group for Sustainable Palm Oil Production UPOIC (Nuakhlong-Khaopanom) supported by the United Palm Oil Industry Public Company, Krabi Province; the Sustainable Oil Palm Smallholders Production (Univanich-Plaipraya) Community Enterprise Group supported by the Univanich Palm Oil Public Company, Krabi Province; and the Community Enterprise Group – Surat Thani supported by the Southern Palm Oil Industry Company (1993), Surat Thani Province. Combined these plantations cover 2,767.33 hectares or 0.46% of the total oil-palm area in Thailand (602,773.76 hectares). The RSPO-certified smallholder groups combined supply 52,713.40 tonnes of fresh fruit bunches (FFB), which translates to an estimated 9,488.41 tonnes of CSPO. This represented about 0.47% of all crude palm oil (CPO) produced nationwide in 2014. Since then, seven other independent smallholder groups representing 3,037 individual smallholders in three countries (Indonesia, Malaysia, and Thailand) have become RSPO-certified. This amounts to 14,148 hectares planted by independent smallholders, producing 199,628 tonnes of FFB and 47,077 tonnes of CSPO (RSPO 2014).

The early success of smallholder certification in Thailand was due to private companies that encouraged farmer groups to become certified because this strengthened their reputation, the stability of supply, and the quality of FFB. For example, Shell-Patum Vegetable Oil is a private company that is a collaboration between Shell Thailand and Patum Vegetable Oil Company, a Thai producer of cooking oil and the largest biodiesel producer in Thailand as well as the first company to receive RSPO certification. They have set up projects in Krabi, Surat Thani, Chumporn, Trang, and Nakhon Si Thammarat Provinces with the help of field teams to develop group-management systems, to provide incentives for training, and to monitor farming

Table 2. RSPO-certified smallholder groups in and their capacity in Thailand (2016).

No.	Name	Number of member(s)	Certified area (hectares)	FFB 2014 (tons)	CSPO (tons)	Palm-kernel production (tons)	Palm kernel-oil production (tons)
1	Community Enterprise Group – Suratthani	75	449.91	9,997.78	1,799.60	449.90	202.45
2	The Sustainable Oil Palm Smallholders Production (Univanich-Plaipraya) Community Enterprise Group	170	784.90	18,833.33	3,390.00	871.00	381.00
3	UPOIC Nuakhlong-Khaopanom	211	1,697.12	34,344.44	6,182.00	1,545.00	695.00
4	Srijaroen Sustainable Oil Palm Production Community Enterprise Group (TUV NORD THAILAND LTD)	78	434.25	11,577.78	2,084.00	521.00	234.00
5	Sichon Palm Yangyuen Community Enterprise Group (TUV NORD THAILAND LTD)	53	186.33	5,383.33	969.00	242.00	109.00
6	Saikueng Bansawan Community Enterprise	244	1,415.22	37,666.67	6,780.00	1,695.00	763.00
7	Lumnam Kadae Pattana Oil Palm Community Enterprise Group (TUV NORD THAILAND LTD)	90	416.35	8,433.33	1,518.00	379.00	171.00
8	Community enterprise growers palm oil and palm oil sustainability. Sikao – Wangwiset	80	618.03	15,705.56	2,827.00	707.00	318.00
9	Sustainable Krabi Oil-Palm farmers' Cooperative Federation (TUV NORD – THAILAND LTD)	86	317.00	8,455.56	1,522.00	380.00	171.00
10	Tapi-Ipun Sustainable Oil Palm community Enterprise Group(TUV NORD THAILAND LTD)	53	493.34	13,155.56	2,368.00	592.00	266.00
11	Trang sustainable palm oil growers' community enterprise network	156	651.00	16,275.00	2,929.50	722.61	325.50
	Total	1,296	7,463.45	179,828.33	32,369.10	8,104.51	3,635.95

Source: RSPO website (June 16, 2016) and calculated by authors at 18% of OER.

practices. They are partnering with six mills (one cooperative mill), eleven smallholder groups, and 1,296 farmers with 7,463.45 hectares of oil-palm plantations (see Table 2).

Collection

In Thailand, independent ramps act as middlemen between the smallholders and the crushing mills. There are about 260 ramps in Krabi Province and 336 ramps in Surat Thani Province; this large number offers smallholder farmers considerable freedom in deciding which ramps to use. However, around 80% of the farmers always sell to the same ramp. In addition, ramps often control the harvesting, collection, and sale of non-RSPO-certified FFB. Crushing mills have limited ability to control the quality of this FFB because they tend to become involved only at the later stages of the process. Moreover, crushing mills have not defined or communicated minimum standards for FFB, while farmers normally do not grade their FFB themselves. Payment is generally done via on-the-spot transactions without strict quality requirements being considered. Hence, there is no practice of quality-related pricing.

In contrast, RSPO-certified smallholders control harvesting, selling, and transporting to the crushing mills themselves. Their harvesting practices, consistent with the RSPO standard, tend to ensure a higher

quality of FFB compared with that produced from non-certified farmers (Colchester 2011; Jaismut et al. 2015; Thongrak and Kiatpathomchai 2012). The interviews confirmed a difference in oil palm-extraction rates (OER) between certified and non-certified farmers of approximately 1.0–1.5%. The OER is calculated as: [(oil recovered/FFB processed) × 100]. Increasing the OER by 1% raises the income of the Thai oil-palm sector by about 3,668.57 million THB annually (see Table 3). Thus, following the RSPO standard for FFB harvesting and storage would provide long-term economic benefits to the different actors in the palm oil-value chain.

The collection process is one part of the FFB market-supply chain. The quality of FFB mainly depends on the harvesting and collection processes, and the price is based on the quality of FFB. Certified FFB is delivered directly to the mill, where ramps or collection centers do not play a role. Therefore, the marketing costs decrease and the quality of certified FFB increases because they are sent directly to the mills.

There are three forms of FFB collection (see Figure 2): (1) non-certified FFB from private farmers (including Good Agricultural Practice (GAP)-certified farmers), (2) certified and non-certified FFB from cooperative farmers, and (3) certified FFB from smallholder farmers and mill plantations.

There are three groups of actors involved in FFB collection as outlined below.

Table 3. The value of changing the oil palm-extraction rate (OER).

OER (%)	FFB/1 kg CPO	Income (THB/kg)	Marginal Income for Farmers		
			THB/kg	THB/Rai/Year	Million THB/Year
17.00	5.88	4.73			
18.00	5.66	5.01	0.28	897	3,668.57
19.00	5.26	5.29	0.56	1,794	7,337.14
20.00	5.00	5.57	0.83	2,691	11,005.71

Note: The calculation is based on a FFB yield of 3,223.00 Kg/Rai, a CPO Price of 29.33 THB/kg, and a total planted area of 4.09 million Rai nationwide.

Source: Data from Office of Agricultural Economics, Thailand.

