Vertical Integration of the Palm Oil Sustainable Global Value Chains in Indonesia and Thailand

Sustainability Frameworks, Local Dynamics,
Material and Information Flows
in the Global-Local Nexus

Elena Degli Innocenti

Propositions

1. Vertical integration cannot be fully achieved without taking into account the horizontal networks at each node.
   (this thesis)

2. Local institutional contexts play an often overlooked role in the success and functioning of global initiatives.
   (this thesis)

3. Hearing that the spirits do not like foreign researchers shows that successful research requires good inter-cultural skills.

4. Obtaining a doctorate degree is like giving birth to a baby, from conception of the proposal to delivery of the final thesis.

5. Striking a balance between standardization and contextualization is a tightrope walk.

6. Consumers will never be able to consume fully sustainably without policy interventions that target producers.

7. Crying 'just stop oil' will not change the world's thirst for oil.

Propositions belonging to the thesis, entitled

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Elena Degli Innocenti

Wageningen, 10 April 2024

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Thesis

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Acronyms and abbreviations

10-Year Renewable and Alternative Energy Development (AEDP)

Agricultural Research Development Agency (ARDA)

Association of Southeast Asian Nations (ASEAN)

Business as Usual (BAU)

Book & Claim (B&C)

Best Management Practices (BMP)

Crude Palm Oil (CPO)

Certified Sustainable Palm Oil (CSPO)

Department of Agriculture (DOA)

Department of Internal Trade (DIT)

Deterioration of Bleachability Index (DOBI)

Crude Palm Oil (CPO)

Empty Fruit Bunches (EFBs)

Free Fatty Acid (FFA)

Fresh Fruit Bunches (FFBs)

Free Prior Informed Consent (FPIC)

Good Agricultural Practice (GAP)

Green House Gasses (GHG)

Global Value Chain (GVC)

Internal Control System (ICS)

Identity Preserved (IP)

Mass Balance (MB)

Multinational Enterprises (MNEs)

Ministry of Agriculture and Cooperatives (MOAC)

Ministry of Commerce (MOC)

Ministry of Energy (MOE)

Ministry of Industry (MOI)

Memorandum of Understanding (MoU)

Malaysian Palm Oil Association (MPOA)

Malaysian Palm Oil Board (MPOB)

Nationally Appropriate Mitigation Actions (NAMAs)

Nationally Determined Contribution (NDC)

National Palm Oil Policy Committee (NPOPC)

Non-Governmental Organizations (NGOs)

Oil Extraction Rate (OER)

Palm Kernal Oil (PKO)

Public Warehouse Organization (PWO)

Refined, Bleached and Deodorized Oil (RBD)

Renewable Energy Directive (RED)

Renewable Energy Development Plan (REDP)

Round Table for Sustainable Palm Oil (RSPO)

Segregated (S)

Trade Union Association for palm oil producers (SPKS)

Sustainable Value Chain (SVC)

Thai Palm Oil Association (TPOA)

United Nations Framework Convention on Climate Change (UNFCCC)

To my family

Chapter 1

General introduction

1.1. Research Context

The growing global demand for palm oil has led to forest conversion, encroachment of fragile ecosystems rich in biodiversity and to climate change (Fargione, Hill, Tilman, Polasky and Hawthorne, 2008; James, 2008; Koh and Ghazoul, 2008; Butler and Laurance, 2009). These impacts are feeding a global debate on the sustainability of global palm oil supply. Governments, companies, investors, and NGOs increasingly feel the pressure from civil society to address these impacts, in particular the environmental and socio-economic aspects. These responses are shaped in different ways: certification schemes, European policies such as the zero-deforestation import related regulations, and specific national palm oil import regulations (Pahl-Wostl et al., 2008; Reuters, 2018). Among these responses supply chain sustainability initiatives have expanded in recent decades but in recent years they experience an increased necessity to be transparent to consumers about what happens at farm level.

Between 1999 and 2020 the number of sustainability reporting standards, industry initiatives, frameworks, and guidelines around the world has proliferated, reaching the number of more than 600. About 90% of the largest 500 companies by market cap published a sustainability report in 2019 and the number of company sustainability reports grew from 11 in 1999 to 9.980 in 2020 (Brightest, 2023). One of the most well-known initiatives is the Round Table for Sustainable Palm Oil (RSPO), founded in 2004 in response to public pressure and to media reports depicting the dramatic impacts of palm oil production on tropical forests and animals

living in those habitats (RSPO, 2020). The RSPO aims to bring positive effects on mitigating the environmental impacts of palm oil production as well as on social issues such as human rights and gender (RSPO, 2022). Certification has resulted, in certain cases, to positively affect farm-level management practices (soil management and yield), creating loyal market relationships between farmers and mills and higher attention for conservation. The same case studies have, however, highlighted the lack of solid evidence of the impact of these improved practices for ecosystem conservation livelihoods and low difference between RSPO-certified and non-certified farms (e.g., orangutan population, number of fires and household income) (Furumo et. al, 2020, Morgans et.al, 2018, Lee at. al, 2020). Land holdings, household education, and low or no statistical difference of other key assets for wellbeing between RSPO-certified and non-certified farms. The inclusion of smallholders in certification programs (compared to companies) seems still to be improved (Beall, 2012). In addition, demonstrating the adoption of sustainability practices among farmers remains a challenge.

Locally embedded dynamics play an important role in the implementation of global supply chain certification frameworks like the RSPO and have the potential to limit and skew their impact and effectiveness. Understanding how these local dynamics influence the realization of integrating sustainable practices in certified global palm oil value chains is critical.

This thesis, therefore, focuses on deepening our understanding of the local structure of the palm oil sector and related market dynamics in relation with actors in the upstream palm oil value chain. This study aims to verify the implementation of vertical integration and to study the potential consequences for the sustainability of the current and future production of palm oil in a global market setting. This thesis makes use of case studies in two palm oil producing countries. First, Indonesia which has a long history of palm oil production, and second Thailand with the highest palm oil production growth rate in recent years (10% annually between 1999 and 2019) (Indexmundi, 2020). Methodologically, this study uses a set of mixed methods

(survey, statistical data analysis, interviews, Delphi method, etc.) to provide the best possible assessment and understanding of the situation, the linkages and the cause-effects relations in supply chain certification schemes.

This Introduction is structured as follows: after the problem statement in this first section, section 2 presents the aim of this thesis in terms of its contribution to scientific debates, followed by the approach used for this. Section 3 summarizes the research objectives. Section 4 presents the theoretical framework and Section 5 the methodological design. The Chapter concludes with an outline of the rest of the thesis in Section 6.

1.2. The global debate on palm oil sustainability and supply

The expansion of oil palm cultivation has been and still is a major driver of deforestation, considered to be responsible for about a quarter of all forest loss (Greenpeace International, 2014). An important driver for this expansion is that despite the presence of many similarities between palm oil and the other vegetable oils, palm oil is more cost efficient than these alternatives (Mattsson et al. 2000). Moreover, palm oil remains solid at room temperature, so it is a great ingredient in the food Industry particularly for the production of margarine. It is currently an ingredient in around 50% of all supermarket products including soap, shampoo, makeup, and lotion (WWF, 2023). It is therefore not surprising that the demand for palm oil has been growing rapidly from 2 million tons in 1970 to 79 million tons in 2020 (Ourworldindata, 2021). It seems likely that this trend will continue. As of 2022, Indonesia, Malaysia and Thailand were the top three global producers of palm oil (see Table 1.1), while consumption was driven by Indonesia, India and China (see Table 1.2).