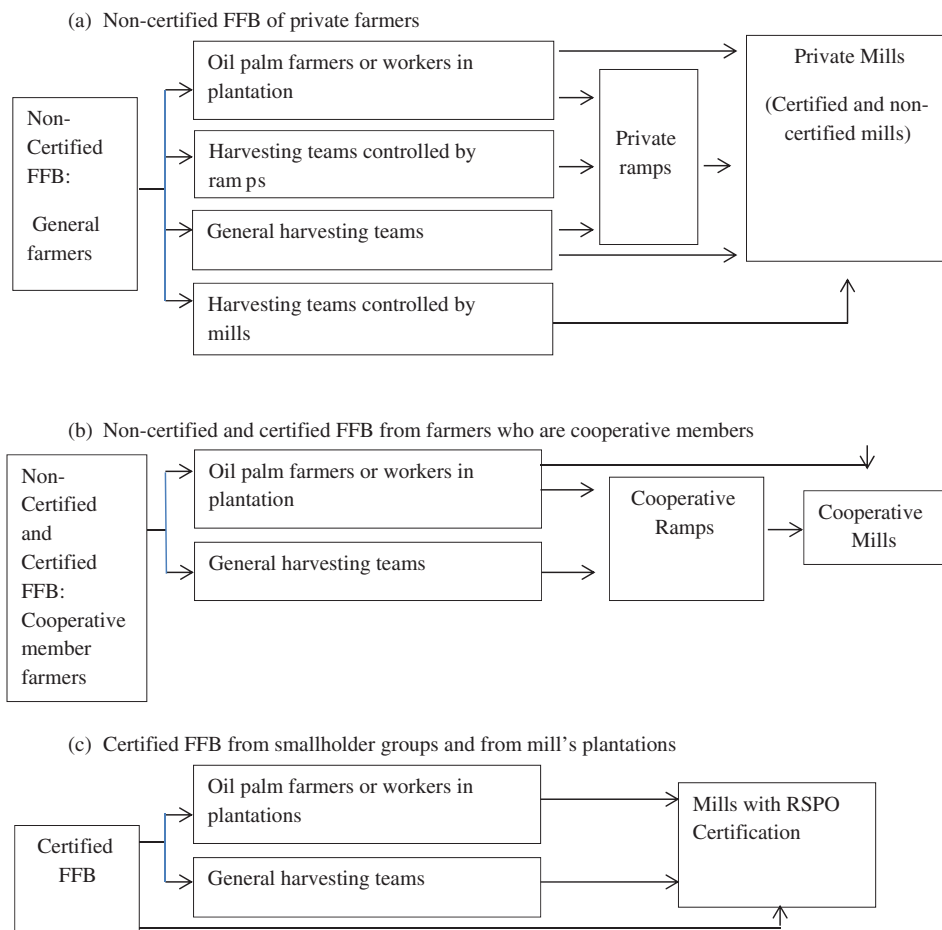


Figure 2. Flows of FFB collection from plantation to mills. Source: Base on authors' fieldwork.

Harvesting teams

Harvesting teams collect approximately 75–80% of the FFB produced by smallholders in Krabi and Surat Thani Provinces. These harvesting teams tend to be organized in three ways. First, independent harvesting teams devote themselves to harvesting and transporting FFB to the ramps or crushing mills. Farmers hire harvesting teams via agreements with contractors and some use family members (Thongrak and Kiatpathomchai 2012). The majority of the farmers use informal contractors, and around 80% of the contractors work independently from ramps and mills. Second, harvesting teams are managed by a private ramp operator to collect FFB and transport it to the ramps before delivering it to the crushing mill. Finally, harvesting teams are

organized especially by small-scale crushing mills, bringing the harvest directly to the mill. The market for collecting FFB is highly competitive because crushing mills need to arrange sufficient and continuous supply of FFB to ensure regular production, which is often a challenge for the Thai mills. The harvesting teams are the first to evaluate whether an FFB is ripe enough to be harvested or not. The general recommendation is to harvest oil-palm trees every 15–20 days. Most farmers attempt to do so. However, when using contracted harvesters, the real harvesting cycle may be shorter or longer. Our interviews with farmers showed that more than 50% of the harvesting teams were not paying attention to the best harvesting practices and regularly harvested unripe FFB. The reason was they did not want to

spend a lot of time collecting loose fruits when harvesting the next time. Harvesting teams are paid between 350 and 1,000 THB per tonne of FFB, depending on the age of the oil-palm trees, the slope of the land, the distance from the farm to the ramp or the mill, the height of the oil-palm tree, and their relationship with the farmer. Therefore, the interests of the harvesting teams, especially the general and ramp-harvesting teams, regularly conflict with those of the farmers and crushing mills. The harvesting teams' income depends on the amount of FFB, while that of the farmers and the crushing mills depends on the quality, i.e., the OER and the amount of free fatty acid (FFA) in the FFB.

Ramp owners

Ramp owners are central to the collection and storage of FFB before forwarding them to mills. They collect FFB from private harvesting teams and oil-palm farmers. Farmers pay ramp-harvesting services the same amount as they pay harvesting teams. Farmers need to sell FFB only to ramps which have a harvest service. These ramps have a monopoly in collecting and selling FFB from those farmers. Most ramps are private, though some are managed by crushing mills or cooperatives. Interviews with the crushing mill operators revealed regular problems with the quality of FFB supplied from the ramps, such as mixing with sand or soil, adding water, and improper classification of the loose FFB before forwarding it to the crushing mills. Ramps may also keep the harvested FFB longer than the recommended 24 hours, especially when collecting larger quantities of loose fruits from the riper bunches. Ramp practices exert considerable influence on the OERs and the quality of the CPO.

Oil-palm farmers

Farmers themselves collect about 5–10% of the FFB. Most RSPO-certified smallholders pay attention to the quality of FFB when collecting these themselves or with the help of their laborers, and they send their harvest directly to the crushing mill without passing through ramps. However, most non-RSPO-certified farmers do not have the means to operate in this way, but they still receive the same price regardless of the quality. For them, cultivating an oil-palm plantation is typically a side activity and not their primary source of income. Consequently, they are not very concerned about assessing quality when collecting FFB. The resulting negative impact on the quality of palm oil is one of the most serious issues in the Thai oil-palm industry.

Processing and storage

Crushing mills, storage companies, and refining mills are important actors in the industrial phase of the Thai palm oil-value chain.

Crushing mills

In 2016, Thailand had 145 crushing mills (of which 120 were located in the southern region of the country) (Office of Agricultural Economics 2015) compared with 43 in 1999. The total capacity of all crushing mills was 2,795 tonnes of FFB per hour, equivalent to 44,720 tonnes per day (with machines running at a rate of 16 hours per day) or 13.42 million tonnes per year (one year calculated as 300 days). Although nearly all crushing mills are located in plantation areas, it may nevertheless take two or three days for FFB to be collected and transported before they are processed, resulting in high levels of FFA. Crushing mills sell CPO to refineries, storage companies, and biodiesel plants after which palm-oil products are consumed domestically or exported to China, India, or Malaysia. Crushing mills have considerable power in controlling the price of FFB. They post the price at their front gate, which is normally about 1–2 THB higher than the real price because they do not want other mills to be informed about their actual price.