Table 1.1: *Top 5 Palm Oil Producing Countries*

Ranking	Country	Production (1000 metric tons)
1	Indonesia	47,000
2	Malaysia	19,000
3	Thailand	3,450
4	Colombia	1,800
5	Nigeria	1,400
6	Guatemala	920
7	Papua New Guinea	800

Source: https://www.indexmundi.com/agriculture/?commodity=palm-oil

Table 1.2: *Top 5 Palm Oil Consuming Countries*

Ranking	Country	Consumption (1000 metric tons)
1	Indonesia	20,100
2	India	9,325
3	China	6,950
4	EU-27	4,600
5	Malaysia	3,675
6	Pakistan	3,495
7	Thailand	2,740

Source: https://www.indexmundi.com/agriculture/?commodity=palm-oil&graph=domestic-consumption

The initial enthusiasm about palm oil's cost-efficiency and applicability in the food and cosmetics industry is in recent years increasingly being accompanied with questions about its sustainability. Companies, governments, and consumers have been put under pressure to reduce the negative impacts from oil palm cultivation by diminishing their use of palm oil. For instance, in 2021 the EU announced a zero-deforestation policy, which obliges exporting countries to adapt their production systems and companies to rethink and re-direct their supply towards sustainable sourcing. Consequently, the imports of palm oil reduced (European Commission, 2021). Others are developing and promoting more sustainably produced palm oil through certification rather than simply reducing palm oil consumption. The RSPO is arguably the most important initiative in this domain.

1.2.1. The RSPO between successes and challenges

The number of RSPO members has grown over the years and so has the number of hectares of palm oil plantations certified as sustainable production areas. Sustainability measures promoted

by the RSPO include reducing the use of restricted pesticides and herbicides for pest and disease control in favour of natural biological methods, reduced water usage by processing mills, and a reduction of forest fires. In addition, there has been much attention for human rights, notably the right to Free Prior Informed Consent (FPIC) for relevant stakeholders. Since RSPO certification started, the global certified area has increased from 125,000 ha in three countries in 2008, to 4.5 million ha in 21 countries in 2021 (RSPO, 2022). An important impact of certification is the increased productivity from certified plantations. The average yield of Certified Sustainable Palm Oil (CSPO) from RSPO-certified estates and mills is 4.5 MT/ha, compared with an average yield of 3.2 MT/ha for palm oil plantations in general (RSPO, 2022). Despite these positive impacts, the pace of deforestation has not been brought under control. Moreover, today the vast majority of palm oil is still sold without RSPO certification. The total production of RSPO-certified palm oil reported by members with palm oil estates and mill operations is 14.7 million tonnes, which represents 19% of the total global production of crude palm oil (RSPO, 2021). This gap between the potential for sustainable produced palm oil and the actual situation in practice is a critical environmental challenge.

1.2.2.A global value chain approach to sustainability governance

By using a Global Value Chain (GVC) approach this thesis aims to identify the key components along the different stages of production, in terms of chain structure, actors' positions, relationships, as well as their impacts on material and information flows in the global value chain of palm oil. The GVC concept is further elaborated in Section 5 of this Chapter. By using a GVC approach this study is able to deepen our understanding of the details of the palm oil value chain dynamics in both Thailand and Indonesia, and thereby to shed light on some of the constraints facing sustainability promotion. Constraints with respect to vertical integration in these countries when trying to supply the needed volumes of sustainable palm oil for a global

market, as well as constraints with respect to the knowledge transfers that would enable sustained behavioral change towards sustainability practices.

1.2.3. Importance of the local

A deeper understanding of the local production context and the upstream dynamics among market actors is extremely important when studying the challenges of applying global standards in specific local contexts and when designing sustainability targets and pathways for such situations (Bush & Oosterveer, 2015). The local context determines market actors' capacity to adapt to the specificity of the crop and shape the chain relationships accordingly, allowing for vertical integration or not. For instance, considering that the palm oil fruits, called Fresh Fruit Bunches (FFBs) need to be processed within 24 hours after harvesting, it is fundamental to study how the supply chain structure, and the relations within it, are shaped, and to what extent these local dynamics converge with a global certification framework like the RSPO and more in general, with sustainability initiatives.

1.2.4. The gap

This thesis aims to fill the gap on the implementation of institutional global frameworks in a local context, by exploring the role of knowledge transfer and learning in behavioral change for implementing sustainability practices. In fact, global sustainability initiatives tend to be evaluated in terms of their general performance and outcomes, with less attention being paid to the dynamics at play in the local context, and the internalization of their principles by local actors, such as local governments, manufactures and producers. However, these dynamics are a core factor when trying to explain the success or failure of such initiatives in different contexts and overlooking them may lead to resolving the sustainability challenge only on paper, but not in reality. In this thesis, I want to contribute to our understanding of the role of local informational and material flows embedded in the local value chain dynamics shaping behavioral change. In particular, this thesis applies different perspectives and approaches to

dissect different constraints that may interfere with the transfer of knowledge for behavioral change across the value chain. In turn, these dynamics may have impacts on the vertical integration of a sustainable global value chain, and more generally on the material and informational flows from the local to the global level. Considering these dynamics also poses the question whether standards should focus on standardized models, "*one size fits all*", or whether they should tailor standards to the specific local context. Context-specific (dis)enabling conditions include price making and transparency, market structures, chain structures, farming systems and settings, relationships, historical development of the sector, geographic distribution, and national policies and plans. Only by understanding these local specificities can we hope to leverage them towards the aims of a sustainability initiative. By exploring these dynamics and interactions, this thesis aims to interconnect the local, national and global levels. In particular, this thesis intends to provide a unique zoom-in and zoom-out perspective on the topic of sustainable supply chains, generating further understanding about global dynamics and drivers as well as about the specific local structures and relationships. The approach developed in this thesis can be visualized as an *Hourglass Framework* (See Figure 1.1).

This framework should be read from both two edges towards the center. The Chapters are arranged from top to down and along the way they explore the different levels: global, national, local. At the top of the hourglass is the global level with different actors involved in processes of developing the global sustainability framework of the RSPO. By moving towards the center of the hourglass, the different chapters take the top (global) level as a reference, and zoom-in on specific cases to explore how it works out in practice to implement a global standard like the RSPO within different upstream chain settings in Indonesia and Thailand (placed in the center of the figure as they represent the core of this thesis' focus). The zooming-in goes as detailed as is needed to study the role of upstream structures, relationships, and interactions between market actors. Seen from the bottom of the hourglass, the levels are repeated in the opposite

way and show how the thesis studies global drivers affecting national palm oil policies and standard implementation again reaching their effects at the center. The center of the figure represents the local context, were the interplay of the global-local nexus unleashes its potential but where missed opportunities are engendered. The arrows show how this thesis covers these three levels by addressing them in the different chapters and explores how they influence each other.