Based on the scale of their production and their technology, crushing mills can be divided into two categories. Small-scale mills, or so-called B-mills (around 43% of all crushing mills), process less than 30 tonnes per hour and mix CPO and crude palm-kernel oil (CPKO) when processing (Office of Agricultural Economics 2015). They typically produce Grade B CPO from loose FFB. They achieve high OERs but also high FFA in their final product. Most Grade B CPO is sold to biodiesel plants and the animal-feed industry. The large number of small-scale mills is the cause of the low quality of CPO produced in Thailand. In 2016, the Thai government introduced measures to increase the OER, including the requirement for every mill to buy both palm fruits from bunches and loose fruits. Therefore, B-millers could no longer buy only loose fruits, resulting in an increase in their cost of production. Large-scale mills typically have a capacity of processing between 30 and 80 tonnes per hour. They separate CPO from CPKO to produce Grade A CPO. The production processes follow high quality standards by using a sterilization method.

Promoting and supporting RSPO standards mostly comes from private actors, while only a limited number of government organizations are involved. Some crushing mills promote RSPO certification to smallholders while others do not do so. Therefore, smallholders find it difficult to access the

advantages accruing from RSPO certification if their plantation is located outside the area of a mill promoting this standard. Furthermore, the certification process requires farmers to form groups which they often find difficult to do. Nevertheless, RSPO certification results in positive effects for both crushing mills and smallholders. According to the interviews, all RSPO-certified mills noted that promoting RSPO supported their reputation and contributed to achieving their corporate social responsibility (CSR) objectives while also producing a higher quality of FFB. At the same time, RSPO-certified mills support certified farmers through an agreement offering them: (1) about 50 THB extra per tonne of certified FFB, (2) a special route for FFB delivery so that they do not have to wait during the high season, (3) knowledge through training and inputs sold against the wholesale price, and (4) advisors to farmer groups.

Storage companies or CPO trading firms

The dominant actors in the CPO value chain are the storage companies or CPO trading firms. They have a role in collecting CPO from crushing mills and then distributing it to refineries or biodiesel plants. P. K. Marine Trading Company is a large-scale storage company and its market share allows it to act practically as a monopolist in the market of storing CPO and CPKO. P. K. Marine Trading started operations in 1990, acting as a warehouse for palm oil exported to China, India, Bangladesh, Indonesia, and Malaysia. Today, in Thailand, the company owns warehouses and open storages throughout the country, and its total capacity is estimated at 350,000 tonnes. This is more than the average national stock of CPO, which was 334,692 tonnes in 2014 or 16.18% of all CPO produced (Office of Agricultural Economics 2017). The company has an agreement with the government to store CPO. Another major trading company is Paco Trading Company, a partner of P. K. Marine Trading, which has a large share of the CPO market in southern Thailand. This company has excellent relationships with crushing mills using spot-market criteria. In addition, the company mixes CPO with high FFA, or low-quality CPO, with normal quality CPO to improve the overall FFA value of CPO. This is the best channel for crushing mills, especially those conducting relatively small-scale CPO transactions in cash, selling a low-quality product.

Refinery mills

Thailand has 14 refinery mills, with an annual capacity of 2.84 million tonnes of CPO, although they operate only at 73.25% of this capacity (Office of Agricultural Economics 2015). They are nearly all

located in central Thailand, receiving also CPO from the southern part of the country. Compared with the crushing mill industry, there is less competition in refining because the considerable amount of investment capital required and the high operating costs involved are barriers for new investors. At the same time, the market for palm-oil products is controlled and often interfered with by the government, and these governmental interventions may create problems for the long-term sustainability of the palm-oil industry. For example, the Thai government sets a maximum consumer price for cooking oil (see Table 4).

Distribution

The RSPO-certified palm oil-value chain involves multiple actors, including farmers, millers, refineries, manufacturers, and retailers. To assure certification in the chain, the RSPO has introduced the supply chain-certification (SCC) standard. The SCC allows actors in the palm oil-value chain to demonstrate that they have implemented systems to control RSPO-certified oil-palm products through auditable requirements. This allows for *physical trade* and *virtual trade* of certified palm oil and the two modes are distinguished below.

Physical trade in Thailand means trading CSPO according to the mass-balance model, using the eTrace system (changed into RSPO PalmTrace in 2016). In Thailand, the application of the mass-balance model is dominant in the case of smallholder production, but also used in the case of large estates and company plantations. In 2014, a total of 15,607 hectares was certified, generating 44,764 tonnes of CSPO and 11,271 tonnes of CSPK (RSPO 2014) (see Table 5).

Virtual trade means trading CSPO using the B&C model through the RSPO-endorsed GreenPalm program. No physical movement of CSPO occurs, but certified growers are awarded a GreenPalm certificate for each tonne of CSPO produced. These certificates can be sold through the GreenPalm web-based trading platform, and manufacturers or retailers who purchase them have the right to claim that they have contributed in equivalent volumes to the production of RSPO-certified sustainable palm

Table 4. Maximum price for cooking oil set by the Thai government (2007–2017).

Year	Ceiling price (Baht per liter)
2007 first time	38.00
2007s time	43.50
2008	47.50
2009	38.00
2010	42.50
2011	47.00
2012–March 2017	42.00

Source: Department of Internal Trade.

Table 5. Thai grower RSPO certification.

Account name	Certified mill name	Sum of total production area (hectares)		Sum of total certified area (hectares)		Sum of total CSPO		Sum of total CSPK	
		2014	2016	2014	2016	2014	2016	2014	2016
Chumporn Palm Oil Industry Public Company Limited	Chumporn Palm Oil Industry Public Company Limited	–	3,213	–	3,034	–	10,729	–	3,233
The Natural Palm Group Co., Ltd	The Natural Palm Group Co., Ltd	381	381	306	306	1,223	1,040	360	288
United Palm Oil Industry Public Company Limited (UPOIC)	Krabinoi Mill	7,513	–	6,296	–	23,900	–	6,000	–
Univanich Palm Oil Public Company Limited	Lamthap Mill	603	603	265	265	706	1,060	177	265
	Siam Mill	3,297	3,262	3,262	3,262	948	993	237	303
	Topi Mill	5,444	5,444	5,444	5,444	17,987	15,423	4,497	4,712
Total		17,203	12,903	15,607	12,311	44,764	29,245	11,271	8,801
Grand Total		3,139,697	2,818,475	2,627,999	2,176,606	11,659,851	10,805,245	2,689,015	2,433,170

Source: RSPO website (December 15, 2014) and (December 22, 2016).

oil. Because this model is flexible and easy to implement, GreenPalm certificate trade empowers independent smallholders to participate in the sustainable palm oil-supply chain. Under this system, the group manager can deal directly with potential buyers and it is used by the Sustainable Oil Palm Smallholders Production (Univanich-Plaipraya) Community Enterprise Group, the Community Enterprise Group, and the Community Enterprise Group for Sustainable Palm Oil Production UPOIC (Nuakhleng-Khaopanom) Group. These smallholder groups receive multiple benefits from implementing the RSPO standard, including an increase in yields, improved business alliances, transfer of knowledge, financial benefits, and enhanced sustainability (Jaismut et al. 2015; Thongrak and Kiatpathomchai 2012). Another benefit is the payment received from the sale of RSPO credits. These rewards are passed on to the community that has helped improve smallholder incomes.