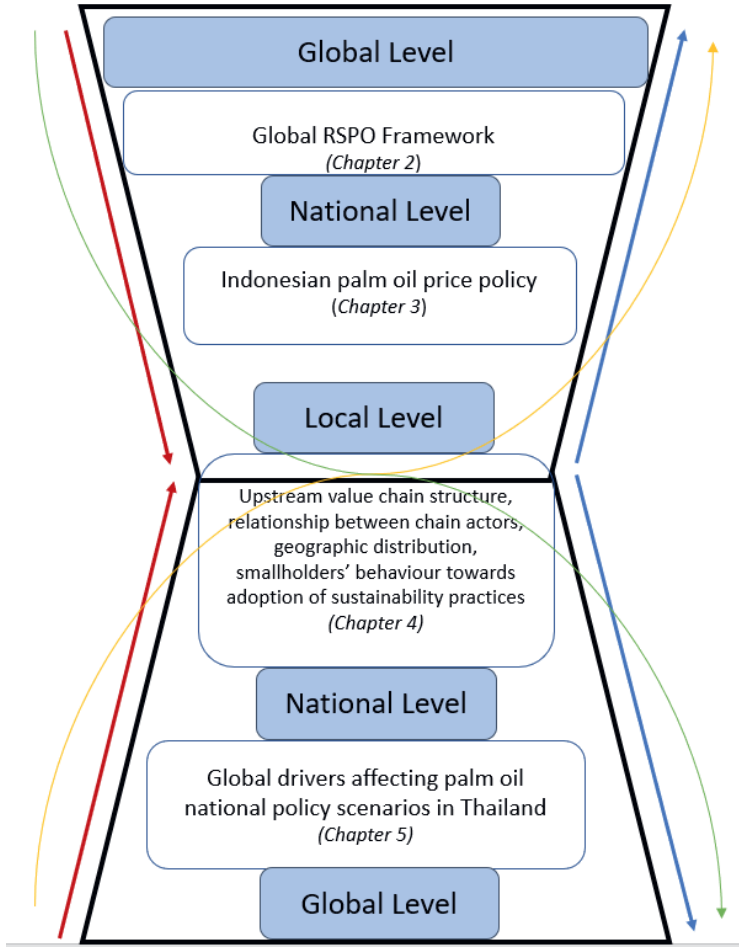

Figure 1.1: *The Hourglass Framework*

1.3. Research objectives

1.3.1. The research problem

Sustainability initiatives dealing with global supply chains, are instruments of global governance that, in order to work across different parts of the globe, require a simplified and standardized framework and operating model. Implementation and monitoring of such global standards are very often focused on performance measurements. However, the specifics of the context in which implementation takes place are often ignored as well as the extent to which implementers are affected by context related dynamics. Even though these instruments of global governance create a direct link between the global and the local levels that overcomes the need for national/local level policy and active engagement, also called the *global-local nexus,* there is no evidence that the first one is a comparatively advantageous approach, compared to the second one to reach vertical integration of materials and information flows in global value chains.

This thesis aims to contribute to the debate on this problem by understanding the role of the value chain structure in its upstream part, its context and related (market) dynamics in enabling vertical integration of material and informational flows when pursuing the sustainability of global value chains. Additionally, my aim is to also provide evidence about the way in which the specific upstream chain structure contributes to create a role for the producers (the expected implementers) in driving for sustainability. Finally, this thesis also aims to generate recommendations to national and local level policy makers for creating sustainable global value chains and what the role of the RSPO should be in this.

1.3.2. Aim of the thesis

The aim of this thesis is to investigate whether local dynamics of informational and material transfers in the palm oil value chain hinder the expansion of sustainability practices at the local upstream level.

In order to realize this aim, the thesis focuses on dynamics within the global palm oil value chain and in particular in what ways these dynamics impact the promotion of sustainability practices at the local level of oil palm cultivation. This section therefore further elaborates the role of global palm oil value chains in governing the palm oil sector and the importance of understanding the local dynamics of palm oil plantation management when promoting sustainability.

1.3.3. Research questions

As already mentioned, the main objective of this thesis is to study the upstream palm oil value chain and to explore how specific local contexts affect the translation of internationally agreed standards and frameworks into local context and dynamics. Furthermore, how the value chain structure and relationship between market actors may lead to challenges and gaps in the implementation of sustainability programs and initiatives.

The central research question of this thesis is: "*What is the role of local context and dynamics when implementing a global sustainability initiative in the palm oil sector and how can potential obstacles be addressed?*"

Accordingly, the thesis is guided by the following four specific research questions:

(1) Has the global RSPO standard contributed to vertical integration of the palm oil chain upstream in Thailand, allowing for material as well as informational flows downstream the certified chain, and to what extent are local dynamics taken into account in the RSPO framework?

(2) Can sustainability outcomes (including smallholders' behavior towards sustainability practices) be affected by the Indonesian upstream supply chain structure and dynamics?

(3) Does RSPO certification foster upstream learning to improve farming practices in Thailand and Indonesia?

(4) Can Thailand converge the national self-sufficiency plan for palm oil and its sustainability ambitions for oil palm production?

1.4. Theoretical Framework

In order to study the vertical integration of material and information flows in the context of global sustainable value chains in Thailand and Indonesia, this thesis applies contributions from three theoretical perspectives: 1) GVC analysis, 2) Social Learning, and 3) Informational Governance and Transparency.

1.4.1. GVC analysis

When studying the sustainability of global supply chains, commodity (Wallerstein, 1974; Hopkins and Wallerstein, 1986) and value chain (Gereffi 1994, 1999) theories provide a helpful framework for understanding the roles and power of market actors participating in a specific chain. Scholars distinguish between producer-driven and buyer-driven global value chains (GVCs) (Gereffi 2013; Gereffi et al. 2005). Global palm oil supply is considered a buyer-driven global value chain. Such buyer-driven global value chains are associated with power asymmetries within buyer-supplier interactions and the chain governance overall (Morrison et al. 2008), whereby leading firms exercise their power to seek economies of scale in a risky globalized and competitive market (Gibbon and Ponte 2005; Humphrey and Schmitz 2002). There is, however, also a mutual dependency between the producers and the buyers: the producers need market outlets that only certain companies can provide and the buyers require constant supply of good quality produce over the whole year. These goals can only be realized through vertical integration of material and information flows (Gereffi et al. 2005). Private sustainability governance initiatives are a tool for vertical integration but in order to succeed they require fitting into local embedded dynamics – also referred to as horizontal networks (Coe et al. 2008; Gereffi et al. 2005; Gibbon and Ponte 2005). However, these are often overlooked

when designing the actual implementation of global standards (Neilson and Pritchard 2009). A simple translation of global sustainability standards' requirements into local contexts is often not sufficient as it may create "missing links" (Oosterveer and Sonnenfeld, 2013).

This thesis makes use of the GVC theory to challenge the universal applicability of vertical integration in certified chains. I analyze actors' position in production and supply networks and their involvement in decision-making about the specifics of the material (product and production) requirements (Castells,1996). By going beyond the hierarchical integration (or vertical integration) alone, I intend to identify locally embedded dynamics and horizontal relationships between actors that influence the transactions of material and information flows from producers to consumers and vice versa. I aim to focus in particular on the relationships between actors in the upstream part of the global palm oil chain to analyze how material and information flows are affected. I also explore the role of the middlemen potentially disrupting the vertical integration (Bush and Oosterveer 2007), depending on their inclusion in certification frameworks or not. I analyze these dynamics by comparing certified and non-certified palm oil value chains and assessing whether there is a difference in terms of material and information flows and whether forms of power based on actors' position in the chain and proximity to valuable information or to the ones detaining that information in the chain, may influence knowledge transfer, the potential for learning and the price making process.

1.4.2. Social learning

Bandura (1977:39) defines the concept of social learning as learning through "casual or directed observation of behavior as it is performed by others in everyday situations". The environment around individuals is composed of other individuals and organized settings and institutions where both the learner and the surrounding environment affect each other through interactions (Lave and Wenger, 1991) by providing continuous feedback (Pahl-Wostl et al., 2008; Reed et al., 2010).

In the context of globalized value chains, more and more sustainability requirements are requested from producers by distant downstream chain actors and institutions (Bolwig et al., 2010). It is, therefore, important to understand whether actually a change in producer practices is triggered by sustainability initiatives or not in order to determine their success (Mancini et al., 2008; Martin et al., 2015).

In this thesis the social learning theory is used to understand whether social actors' capacity to change their practice through interactions is influenced by the specificity of a particular context (Schneider et al., 2009) rather than just by the amount of inputs (knowledge transfer) they receive from others (Glasser, 2009). Although knowledge transfer may take place in the form of content exchange like a technical training, it is not guaranteed that it is internalized to the extent that implementers are ready to transform the system they belong to, to change their beliefs and values, and to adopt different daily practices. The institutional framework influences the acquisition of knowledge by actors at different levels of the chain (Fromm, 2007; Gereffi, 1995) and this may occur as an act of imitation or as a process of 'learning together to manage together' (Tran et al., 2018). I intend to investigate upstream institutional arrangements in Thailand and Indonesia palm oil chains to assess under which conditions information and material flows are exchanged and whether this results in opportunities for social learning.

The concept of *social learning* is operationalized by analysing learning by *experience* (Pahl-Wostl, 2009; Pahl-Wostl et. al., 2007), and learning by *interaction* (Lundvall, 1992; Argyris, 1990; Forester, 1999; Grin and Hoppe, 1995; Grin and van de Graaf, 1996; Leeuwis, 2004; Leeuwis, 2000; Mendes Betim et al., 2018; Schön, 1983; Wals, 2011). Learning by experience is further conceptualized as learning *by doing*: experiencing (actions) and reflecting (on actions taken) (Arrow, 1962; Rosenberg, 1982) and learning *by deciding* (deciding on the next actions based on previous actions and their effects) (Kolb, 1984). The study additionally uses the concepts of single, double and triple-loop learning to assess whether the level of learning entails

one of the following changes identified by the literature: 1) from experiment-based practices to improvement of routines and performances; 2) transforming, innovating and creating forms of institutional interaction, in circumstances where not only new actions are taken but where also the assumptions behind those actions are new (Sol et al., 2013); 3) changes of the values, beliefs or norms that are behind operational assumptions and actions (Argyris, 2003; Keen et al., 2005; Pahl-Wostl et al., 2011).

1.4.3. Transparency – Informational Governance

Transparency thinking applied in research on sustainability has often focused on the information flow from implementers to consumers. The attention goes immediately to investigate to what extent implementers are actually following sustainable practices during their production processes (Gupta, Boas, & Oosterveer, 2020; Mol, 2010). Some scholars speak of "regulation by information" (Case, 2001; Florini, 2003; Tietenberg, 1998) and the power of inclusion/exclusion that sophisticated measurement and reporting tools and infrastructures, including auditing systems, may have at the disadvantage of those who lack the necessary skills (Bush, Toonen, Oosterveer, & Mol, 2013; Glin, Mol, Oosterveer, & Vodouhe, 2012; Haufler, 2010; Gulbrandsen, 2010).

One aspect that is less studied is the extent to which transparency is present in the relationships between market actors in the upstream value chain, and what consequences derive from more or less transparency in terms of the success of a sustainability initiative. In his key contribution to this debate, Mol claims that consumers' pressure towards producers is not necessarily the key driver for environmental impact (Mol, 2015). In the same vein, McCarthy raises the point that transparency governance instruments such as audits alone are not the answer to reveal the complex reality of power dynamics at different spatial, temporal, and jurisdictional scales on the ground (McCarthy, 2012). Imperfect information and unbalanced market power may

constitute a reality where sustainability standards have to be fulfilled without real buy-in from those who are supposed to be the implementers.

Mol introduces the concept of informational governance where information is a driver for change (Mol, 2008; Mol, 2006), and control over information is defined as crucial in contemporary environmental governance (Mol, 2010). Rather than studying what information flows go from upstream to downstream in value chains, we should study the transparency of information flows from downstream buyers to upstream producers. When assessing the success of a sustainability initiative, scholars need to give as much attention to studying producers' benefits as they give to studying the environmental impact, which seems generally to be more prominently looked at (e.g. Colchester, Sirait, & B Wijardjo, 2003; McCarthy, 2012). Additionally, studying the institutional structure of a sustainability initiative allows for understanding whether benefits are targeted for the implementers or not (Glover & Kusterer, 1990; Warning & Key, 2002; Raharja et al., 2020). The answer to this question affects producers' position towards the sustainable practices they are required to implement (Sawyer & Gomez, 2008).

In this respect, I look at the governance structure of market exchange (Williamson, 1985), and the related relationships between the producers and the first level processors in the specific context of a monopsony, and how in this case access to information has an impact on implementers' behavior (Sáenz-Segura, D'Haese, & Schipper, 2010). This thesis does this in the context of the upstream palm oil chain in Indonesia and its related price setting mechanism, to provide new insights in this ongoing debate in the scientific literature on the role of market price transparency in enabling successful sustainability initiatives (Slangen, Loucks, and Slangen, 2008; Rist, Feintrenie, and Levang, 2010; Cahyadi and Waibel, 2013; Key and Runsten, 1999).

1.5. Methodological Design and research methods

The main objective of this thesis is to deepen our understanding of the intersection between global-local in the context of global palm oil value chains with production sites in Indonesia and Thailand (see Figures 1.2 and 1.3 for the precise location of research within these two countries). This will allow us to identify whether possible gaps affect the ultimate goal of sustainable palm oil production. The decision of a comparative research methodology was based on the aim to verify whether the implementation of the RSPO certification in two different countries have similar results or not, and why. By using case studies this thesis provides a unique deep analysis of how local context and dynamics affect the implementation of a sustainable certification program and vertical integration.

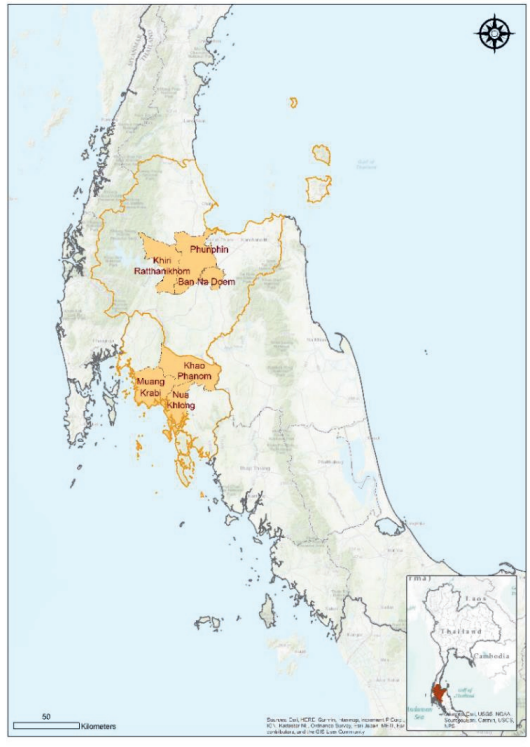

Figure 1.2: *Map of the research area in Thailand*

Figure 1.3: *Map of the research area in Indonesia*

The choice for Indonesia and Thailand as cases for this thesis is based on their differences and similarities. These countries have a different palm oil production history, they rank first and third in quantity of palm oil production respectively (Indexmundi, 2020a) and they have both been pioneering the implementation of the RSPO standard through multi-stakeholder projects. These features make them appropriate cases for comparison. Indonesia, the most important palm oil producing country and the largest global exporter, has a long history in palm oil production with the majority of smallholders working in schemes managed by companies (mills). These characteristics make Indonesia a good case to study vertical integration. Thailand has a more recent production history in oil palm cultivation and a lower productivity per hectare compared to Indonesia but with a high growth rate in palm oil production (the highest growth rate worldwide between 1999 and 2019: 10%/year) (Indexmundi, 2020a). Thailand is also a free market-based country, where 76 per cent of the land under oil palm cultivation is managed by independent smallholders (OAE, 2020; Teoh, 2010; World Bank & IFC, 2011). Therefore, Thailand appears to be a good case for comparison with the Indonesian palm oil value chain

structure and context. Despite Malaysia being the second largest producing country, and given that it is characterized by a similar scheme structure as Indonesia, to include Thailand next to Indonesia seems to be more suitable to answer our research questions and to draw general conclusions. The specificity of the Thai upstream palm oil chain, where intermediaries have a key role and producers do not have tight contracts with mills, allowed to answer RQ1 on the translation of global standards into local contexts and whether RSPO has contributed to vertical integration. The specific proximity and contractual agreements between producers and mills in Indonesia allowed to address RQ2 by investigating whether incentives such as price can affect the uptake of RSPO practices. The proximity between buyers (mills) and producers in Indonesia as opposed to the free and scattered upstream palm oil structure in Thailand, allowed to answer RQ3 by comparing how local institutional arrangements can affect knowledge transfer and social learning in the two countries. In addition, this allowed for testing the assumption that proximity between market actors leads to better learning of RSPO practices.

Additionally, the goals of the national palm oil policies in the two countries are different. In Indonesia production expansion is related to internal consumption and export. In Thailand, instead, government plans for expansion (up to 1.6 million hectares of oil palm by 2029 compared with 650,000 ha in 2011, (Yangdee, 2007) come from the political ambition to be independent from palm oil imports.