Governance structures in the upstream levels of the palm oil-value chain

Governance of the Thai palm oil-value chain is dominated by political actors in the case of non-RSPO-certified palm oil and by private actors and international organizations in the case of RSPO-certified palm oil (von Geibler 2013). This section describes the governance of the Thai palm oil-value chain with respect to the role of contracts and agreements, the level of trust in transactions, the relative power of the actors involved, the mechanisms that millers or refineries may use to control smallholder farmers, and the ability of smallholders to access upstream markets.

Contracts and agreements in production and marketing networks

Contracts and agreements between the actors in the palm oil-value chain create vertical linkages between them through business transactions that secure benefits and reduce uncertainty (Laporte and Le Duff 2012; Tsay, Nahmias, and Agrawal 1999; Zirpoli and Caputo 2002). These arrangements may also contribute to the avoidance of ethical hazards (Luo 2002). However, contracts and agreements between smallholders and companies may also face problems such as lack of compliance by the involved parties, absence of transparency, limited capacity of farmers to participate in them, and so forth (Cahyadi and Waibel 2013, 2016; Maryadi, Yusuf, and Mulyana 2004; Rist, Feintrenie, and Levang 2010). We distinguish between informal and formal contracts, applied in both RSPO-certified and non-RSPO-certified palm oil-value chains.

Informal contracts within RSPO-certified chains are partnership agreements between RSPO-certified farmers, RSPO-certified groups, and their supporting crushing mills. An informal contract is a type of agreement without any formal legal status. The farmers receive support in the form of training on best management practices such as seed selection, fertilizer application, and proper health, safety, and environmental practices. The informal contracts also create benefits for farmers by making fertilizer available at wholesale prices, improving seedling provision (better prices and priority access), offering free collection of empty fruit bunches (EFB), extending premium prices based on quality, and providing a direct channel for delivering FFB and technical support. The farmers are expected to regularly deliver FFB to the crushing mills, to use the best available

Table 6. Direct sales of FFB for mills from RSPO-certified farmers ($N = 20$).

Reasons for selling FFB directly to the mill	Percentage of farmers agreeing with the reason presented
Informal agreement	95
Trust in the price evaluation	100
Premium price for FFB	85
Trust in mill financing	100

Source: Interviews.

management practices, and to be committed to the group's agreements and expectations regarding sustainability with respect to socioeconomic and environmental values. Transactions in the non-RSPO-certified chain can also be based on informal contracts and this situation is particularly useful for transactions at a small-scale level (Frankel, Schmitz Whipple, and Frayer 1996) such as between farmers and harvesting teams or ramps. Small-scale crushing mills sell CPO to CPO traders on the spot market without the benefit of prior contracts. The parties must keep and follow the conditions of the RSPO member groups.

Formal contracts are used higher up in both the RSPO-certified and the non-RSPO-certified palm oil-supply chain. Large-scale crushing mills sell CPO and CPKO to refineries within 15 days after the start of the contract. The refineries buy from the crushing mills on credit, payable 15 days after the CPO is delivered.

Trust and lack of trust in transactions

The small size of the farms, characteristic of Thai oil-palm cultivation, and the fact that most smallholders have more than one occupation (which typically means that farming is not a primary source of income) create the need to involve external actors in farm management. Successful management of oil-palm plantations, therefore, relies on trust associated with maintaining intensive long-term social relationships (Morgan and Hunt 1994). Trust and commitment between smallholders and the harvesting teams and the ramps are key determinants of cooperation in the FFB production network. In general, social dynamics, economic activities, and social capital are generated and modified through the buyer-seller relationship (Kenneth 1997). Efficiency in the transactions decreases costs and diminishing trust increases them (Bromiley and Cummings 1995; Gulati 1995). In non-RSPO-certified oil palm-supply chains, trust promotes long-term relationships between smallholders and collectors (fertilizer teams, harvesting teams, and ramps) through interactions that arise naturally during everyday farm-management activities and social contacts. Management

involves securing production inputs, harvesting activities, and making decisions about production, all of which are supported by service teams in the village and based on trust. These transactions occur through family relationships with those who do palm-oil business in the village. In the case of smallholder plantations, hiring farm laborers also takes place in the village. Smallholders' trust in the transactions with collecting teams and ramps similarly emerges from personal relationships, depending on the length of the association, the degree of familiarity, and the general transparency of the transactions. Therefore, the division of labor in oil-palm farming in rural areas is based on trust, which is necessary for successful specialization and for realizing economies of scale in palm-oil transactions at the smallholder-farm level.

By contrast, the relatively small number of RSPO-certified farmers who sell their FFB directly to the crushing mills base their transactions with downstream actors on somewhat different elements. As already noted, the RSPO-certified farmers sell their FFB directly to certified mills rather than to independent and unregulated ramps. Nevertheless, Table 6 shows that even for RSPO-certified smallholders who sell certified FFB to crushing mills directly and not via ramps, trust remains important although these transactions tend to be more formal. For example, some interviewees emphasized the importance of informal agreements, while they also placed more trust in the mills' price evaluation, expecting that they would receive a premium price for their FFB and profit from the mill's financial arrangement. From the crushing millers' perspective, trust is vested in the farmers' willingness to secure the quality of FFB, expecting them to have a high OER, be ripe, and be without mixtures with sand or water.

The relative power of actors

This section discusses the power of key actors involved in the palm-oil chain and their mutual relations to better understand the unequal distribution of power among the various actors operating in the agricultural value chain.

The Thai palm oil-value chain has a top-down power structure and is dominated by the government and the refineries, especially with regard to the price of palm oil. Next to these refineries, CPO traders, CPO millers, and middlemen are also important private actors. In the non-RSPO-certified palm oil-value chain, middlemen play a key role together with the refineries, followed by the CPO traders and the crushing mills. In the upstream part of the value chain, the refineries influence the

Table 7. CPO production, domestic consumption and export between 2013 and 2015 (MT).

Year/Account	2013		2014		2015		2016	
	CPO (tons)	%	CPO (tons)	%	CPO (tons)	%	CPO (tons)	%
Domestic	2,087,100.00	97.75	1,836,918.00	91.82	2,068,474.90	100.00	1,985,858.60	99.99
Export	48,083.00	2.25	163,692.00	8.18	0.10	0.00	141.40	0.01
Total	2,135,183.00	100.00	2,000,610.00	100.00	2,068,475.00	100.00	1,986,000.00	100.00

Source: http://www.oae.go.th/oae_report/export_import/export_result.php (February 22, 2017).

setting of the CPO price, particularly when purchasing CPO from the crushing mills. Small-scale crushing mills have difficulties in accessing the CPO market directly, and they sell their CPO to traders with large storage capacity. These traders determine the quantities purchased from the small-scale mills and the prices paid. Exporters and large crushing mills refer to Malaysian market prices when setting the prices for their domestic suppliers.

Although the RSPO-certified palm-oil chain is buyer-driven, the ability of the Thai palm-oil sector to supply RSPO-certified products to the global market is constrained by the dominance of smallholder farming in the sector, the process of certification and the small number of certified farmers, and the size of the market. As noted earlier, many Thai smallholders lack the motivation to obtain certification. This is partly due to the upfront investment costs involved. Some interviewees noted that the international RSPO standards were in conflict with Thai traditions (such as the tradition of relationship-based marketing), and some claimed that the international RSPO standards are not meant to lead to sustainable palm-oil production, but actually to establishing trade barriers to protect the global market for European commodities. Despite these limitations, RSPO-certified palm oil produced by Thailand's smallholders and large company estates has increased. In this respect, it is important to note that Thailand only exported 141.40 tonnes or 0.01% of the total production of CPO in 2016 (see Table 7).

Only some CPO and palm oil-based products are exported to India and China, but most NCPO is used domestically because the average cost of Thai NCPO is higher than the world market price. The Thai government dominates the domestic market by controlling the price of both CPO and refined palm oil (RPO), which is achieved by setting a maximum price for refined, bleached, and deodorized (RBD) CPO. The government also controls international trade through direct regulation. Within the supply chain, refineries control the crushing mills while the crushing mills control the farmers and the ramps, especially during high seasons. The Thai palm oil-value chain is controlled top-down through the price mechanism in the market.

Smallholders' access to upstream markets

The ability of oil-palm smallholders to access markets, including their negotiating power, depends largely on the season and the location of the ramps, middlemen, and mills. The market for non-RSPO-certified FFB is a spot market where, during the season with low production when less FFB is available, the crushing mills have a relatively low capability to determine the price because they have difficulties in fulfilling their demand. Crushing mills use price as a strategy to attract FFB during periods of severe shortages. Ramps and collectors have some ability to decide whether or not to sell because they have the freedom to handle the FFB that was not sent directly to the mills. During the high production season, the FFB market is normalized, but even then, there is no problem selling FFB because the crushing mills have a larger capacity than the total amount of FFB available. In 2014, the crushing mills in southern Thailand were operating at approximately 53.27% of their capacity (Office of Agricultural Economics 2015). As a consequence, quality – as opposed to quantity – is not a real issue in these transactions. Farmers confirmed that the Thai palm-oil sector has no system to monitor the quality of FFB. Crushing mills identify the OER by visual inspection on which they base the price of FFB offered to middlemen and farmers. Interviewed farmers explained that they have the impression that FFB transactions are not very transparent and they fear being exploited by the millers.

Certified farmers note that RSPO certification is a major challenge, but they need this designation to access international markets. From the interviews, we found that in 2018 the Srijaroen Sustainable Palm Oil Community Enterprise Group with 339 members, 803 plots, 2,978 hectares, and 49,912.38 tonnes of certified FFB received about THB 8,142,207 (US\$270,000). This amount included the premium price for certified palm oil = 50 THB per tonne that total about THB 2,495,619 (US\$82,745.99). Certified farmers deliver their FFB directly to the RSPO mill during all seasons. This certification process has supported the farmer groups involved and strengthened collective action mechanisms that are often seen as key tools for

increasing farmers' access to markets (Hellin, Lundy, and Meijer 2009). However, with less difference in price between certified and non-certified FFB, the individual benefits from RSPO certification practices are still insufficient to motivate most smallholders to access the certified market.

Discussion and conclusion

In this article, we have compared the CSPO and NCPO value chains in Thailand with respect to input supply and production, collection and sales, processing and storage, and distribution. In addition, we have analyzed the governance arrangements expressed in contracts and agreements on collection and sales, the trust in transactions, the relative power of the actors involved, and the mechanisms by which millers and refineries control smallholder farmers' access to the market.

The greening of palm-oil supply is a strong demand of consumers at the end of the value chain in the global market and CSPO is a response to this situation (Schleifer and Sun 2018). The CSPO value chain in Thailand clearly shows increasing efficiency and quality compared with the NCPO value chain. The integration of sustainability through the RSPO certification system creates innovations in the management and private governance arrangements of the palm oil-value chain and offers opportunities to access new markets (Schleifer and Sun 2018). The RSPO as a voluntary certification scheme offers smallholder farmers in Thailand an interesting opportunity to increase productivity and promote sustainability because it formalizes the collaboration between private actors in the Thai palm oil-value chain. Our findings support that stakeholders involved in the chain have major roles in transforming the palm oil-supply chain. Governing sustainability in the Thai palm-oil chain relies on the involvement of private actors and public authorities are not engaged. This is contrary to the palm-oil sector in Indonesia (Luttrell et al. 2018), where both private and public actors have been involved in developing governance arrangements to promote sustainability initiatives. Our study, therefore, shows that the international market is an active driver in promoting sustainability in supply chains. Only when there is a substantial dependence on exports of palm oil and when key value-chain actors are concerned about their CSR goals, is the process of moving toward more sustainability actively driven by private companies and NGOs and supported by the government. We have demonstrated that it is unlikely that smallholder producers will take such initiatives themselves.

We found that both the CSPO and the NCPO value chains are mostly driven on a top-down basis by private industrial actors, notably the millers and storage companies. These private actors exercise control over the different phases from seedling supply via production to processing. The private actors, especially the millers, have the main role in promoting and governing the CSPO value chain. They are involved in getting the smallholder groups certified, mainly to strengthen their reputation and to improve their relationship with farmers. The CSPO chain is shorter and more transparent than the NCPO chain because its FFB is collected without passing through collection centers or ramps. We found that the advantages of the CSPO chain include: (1) smallholder farmers' improved profit, (2) good relationships between farmers and millers, (3) strong networks among certified farmers and others, (4) training opportunities aimed at transferring knowledge and new technologies to increase the productivity of oil-palm cultivation, (5) easy access to inputs for producers, (6) pride of certified farmers in their sustainable practices, (7) increase in the quality of FFB, and (8) creation of CSPO value-chain links to international markets. However, in terms of the economic aspect, Salman, Najib, and Djohar (2017) confirmed that in the PT BCA oil-palm plantation (Papua, Indonesia), over the long term, the net present value (NPV) of non-certified palm-oil investment was a bit higher than in the certification scenario. In addition, Hutabarat et al. (2018) showed that RSPO certification had a loss of 8% of net income per hectare in the first year. Furthermore, Schmidt and De Rosa (2020) (Tan et al. 2009) confirmed that RSPO certified oil produced in Indonesia and Malaysia reduces GHG emission by 35% compared to the non-certified alternative. Therefore, it should be clear that the policy guidelines to guarantee future additional and long-term benefits are to adopt the RSPO certification scheme.