The Thai government wants to meet both the internal demand for cooking oil as well as for biodiesel to reduce its dependency on oil (Petchseechoung, 2017), but it has no ambitions to increase its exports. The specific challenges of this ambition triggered RQ4 which aims to study whether national plans for self-sufficiency and sustainability of palm oil can be achieved at the same time and what alternative pathways are available. For both countries the study has been focused on regions with the highest palm oil production as well as the longest standing history (Krabi and Surat Thani provinces for Thailand and Riau province for Indonesia). These are also

the regions where the pioneering RSPO projects were undertaken, to make sure this study could rely on relevant and available data, good respondents' experience and knowledge, and a good representation of the palm oil sector.

The choice of these two countries has also helped in terms of the generalization of findings, conclusions, and contributions to scientific debates. This thesis, by comparing such different palm oil chain structures, intends to highlight the pros and cons of different institutional upstream settings and to understand how they have a key role in the global RSPO standard having different impacts and challenges across different countries and contexts. More in general, the results of this thesis can be used to question and improve any standard or global sustainability initiative that is implemented in a range of different contexts, by looking at whether the latter resembles more the Indonesian or the Thai situation.

In order to do this, this thesis combines quantitative and qualitative data collection methods that were designed specifically for the four research questions in this study. Quantitative data have been collected through a cross-sectional survey with the four research questions in mind. Qualitative data have been designed to complement the understanding of the quantitative data and collected during multiple field studies, and is supported by data triangulation.

All four questions have been answered through the use of different specific case studies, appropriately chosen based on the different research questions, using different research methods.

(1) Primary data collection: primary data were collected through a large survey conducted among RSPO-certified and non-certified oil palm farmers. Additionally, in-depth interviews and focus group meetings were used to further understand the upstream structure of the supply chain in Indonesia and Thailand, the relationship between supply chain actors and the different perceptions and perspectives. Finally, participant

observation has also been fundamental to capture details in the local context that affect the implementation of global sustainability frameworks like the one promoted by the RSPO.

(2) Secondary data collection: secondary data includes literature review related to the topic of this thesis and specifically to the four research questions, published and unpublished reports describing the implementation of RSPO certification in the farmer groups selected as sub-cases, and publicly available data on palm oil and other vegetable oils production, consumption, trade in the past, present and future.

In each of the four research questions of this thesis, a different combination of research methods was applied (Table 1.3).

Table 1.3: *Methods used for each article*

Chapters	Survey	Interviews	Focus group	Time-series	Delphi method
2	●	●	●		
3	●	●	●	●	
4	●	●	●		
5					●

The first three chapters make use of a multiple-method approach; both quantitative and qualitative data were collected. Qualitative methods were used to get a better understanding of the context, on which to develop a questionnaire and identify the respondents in both countries. An initial set of in-depth interviews helped understanding the development of the RSPO implementation projects and get the list of RSPO producers delivering certified palm oil bunches to the mills involved in the projects. Further on, qualitative data from interviews and focus groups was generated to corroborate and triangulate the quantitative data collected through the survey, in order to get a clearer picture of the context dynamics.

The same survey was conducted among oil palm producers in Thailand and Indonesia with different individual profiles - independent, included in a scheme, certified and non-certified - in order to allow for comparison and answering the four research questions. Responses were analyzed through STATA software. A set of questions was used to gather quantitative data to quantify trends in sales. By assessing which market outlets farmers were choosing, it was possible to understand how independent economic agents react to the RSPO standard, whether the implementation of the RSPO certification program had any influence on where they sell their FFBs, which in turn would affect the vertical integration of the RSPO-certified value chain (RQ1). Questions about producers' relationship with their buyer (mill) were specifically targeted to complement the methodology for answering RQ2 by providing quantitative data on producers' perspective about their power position, dependency, access to input and trust in relation to mill and cooperative. In addition, descriptive statistics and regression analyses were used to understand the level of knowledge acquired (learning) based on a set of elements including farming practices, harvesting and post-harvesting practices, taking the RSPO-defined Best Management Practices (BMP) as the reference standard (RQ3).

Qualitative data (generated through semi-structured interviews) was used to understand the origin of ramps (middlemen) in Thailand, their role in the upstream value chain and the level of dependency of farmers from this upstream part of the value chain. Additional semi-structured interviews were conducted with other key informants involved in the process of RSPO certification, to get a better perspective on the project features and its challenges to complement the official and grey literature (RQ1). Semi-structured interviews with various stakeholders were conducted to gather broad knowledge and a range of different perspectives on the contractual agreements between the producers and the mills, the price making process and the transparency in it (RQ2). Finally, semi-structured interviews were held with representatives of the sector (farmers, ramp owners, management of mills, a palm oil refinery) and stakeholders

in Thailand and Indonesia to gather additional perspectives on the type of knowledge shared during the different activities performed along the production process (from seed to sale) and complement the quantitative data. By studying the context and interactions between actors, we assessed the opportunities for (social) learning within the RSPO-certified value chains in Indonesia and Thailand (RQ3).

Focus groups were useful to gather respondents' perspectives on the upstream dynamics of the RSPO implementation. This method was used because it created a setting in which participants could feel relaxed (usually one respondent's home), and where it was possible to gather information from different sector representatives or multiple individuals from a household.

A fine-grained dataset (time-series) of the monthly farm gate prices paid by the mill to the group, for selected periods between 2002 and 2013, was used to analyse price trends, which were then compared with international prices for the same period retrieved from Indexmundi (2014). Data was used to describe the price trends over time and contrast the pre- and post-RSPO-certification price data to calculate whether the price farmers received was more favourable when participating in the RSPO program (RQ2).

Participant observation in Thailand and Indonesia (for a total period of around six months of field work) complemented this study by providing a strong contribution to the data analysis; by travelling from one respondent to the other one I got to understand the geographical distribution of ramps and producers and activities such as FFB sale and grading (RQ1, RQ2, RQ3, RQ4). Triangulation was applied at different stages of the data collection to contextualize and validate data for all RQs.

To answer RQ4, explorative scenarios and the Delphi method were used. Secondary as well as primary data (collected for RQ1 and RQ3) about palm oil production in Thailand, Thai palm oil policy and the socio-environmental impacts were used to map the present situation (current

supply chain, value chain actors, value chain dynamics, waste and value added) as the basis for designing a desired situation. A literature review on the history of palm oil in Thailand and policy trends was used to understand the historical and current development of the palm oil sector in the country and identify lessons learned from the palm oil expansion process in Thailand so far. Literature review was also used to identify global drivers that could affect these explorative policy scenarios.

From the mapping of the current state of the palm oil sector, key characteristics affecting sustainability in the Thai palm oil sector were identified at farm, national and international levels to provide the basis for building explorative policy scenarios. This also allowed me to understand the gap between the current state and the aimed outcome of converging domestic palm oil demand and sustainability aims, and through which policy pathways this outcome could be made achievable. The Thai government target for self-sufficiency was used as the baseline scenario.

The key method for answering RQ4 is the Delphi method. This method was used as a tool to facilitate forecasting by collecting experts' opinions in an iterative and anonymous manner (two round-methodology). The experts validated assumptions, key characteristics of the Thai palm oil sector and its challenges, and global drivers affecting the Thai policy, which allowed to refine the initial explorative scenarios (Van Ittersum, Rabbinge and Van Latensteijn, 1998) with the final goal of answering the question whether the palm oil sector in Thailand can reach its target of national self-sufficiency without foregoing its commitments to sustainability by 2050.

1.6. Outline of the thesis

This thesis consists of six chapters, interconnected as described in Figure 1.4. *Chapter 1* provides an introduction to the main challenges of the palm oil value chain and its sustainability,

the RSPO certification program, the scope of the thesis, a justification of the case studies in Indonesia and Thailand, the research questions and the research methods applied, and an intro to the theoretical framework applied.

Chapter 2 analyses the local-global governance nexus in the palm oil chain. It studies the implementation of the global RSPO certification requirements in the context of the palm oil production in Thailand and the role of ramps (intermediaries) to find potential missing links in the process of translating globally agreed environmental standards into the upstream production context.