At the same time, as RSPO certification remains marginal in Thailand, we identified several barriers for non-certified smallholder farmers to become credentialed. First, mills provide limited support. Furthermore, the large distance between the smallholder's oil-palm plantation and the mill makes it impossible to deliver FFB to the mill and inconvenient to attend group activities such as trainings, meetings, and monitoring activities. Second, adequate access to the required knowledge and information is often problematic. For instance, most smallholder farmers are not informed about RSPO certification and what it entails. Third, the Thai government is hardly promoting RSPO certification despite the numerous government agencies working

closely with the smallholders in the villages. Fourth, the seasonal character of the production cycle leads to a FFB oversupply in some months of the year and to an undersupply in others, affecting the price of FFB. Most smallholder farmers emphasize that farmers' income is more important than environmental sustainability, considering the small premium price for certified FFB. Fifth, access to the global market is challenging. Most Thai palm oil is sold on the domestic market because on the global market CPO produced in Thailand cannot compete with other producing countries where the CPO price is substantially lower. Sixth, crushing mills are barely motivated to engage in promoting, organizing, advising, and managing the process of certification throughout the chain because there seems to be few advantages for them. Only seven mills out of the total of 147 facilities at this time support RSPO certification of smallholder farmers. Finally, the RSPO requirement to form groups of farmers is seen as difficult. As most farmers do not join a group, they do not have the opportunity to become certified. Furthermore, smallholders are particularly concerned about the expensive membership fees and the costs of the certification-auditing procedure.

In terms of the organization and functioning of governance arrangements in the chain, informal contracts based on trust dominate the relationships between farmers and harvesting teams or ramps. The main factor influencing the transactions is the quantity of FFB available on the market, and this depends on the season. More specifically, the balance of power between farmers or collectors and millers is determined by the supply and demand of FFB over the course of the year. Informal agreements also include the collaboration between the certified smallholder farmers, the certified groups, and the supporting crushing mills. Formal contracts were mainly found higher up in both the CSPO and the NCPO chains, detailing obligations of credit and payment. In the NCPO chains, the FFB collectors (ramps) have more power than individual farmers because they control access to the crushing mills, quality of FFB, collection and storage of FFB, and FFB price. The millers have more influence on the grading and pricing of FFB during the high season of FFB production.

In general, there is little stability and trust in the NCPO chain, and this offers few opportunities for improving sustainability. The NCPO farmers have more flexibility in their farm management and marketing, and they can sell their FFB to collectors or ramps of their choice and do not have the obligation to sell their FFB to a certified mill. Thai government agencies have governed the NCPO chain through market interventions and policymaking

with price controls from FFB to final products. More active engagement of these public actors in the implementation of sustainability commitments could be achieved by creating new forms of governance and supply-chain relationships that public actors play a critical role in the commodity chain (Luttrell et al. 2018). Therefore, RSPO as a new form or innovation management has been developed by multi-stakeholder initiatives as an attractive pathway to increase sustainability through certification.

This research confirms that the CSPO chain is innovative in driving sustainability in the production, processing, distribution, and governance of palm oil in Thailand. However, the structural characteristics of the Thai palm oil-supply chain do not appear at present to be favorable for expanding the CSPO chain. Therefore, to motivate stakeholders to operate more sustainably, to protect the environment, and to reduce carbon emissions to mitigate global warming, not only the private but also state actors in the Thai palm oil-value chain should collaborate more closely in driving the sustainable palm oil-certification scheme.

Based on these conclusions, we have formulated the following four recommendations for driving sustainability in the palm oil-supply chains and to encourage the involved actors to contribute to future sustainable supply chains. First, we confirmed that the Thai palm oil-value chain is dominated by political actors, as expressed in the current policy mainly aimed at promoting palm-oil production and increasingly claiming to be sustainable, but few could provide hard evidence of sustainable practices such as upgrading RSPO certified palm-oil supply. There is a need for the state authorities to support RSPO certification through public policy in order to realize the potential benefits for certified smallholder farmers. Possible interventions include efforts to subsidize membership fees and the costs involved in applying for certification, to help the involved actors better understand the advantages of the certified palm-oil market, and to establish a specific department for those issues. Second, a pilot project to prepare for global certification needs to be established, with the main aim to widely promote sustainable palm-oil practices among producers, processors, and consumers. Third, there is a need to create commitments among both private and state actors to promote the certification of palm-oil production and to show the benefits of those commitments. Meanwhile, this would enable the actors involved in the certified palm-oil chain to support and collaborate with the actors involved in the conventional supply chain. Finally, a top-down approach is needed to focus on smallholder farmers who grow the most oil palm by encouraging sustainable practices in daily life, creating smart younger farmer groups, and

providing support for them to succeed in adopting best practices such as the oil palm Thai Agricultural Practice (Thai-GAP) groups before upgrading to RSPO groups. In addition, a limitation to this study was that it did not address differences in the economic value between the certified and the non-certified chain or benefit-sharing among actors in those chains. The primary data collection was less focused on the downstream end of the value chain where the international market for certified palm oil is important. Future research should, therefore, address the relative economic value of the certified palm-oil chain compared with the non-certified palm-oil chain, the roles of private global authorities in governing the sustainable palm-oil chain, and the promotion of sustainable palm-oil supply in the long term contributed by private actors in the palm oil-value chain.

Notes

1. According to the GreenPalm website, "GreenPalm is a certificate trading programme that allows manufacturers and retailers to purchase GreenPalm certificates to allow Book and Claim supply chain option from an RSPO certified palm oil grower to offset each tonne of palm oil, palm kernel oil they use." See <https://www.greenpalm.org/about-greenpalm/what-is-green-palm>.
2. "RSPO PalmTrace is the RSPO's traceability system for certified oil palm products." See <https://rspo.org/palmtrace>
3. A ramp is the middleman who serves as the collection point for FFBs produced from smallholders and sold to the mills.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

The authors are grateful for financial support provided by the INREF SUSPENSE program of Wageningen University and Research.