Chapter 3 assesses how transparency in management and price setting affects smallholders' adoption of sustainability practices by investigating the relationship between RSPO-certified oil palm producers and the first level processors.

Chapter 4 provides an empirical understanding on how different upstream chain contexts and actor relationships affect knowledge transfers, as well as the potential for knowledge to evolve into learning about sustainable palm oil production among oil palm farmers in Indonesia and Thailand.

Chapter 5 explores four different policy scenarios for Thailand in 2050 to understand the gap between the current state of the national palm oil sector and the desired state of converging domestic palm oil self-sufficiency policy with sustainability. Additionally, it discusses through what policy pathways this outcome would be achievable.

The objective of this study is to feed the debate on the sustainability of the Thai palm oil sector by identifying different challenges and opportunities based on the current state. We draw explorative scenarios on the basis of 1) the characteristics and challenges of the current state of the palm oil sector in Thailand, 2) the global drivers, and 3) the understanding of key local stakeholders.

Chapter 6 discusses the findings collected in this thesis and presents the conclusions by answering the different RQs. It provides a summary of the key findings from the four empirical chapters and offers reflections on the main gaps between a globally developed standard and its actual fit into the local context. Finally, it presents several policy recommendations for an improvement of the palm oil value chain's sustainability, the internal and external validity of this research study, and identifies needs for further research.

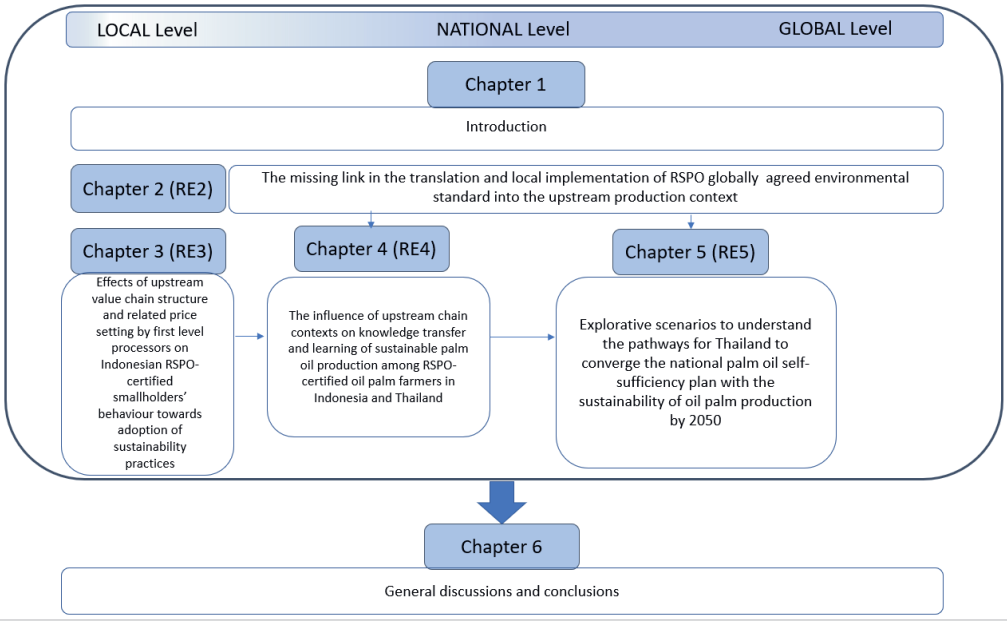

Figure 1.4: *Interconnection between Chapters*

Chapter 2

Breaching the Black Box: the Role of Ramps in Thai Sustainable Palm Oil Certification

Abstract: Certification of sustainable palm oil as organised through the Round Table on Sustainable Palm Oil is based on a simplified understanding of the global palm oil value chain—according to which instructions about production practices can be directly translated from the palm oil mill to the primary producer. The reality of palm oil provision is much more complex than this as is shown in the case of Thailand. On the basis of qualitative field study in Southern Thailand this paper clarifies that intermediary stages, such as the collection of oil palm fruit bunches at the ramp, play a key role in the organisation of the chain. The fluidity and complexity of the palm oil flow at the local level complicates the promotion of sustainability through certification. Global and national stakeholders, such as processing and trading firms, NGOs and national governments, should therefore open this black box of local dynamics to more effectively contribute to sustainability in palm oil supply.

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2.1. Introduction

Consumers and Non-Governmental Organizations (NGOs) are increasingly critical about the environmental and social impacts of palm oil production. New governance mechanisms, such as palm oil certification schemes, have been designed to enable the provision of responsible and sustainable palm oil and compliance to these schemes by producers is expected to increase the credibility of their environmental performance and reduce consumer concerns.

One palm oil certification scheme is developed by the Round Table for Sustainable Palm Oil (RSPO). The RSPO is a non-profit organization created in 2004 to promote sustainable palm oil and a total of 47 organizations – representing different categories of stakeholders in the palm oil industry such as growers, processors, manufacturers, retailers, banks and investors, environmental NGOs and social/development NGOs (RSPO 2013b) – joined the organization with the aim to develop and implement standards for sustainable palm oil and to address concerns for people, planet and prosperity in the production and use of palm oil. According to RSPO, their governance structure ensures the '*representation of all stakeholders throughout the entire supply chain'.*[11] By directly involving stakeholders, in the development of their certification scheme, the RSPO aimed at maximizing credibility of and compliance with sustainable palm oil production. Today, RSPO certification is the most widespread international palm oil certification scheme. The scheme is based on eight principles – each further defined by one or several criteria – that are translated into the local context by national interpretation working-groups.[2] The RSPO seems to assume that all producers have direct access to global markets. However, this view does not necessarily fit reality everywhere, as it ignores intermediaries, such as middlemen, who link local producers with the global market. This paper argues that such intermediaries should not be ignored when promoting sustainable palm oil

[1] The seat of the association is in Zurich, Switzerland, the Secretariat is based in Kuala Lumpur with a RSPO Liaison office in Jakarta (http://www.rspo.org/en/history).

[2] The national interpretation working group is composed of self-selected representatives from the aforementioned categories of interest, plus "*relevant government representatives*" and technical experts.

production and especially not when global demand are translated into local production requirements through certification schemes.

The *ramps* in Thailand form one example of such intermediaries. Ramps are collection points where fresh fruit bunches (FFBs) from different smallholder oil palm producers are collected, purchased and subsequently sold to the mills. The name *ramp* is derived from the way FFBs are weighed; producers bring FFBs with their vehicle,[3] and go up a raised structure locally called a ramp. Ramps not only collect FFBs but are also involved in supporting production and harvesting among smallholders. Such intermediaries are important at the local level but they are not really included in governing the palm oil supply chain. This paper analyses the local-global governance nexus in the palm oil chain, focusing on global RSPO certification requirements, their application at the level of palm oil production in Thailand and the role of ramps (intermediaries) therein. The role of locally embedded actors is analyzed to identify potential missing links in the process of translating globally agreed environmental standards into the local production context. Ultimately, we would like to answer the question whether the internationally agreed upon RSPO standard has contributed to the vertical integration of the palm oil chain upstream in Thailand, allowing for material as well as information flows downstream the certified chain, and the extend to which local dynamics are taken into account and included in the RSPO framework.

The paper is structured as follows. In Section 2 we present the theoretical framework we apply in this study. Section 3 outlines the characteristics of the Thai palm oil sector and local RSPO initiatives. Section 4 presents the materials and methods used in the research. Sections 5 and 6 present the empirical findings on the role of middlemen in RSPO-certified value chains in Thailand, while conclusions are provided in Section 7.

[3] Ranging from a simple motorbike with a large basket on the side or the back, to pick-up trucks (Source: personal observation).

2.2. Theoretical framework

Palm oil production can be understood as a global value chain, a concept extensively discussed in the literature. Value chain studies (Gereffi 1994, 1999) with their origins in the commodity chain analysis of Wallerstein (1974) and Hopkins (1986) intend to analyse the roles played by private companies in steering the global commodity markets. This literature focuses on questions of economic power, such as the distinction between producer-driven and buyer-driven global value chains (GVCs) (Gereffi, 1994).