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References

- Basiron, Y., and C. Weng. 2004. "The Oil Palm and Its Sustainability." *Journal of Oil Palm Research* 16 (1): 1–10.
- Benites-Lazaro, L., L. Giatti, and A. Giarolla. 2018. "Sustainability and Governance of Sugarcane Ethanol Companies in Brazil: Topic Modeling Analysis of CSR

- Reporting." *Journal of Cleaner Production* 197: 583–591. doi:10.1016/j.jclepro.2018.06.212.
- Blind, K., A. Mangelsdorf, C. Niebel, and F. Ramel. 2018. "Standards in the Global Value Chains of the European Single Market." *Review of International Political Economy* 25 (1): 28–48. doi:10.1080/09692290.2017.1402804.
- Brandi, C., T. Cabani, C. Hosang, S. Schirmbeck, L. Westermann, and H. Wiese. 2013. *Sustainability Certification in the Indonesian Palm Oil Sector: Benefits and Challenges for Smallholders*. Bonn: Deutsches Institut für Entwicklungspolitik. <https://www.econstor.eu/handle/10419/199199>.
- Bromiley, P., and L. Cummings. 1995. "Transactions Cost in Organizations with Trust." *Research on Negotiation in Organizations* 5: 219–250.
- Bush, S., P. Oosterveer, M. Bailey, and A. Mol. 2015. "Sustainability Governance of Chains and Networks: A Review and Future Outlook." *Journal of Cleaner Production* 107: 8–19. doi:10.1016/j.jclepro.2014.10.019.
- Cahyadi, E., and H. Waibel. 2013. "Is Contract Farming in the Indonesian Oil Palm Industry Pro-Poor?" *ASEAN Economic Bulletin* 30 (1): 62–76. doi:10.1355/ae30-1d.
- Cahyadi, E., and H. Waibel. 2016. "Contract Farming and Vulnerability to Poverty among Oil Palm Smallholders in Indonesia." *The Journal of Development Studies* 52 (5): 681–695. doi:10.1080/00220388.2015.1098627.
- Chkanikova, O., and R. Sroufe. 2021. "Third-Party Sustainability Certifications in Food Retailing: Certification Design from a Sustainable Supply Chain Management Perspective." *Journal of Cleaner Production* 282: 124344. doi:10.1016/j.jclepro.2020.124344.
- Colchester, M., ed. 2011. *Oil Palm Expansion in South East Asia: Trends and Implications for Local Communities and Indigenous Peoples*. Moreton-in-Marsh: Forest Peoples Programme.
- D'amato, D., and J. Korhonen. 2021. "Integrating the Green Economy, Circular Economy and Bioeconomy in a Strategic Sustainability Framework." *Ecological Economics* 188: 107143. doi:10.1016/j.ecolecon.2021.107143.
- Degli Innocenti, E., and P. Oosterveer. 2020. "Opportunities and Bottlenecks for Upstream Learning within RSPO Certified Palm Oil Value Chains: A Comparative Analysis between Indonesia and Thailand." *Journal of Rural Studies* 78: 426–437. doi:10.1016/j.jrurstud.2020.07.00.
- Dermawan, A., and O. Hospes. 2018. "When the State Brings Itself Back into GVC: The Case of the Indonesian Palm Oil Pledge." *Global Policy* 9: 21–28. doi:10.1111/1758-5899.12619.
- Frankel, R., J. Schmitz Whipple, and D. Frayer. 1996. "Formal versus Informal Contracts: Achieving Alliance Success." *International Journal of Physical Distribution & Logistics Management* 26 (3): 47–63. doi:10.1108/09600039610114992.
- Gereffi, G. 1994. "The Organization of Buyer-Driven Global Commodity Chains: How U.S. Retailers Shape Overseas Production Networks." In *Commodity Chains and Global Capitalism*, edited by G. Gereffi and M. Korzeniewicz, 95–122. Westport, CT: Praeger.
- Gereffi, G., and K. Fernandez-Stark. 2011. *Global Value Chain Analysis: A Primer*. Durham, NC: Center on Globalization, Governance and Competitiveness, Duke University.

- Gereffi, G., and B. Stallings. 1995. *Global Change, Regional Response: The New International Context of Development: Global Production Systems and Third World Development*. Cambridge: Cambridge University Press.
- Glasbergen, P. 2018. "Smallholders Do Not Eat Certificates." *Ecological Economics* 147: 243–252. doi:10.1016/j.ecolecon.2018.01.023.
- Grabs, J., and S. Ponte. 2019. "The Evolution of Power in the Global Coffee Value Chain and Production Network." *Journal of Economic Geography* 19 (4): 803–828. doi:10.1093/jeg/lbz008.
- Gulati, R. 1995. "Does Familiarity Breed Trust? The Implications of Repeated Ties for Contractual Choice in Alliances." *Academy of Management Journal* 38 (1): 85–112. doi:10.5465/256729.
- Hellin, J., M. Lundy, and M. Meijer. 2009. "Farmer Organization, Collective Action and Market Access in Meso-America." *Food Policy*. 34 (1): 16–22. doi:10.1016/j.foodpol.2008.10.003.
- Henson, S., and T. Reardon. 2005. "Private Agri-Food Standards: Implications for Food Policy and the Agri-Food System." *Food Policy*. 30 (3): 241–253. doi:10.1016/j.foodpol.2005.05.002.
- Hutabarat, S., M. Slingerland, P. Rietberg, and L. Dries. 2018. "Costs and Benefits of Certification of Independent Oil Palm Smallholders in Indonesia." *International Food and Agribusiness Management Review* 21 (6): 681–700. doi:10.22434/IFAMR2016.0162.
- Ivancic, H., and L. Koh. 2016. "Evolution of Sustainable Palm Oil Policy in Southeast Asia." *Cogent Environmental Science* 2 (1): 1195032. doi:10.1080/23311843.2016.1195032.
- Jaismut, P., S. Benchasri, P. Pruthikanee, S. Sanputawong, and S. Simla. 2015. "Study of Sustainable Oil Palm Production by the Standard of Roundtable on Sustainable Palm Oil in Krabi Province." *Khon Kaen Agricultural Journal* 43 (1): 1013–1019.
- Kenneth, R. 1997. "Reviewed Work: Trust: The Social Virtues and the Creation of Prosperity by Francis Fukuyama." *International Journal on World Peace* 14 (1): 84–87. <http://www.jstor.org/stable/20047503>.
- Laporte, M., and J. Le Duff. 2012. "Trust and Contract Effects on the Efficiency of the Supplier-Manufacturer Relationships: A Dyadic Perspective." Master's thesis, Linneaus University. <https://www.diva-portal.org/smash/get/diva2:540326/FULLTEXT01.pdf>.
- Lee, J., and G. Gereffi. 2015. "Global Value Chains, Rising Power Firms and Economic and Social Upgrading." *Critical Perspectives on International Business* 11 (3–4): 319–339. doi:10.1108/cpoib-03-2014-0018.
- Luo, Y. 2002. "Contract, Cooperation, and Performance in International Joint Ventures." *Strategic Management Journal* 23 (10): 903–919. doi:10.1002/smj.261.
- Luttrell, C., H. Komarudin, M. Zrust, P. Pacheco, G. Limberg, F. Nurfatriani, F. Wibowo, et al. 2018. *The Governance Arrangements of Sustainable Oil Palm Initiatives in Indonesia: Multilevel Interactions between Public and Private Actors*. Bogor Regency, Indonesia: Center for International Forestry Research.
- Lyons-White, J., and A. Knight. 2018. "Palm Oil Supply Chain Complexity Impedes Implementation of Corporate No-Deforestation Commitments." *Global Environmental Change* 50: 303–313. doi:10.1016/j.gloenvcha.2018.04.012.
- Marshall, M. 1996. "The Key Informant Technique." *Family Practice* 13 (1): 92–97. doi:10.1093/fampra/13.1.92.
- Maryadi, A., A. Yusuf, and A. Mulyana. 2004. *Pricing of Palm Oil Fresh Fruit Bunches for Smallholders in South Sumatra*. Palembang, Indonesia: Faculty of Agriculture, Sriwijaya University. <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.385.6836&rep=rep1&type=pdf>
- Morgan, R., and S. Hunt. 1994. "The Commitment-Trust Theory of Relationship Marketing." *Journal of Marketing* 58 (3): 20–38. doi:10.1177/002224299405800302.
- Nikoloyuk, J., T. Burns, and R. de Man. 2010. "The Promise and Limitations of Partnered Governance: The Case of Sustainable Palm Oil." *Corporate Governance: The International Journal of Business in Society* 10 (1): 59–72. doi:10.1108/14720701011021111.
- Npueng, S., P. Oosterveer, and A. Mol. 2018. "Implementing a Palm Oil-Based Biodiesel Policy: The Case of Thailand." *Energy Science & Engineering* 6 (6): 643–657. doi:10.1002/ese3.240.
- Office of Agricultural Economics. 2015. *Thai Palm Oil Industry and Roadmap for Implementation of Strategic Agricultural Crops*. Bangkok: Office of Agricultural Economics. <https://cupdf.com/document/logo-thai-palm-oil-industry-and-roadmap-for-mrlersak-rewtarkul-paiboo.html>
- Office of Agricultural Economics. 2016. *Cost of Oil Palm*. Bangkok: Office of Agricultural Economics.
- Office of Agricultural Economics. 2017. *Data on Production, Import, Export and Stock of Palm Oil in Thailand, 2014–2015*. Bangkok: Office of Agricultural Economics.
- Oosterveer, P. 2015. "Promoting Sustainable Palm Oil: Viewed from a Global Networks and Flows Perspective." *Journal of Cleaner Production* 107: 146–153. doi:10.1016/j.jclepro.2014.01.019.
- Oosterveer, P., B. Adjei, S. Vellema, and M. Slingerland. 2014. "Global Sustainability Standards and Food Security: Exploring Unintended Effects of Voluntary Certification in Palm Oil." *Global Food Security* 3 (3–4): 220–226. doi:10.1016/j.gfs.2014.09.006.
- Oosterveer, P., and D. Sonnenfeld. 2012. *Food, Globalization and Sustainability*. London: Routledge.
- Pacheco, P., S. Gnych, A. Dermawan, H. Komarudin, and B. Okarda. 2017. *The Palm Oil Global Value Chain: Implications for Economic Growth and Social and Environmental Sustainability*. Bogor Regency, Indonesia: Center for International Forestry Research.
- Rist, L., L. Feintrenie, and P. Levang. 2010. "The Livelihood Impacts of Oil Palm: Smallholders in Indonesia." *Biodiversity and Conservation* 19 (4): 1009–1024. doi:10.1007/s10531-010-9815-z.
- Robobank. 2016. *Make Sustainable Palm Oil the Norm*. Utrecht: Robobank. <https://www.rabobank.com/en/press/search/2016/rabobank-make-sustainable-palm-oil-the-norm.html>
- Roundtable on Sustainable Palm Oil (RSPO). 2014. *Certified Growers*. Geneva: RSPO. <http://www.rspo.org/certification/certified-growers>
- Roundtable on Sustainable Palm Oil (RSPO). 2020. *Book and Claim Supply Chain Model (RSPO Credits)*. Geneva: RSPO. <https://rspo.org/news-and-events/events/webinar-book-and-claim-supply-chain-model-rspo-credits>
- Salman, F., M. Najib, and S. Djohar. 2017. "Cost and Benefit Analysis of RSPO Certification (Case Study in

- PT BCA Oil Palm Plantation in Papua).” *Indonesian Journal of Business and Entrepreneurship* 3 (3): 219–219. doi:10.17358/ijbe.3.3.219.
- Saswattecha, K., C. Kroeze, W. Jawjit, and L. Hein. 2015. “Assessing the Environmental Impact of Palm Oil Produced in Thailand.” *Journal of Cleaner Production* 100: 150–169. doi:10.1016/j.jclepro.2015.03.037.
- Schleifer, P. 2016. “Private Governance Undermined: India and the Roundtable on Sustainable Palm Oil.” *Global Environmental Politics* 16 (1): 38–58. doi:10.1162/GLEP_a_00335.
- Schleifer, P., and Y. Sun. 2018. “Emerging Markets and Private Governance: The Political Economy of Sustainable Palm Oil in China and India.” *Review of International Political Economy* 25 (2): 190–214. doi:10.1080/09692290.2017.1418759.
- Schouten, G., and P. Glasbergen. 2011. “Creating Legitimacy in Global Private Governance: The Case of the Roundtable on Sustainable Palm Oil.” *Ecological Economics* 70 (11): 1891–1899. doi:10.1016/j.ecolecon.2011.03.012.
- Schmidt, J., and M. De Rosa. 2020. “Certified Palm Oil Reduces Greenhouse Gas Emissions Compared to Noncertified.” *Journal of Cleaner Production* 277: 124045. doi:10.1016/j.jclepro.2020.124045.
- Tan, K., K. Lee, A. Mohamed, and S. Bhatia. 2009. “Palm Oil: Addressing Issues and towards Sustainable Development.” *Renewable and Sustainable Energy Reviews* 13 (2): 420–427. doi:10.1016/j.rser.2007.10.001.
- Thongrak, S., and S. Kiatpahtomchai. 2012. *Impact Study of the Project on Sustainable Palm Oil Production for Bioenergy in Thailand*. Songkla: Faculty of Economics, Prince of Songkla University. <https://www.rspo.org/file/ThaiISHFinal%20Report%20of%20Impact%20Study.pdf>
- Tran, N., C. Bailey, N. Wilson, and M. Phillips. 2013. “Governance of Global Value Chains in Response to Food Safety and Certification Standards: The Case of Shrimp from Vietnam.” *World Development* 45: 325–336. doi:10.1016/j.worlddev.2013.01.025.
- Tsay, A., S. Nahmias, and N. Agrawal. 1999. “Modeling Supply Chain Contracts: A Review.” In *Quantitative Models for Supply Chain Management*, 6th ed., edited by S. Tayur, R. Ganeshan, and M. Magazine, 299–336. Dordrecht: Kluwer Academic.
- Von Geibler, J. 2013. “Market-Based Governance for Sustainability in Value Chains: Conditions for Successful Standard Setting in the Palm Oil Sector.” *Journal of Cleaner Production* 56: 39–53. doi:10.1016/j.jclepro.2012.08.027.
- von Hagen, O., and G. Alvarez. 2011. *The Impacts of Private Standards on Global Value Chains: Literature Review Series on the Impacts of Private Standards, Part I*. Geneva: International Trade Centre. doi:10.2139/ssrn.2184282.
- Zirpoli, F., and M. Caputo. 2002. “The Nature of Buyer-Supplier Relationships in Co-Design Activities.” *International Journal of Operations & Production Management* 22 (12): 1389–1410. doi:10.1108/01443570210452066.