Power asymmetries, strongly associated with buyer-supplier interactions, have been understood as a crucial element in GVC governance, (Morrison et al. 2008). On the one hand, leading firms are identified as powerful actors in GVCs, seeking economies of scale to fight competitors in price and volume in a globalized risky market (Gibbon and Ponte 2005; Humphrey and Schmitz 2002). On the other hand, product diversification and branding increase the opportunities for rent seekers to capitalize on the fragmentation of GVCs. Value addition is shifting from upstream to downstream in the chain, hand in hand with a skewed yet growing mutual dependency: producers need the market outlets offered by large leading firms, but these require an assured supply of quality produce—typically leading to increased vertical integration (Gereffi et al. 2005). Increased vertical integration is associated with improved material and information flows. Private governance initiatives, such as certification schemes, are used to harness material and information flows. This analysis, however, largely ignores the increasing role of non-economic actors, such as NGOs and consumers, in steering the global chain, neither is much attention paid to how global dynamics are embedded in the specific local context.

Network (society) theories go beyond hierarchical economic dynamics of the GVC framework and points at external, yet influential, actors who affect the transfer of matter and information from producers to consumers and vice versa (Coe et al. 2008; Gereffi et al. 2005; Gibbon and Ponte 2005). Castells (1996) suggests that the actors' position in production and supply

networks and their involvement in decision-making on the specifics of the material (product and production) standards and the associated material and information flows, creates a new form of power (Castells 2009). This 'networking power' influences who is included in the network and who is excluded from it. In global supply chains, as that of palm oil, such networking power is not only in the hands of large companies but also in those of local traders, or middlemen. These middlemen are often ignored in GVC analysis when assessing the relations between producers and buyers. They are, however, essential actors without whom the link between spatially diffused small-scale producers and distant concentrated large-scale processors would be mutilated. Middlemen are the "missing link" (Bush and Oosterveer 2007) or black box in GVC (See Figure 2.1 for the case of palm oil). Middlemen affect the ways in which value chains function (Goodman and Dupuis, (2002) and how (sustainability) standards are implemented.

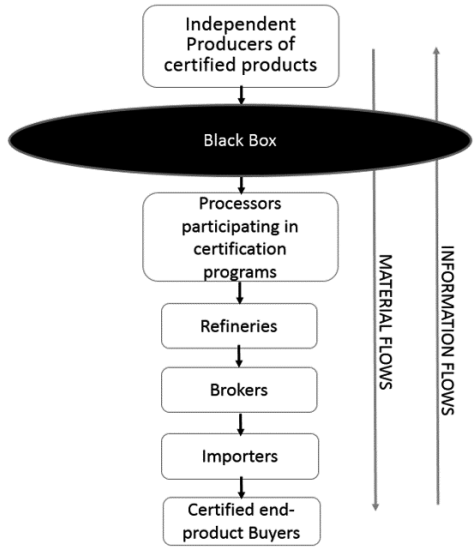


Figure 2.1: *Black box in certified global palm oil value chains*

Transposing global sustainability standards into local contexts is not the mere translation of requirements for compliance (Oosterveer and Sonnenfeld 2013) but requires an active

intervention targeting the specificities of the chain at different levels, including addressing the existence of possible black boxes at the local level. Ignoring or rejecting such local network dynamics may limit the scope of action and the expansion of certification programs but considering these may increase and profit in particular from convergence between formal (GVC) and informal (horizontal) flows of certification-relevant information.

When in a certified palm oil value chain vertical integration is compromised by the presence of a black box, the material flows from upstream to downstream and the information flows from downstream to upstream are also being affected. Opening up this black box and understanding local dynamics between smallholder producers and middlemen is essential when promoting sustainable palm oil production globally. The case of Thailand is particularly illustrative in this respect as shown below.

2.3. Thai palm oil sector and RSPO

Palm oil represents 34 percent of the global production of vegetable oils, cultivated on less than five percent of the total area under oil crops (RSPO 2007). This is due to oil palm's high oil content and its relatively higher yield in comparison with other oil crops (Mattsson et al. 2000). Globally, around 3 million smallholder households take part in oil palm cultivation (World Bank and IFC 2011). Palm oil is an essential component of the diet for many people worldwide, including in transition economies such as China, India and Brazil (Fitzherbert et al., 2008). About 75 percent of palm oil produced globally is traded internationally (World Bank and IFC 2011) and after Indonesia and Malaysia, Thailand is ranked as third exporter, with 2.9 percent of global production (Colchester et al. 2011).

Most palm oil produced in Thailand is destined to the domestic market (Colchester et al. 2011). In 2011, out of a total production of almost 2 million tons of crude palm oil, Thailand exported less than 0.4 million tons, another 0.4 million tons was destined to biodiesel, while the largest

part was used for domestic food consumption (JIRCAS 2014; OAE 2012). The Ministry of Agriculture and Cooperatives has formulated a plan to increase the oil palm plantation area from 650,000 hectares in 2011 to 1.6 million hectares by 2029 (Yangdee 2007). Yet, the area under oil palm plantation may increase even further, given the rising trend in domestic palm oil consumption (Unjan et al. 2013). Between 2008 and 2014 Thailand faced the highest growth rate of palm oil production worldwide (Indexmundi 2014), while the oil palm area expanded rapidly (29 percent between 2000 and 2009, and another 18 percent between 2009 and 2011). Thai fresh fruit bunch (FFB) production grew by 2,6 million tonnes between 2009 and 2011 (32 percent).

The reasons for this recent rise in production levels are partially historic, partially geographic. The palm oil industry only started developing in Thailand during the late 1960s, while Malaysia's palm oil sector dates back to 1917. According to the owner of the Southern Palm Oil mill in Surat Thani '*Only 20 years ago oil palm production was not famous in Thailand. I had to guarantee the bank for individual farmers who wanted to start oil palm production at that time, which was not seen as a good and economically viable activity*' (SPO, 24/07/2013). Also, compared to Malaysia and Indonesia, Thailand is disadvantaged by its lower rainfall and soil fertility, and by the presence of low-quality oil palm varieties planted on small-scale plantations in the past—responsible for one third of Thai palm oil production today. As a consequence the average palm oil yield in Thailand is lower than in Indonesia, while the production costs are higher, particularly in the north of the country (Yangdee 2011).

At present 90 percent of Thai oil palm plantations are in the south, with the provinces of Krabi, Surat Thani and Chunphorn accounting for 72 percent of the total planted area (AOE, 2008 in Colchester et al., 2011). In 2011 Surat Thani produced 2.87 million tonnes FFB, closely followed by Krabi with a production of 2.86 million tonnes, both producing more than 26 percent of the total Thai FFB production (OAE 2012).

Around 120.000 farmers are involved in Thai oil palm production, and smallholders (owning less than 50 ha) cultivate over 76 percent of the total area. The average production area for smallholders is around 4 ha, while large plantations count on average almost 800 ha (AOE, 2008 in Colchester et al., 2011). The harvest occurs approximately every 20 days. The majority of the farmers have no formal contract with a particular mill, so they are free to sell to anyone, including to intermediaries. Important intermediaries in Thai palm oil supply chains are called ramps as these are the collection points where smallholders deliver their FFBs. Ramps collect the harvests from several smallholders and then transport the FFBs on large trucks to the oil crushing mills. This practice allows ramp owners to bargain on the price with the mills, given the high volume delivered. Additionally, ramps can facilitate fast delivery which is important because FFBs have to be processed within 24 hours after harvesting in order to produce good quality crude palm oil (CPO) (Tagoe et al. 2012).

Thailand is a pioneer in RSPO certification for independent smallholders. In 2012, Thailand was the first country to have independent smallholders producing RSPO-certified palm oil: 412 smallholders were certified, covering almost 3000 ha of oil palm plantation (RSPO 2012). Certification of Thai smallholders was initiated in 2010, when the German Federal Ministry of Environment, Nature Conservation and Nuclear Safety (BMU) commissioned a project on Sustainable Palm Oil production for Bio-energy, under the International Climate Protection Initiative. This project was implemented by GIZ together with the Thai government Office of Agricultural Economics (OAE) and other partner institutions. A “Three I-steps” strategy led the project: 1) Increase productivity through technical support and input cost reduction; 2) Increase FFBs quality through premium price linked to the grading system, and 3) Internalize sustainability through Best Management Practices (BMPs) and long term relationships between smallholders and mills. Besides organizing, building capacity and increasing farmers’ yield, the project aimed at getting the participants RSPO certified, and strengthening farmer-mill

relations, to ensure that the outcomes would survive beyond the end of the project (GIZ, 2014). Due to the limited demand for sustainable palm oil it is not possible to apply traceability tools, such as Identity Preserved (IP) and Segregated (S) schemes, to separate RSPO-certified from non-RSPO-certified palm oil throughout the chain. In Thailand, mills opt for the Mass Balance (MB)[4] and Book & Claim (B&C)[5] schemes in RSPO certification. Under the MB and B&C systems, RSPO-certified palm oil is administratively monitored but not physically separated throughout the supply chain (RSPO 2008a, 2008b). These schemes allow for mixing of RSPO and non-RSPO-certified palm oil, and only guarantee that the total volume of certified palm oil is registered and assured. Ten mills were initially selected for this GIZ-RSPO project, based on criteria such as mill capacity, relation of the mill with smallholders, approach of the managerial staff towards RSPO, and export orientation. Mills had to provide farmers participating in the project with: 1) input support through a 20 percent discount on the costs of fertilizer and seedlings; 2) premium price based on quality; 3) technical support; and 4) access to Empty Fruit Bunches (EFBs) for free to use as organic fertilizer, based on the amount of FFBs sold to the mill (GIZ, 2014). After assessing the motivation of the mills to participate in the project four mills and the Aoluek cooperative were selected. The four mills participating in the program were: United Palm Oil and Univanich in Krabi province, Southern Palm Oil in Surat Thani province and Suksomboon Palm Oil in Chomburi province (GIZ, 2012). With the assistance of these mills, GIZ was able to obtain the first RSPO certification of independent producers. In total, around 500 farmers were certified (GIZ, 2014).[6]

[4] *"The mass balance model is constructed in such a way that volumes of RSPO certified product shipped, will never exceed volumes received by the end user"*
(http://www.rspo.org/file/fact_sheet_mass_balance_240908[1].pdf).

[5] The B&C system assigns credits equivalent to the volumes of Crude Palm Oil produced by the mills participating in the RSPO project which are sold to a manufacturer, independently from what is actually supplied (http://www.rspo.org/file/fact_sheet_-_mass_balance_240908[1].pdf.

[6] The national interpretation for Thai smallholders is developed by the Thai National Interpretation Working group (Thai NI WG), composed of stakeholders and NGOs, and approved by the RSPO in order to help the transition (RSPO, 2012).

2.4. Materials and methods

Out of the four mills involved in the RSPO-GIZ project, we selected the three located in the provinces of Surat Thani and Krabi – provinces jointly responsible for over half of the total production of palm oil in Thailand – as case studies. For each case we applied a multi-method research approach to study the palm oil supply chain from primary producers to mills. Triangulation through the application of different research methods allowed for deepening the understanding of the findings, contextualizing and validating them. We used qualitative methods to understand the context, develop a questionnaire and identify the respondents: in 2012, we conducted interviews with United Palm Oil and Univanich in Krabi province, and with Southern Palm Oil in Surat Thani province, to understand the development of the RSPO implementation project and to get the list of RSPO producers selling certified oil palm bunches to these mills. We also interviewed producers in the process of certification, one GAP certified farmer and one government officer of the department of agriculture responsible for implementing GAP in Surat Thani province. Next we collected survey data on palm oil primary producers registered by the mills Southern Palm Oil and United Palm Oil as RSPO certified or in the process of RSPO certification to quantify trends in sales. In 2014 and 2015 we conducted 17 semi-structured interviews with ramp owners (10), mills' management staff: United Palm Oil, Univanich and Aoluek cooperative in Krabi province, Southern Palm Oil in Surat Thani province) and other key informants involved in the settlement of RSPO certification, namely GIZ (2) and one Prince of Songkhla University representative. We also conducted one household-based interview with a RSPO producer who had followed training courses from Prince of Songkhla University and was applying for RSPO certification. Participant observation complemented this study. Finally, we obtained information through official and grey literature (i.e. RSPO-GIZ project related reports and training material brochures). We selected the Southern Palm Oil (SPO) mill in Surat Thani and the United Palm Oil (UPO) mill in Krabi to

analyse the changes after introducing RSPO-certification in a vertically integrated market, to analyse how independent economic agents react to the RSPO standard, and what this implies for their sale of FFBs. The Univanich mill in Surat Thani was included through several interviews with informants but not in our survey. In total, 270 farmers were interviewed: 101 RSPO-certified farmers who were trained during the GIZ project and 18 farmers who joined the certification scheme later on were randomly selected from the mills lists; and 151 non-RSPO-certified farmers were randomly selected from neighboring areas. Besides, 10 ramps in the same area were identified and the owners were interviewed. The owners of four of these ramps were also RSPO-certified oil palm producers.

2.5. Ramps as central node in Thai global value chains

Ramps are central in Thailand's palm oil supply chain. Vehicles deliver FFBs at the ramp and this ramp is connected with a balance, which in most cases is in turn linked to a computer inside an office, where a person records the weight of the vehicle transporting the FFBs. The vehicle then goes to another area, where the FFBs are offloaded, examined and selected according to quality features and other determinants (bunch size, ripeness of the fruit, level of moisture, and length of the peduncle). FFBs that do not comply with the minimum standards required by mills are rejected and placed back on the vehicle.[7] Once the FFBs have been selected, the vehicle goes back on top of the ramp to establish the difference in weight, so that the amount of money corresponding to the specific weight and product quality of the FFBs can be calculated.

Initially, some wealthier oil palm producers developed the ramps. Smaller producers did not have a truck large enough to transport all their FFBs to the mill, while others did not have enough produce to make a trip to the mill worth the expenses. Some entrepreneurs saw a

[7] This quality check is mostly conducted only for occasional customers, rather than with the regular ones (Source: interviews March 2014).

business opportunity and started offering transportation services after collecting FFBs from different producers at one locality. Over the years such collection points progressively spread in Surat Thani and Krabi provinces and today every village in the palm producing area hosts at least one ramp. Opening a ramp does not require an official license, but only a registration by the tax office. Today ramps have diversified and provide also other services such as pruning, fertilizing and harvesting.

Ramp staff is organized and trained by the ramp owners. Depending on the size of the business ramps use other workers than family members (in the study area often migrant workers from Myanmar). Workers get trained by ramp owners in FFB selection and, in case the ramp is providing other services, also in pruning, fertilizing, weeding, planting, and most frequently in harvesting. The wealthier the ramp, the larger the range of services offered to customers, as well as the number of employees involved in these activities. Every additional service a ramp gives to producers strengthens their relationship and secures the supply of FFBs. In the words of a ramp owner '*most of the people I provide planting services for, afterwards sell their FFBs to me*' (ramp8, 16/03/2014).

This way, farmers do not only have easy access to a range of services linked to oil palm cultivation but they do not need to pay for them prior to their FFBs sale either. When the sale takes place the costs of services and inputs are deducted. The ramp represents an easy-to-reach and timesaving creditor, free of interest for smaller farmers. Moreover, ramps may offer monetary loans and farmers may even occasionally ask for a guarantee from the ramp when applying for a bank loan (ramp1, 17/03/2014). Credit is given in small amounts, ranging between 1500-3000 baht (USD 50-100), and only applies to regular customers. Occasional customers are not considered eligible for credit, since they have a high likelihood of disappearing without paying their debts. Some ramps that previously experienced this have become stricter on their credit policy, refining candidate selection (ramp6, 21/03/2014, ramp5,

21/03/2014). Among regular customers, the ones requiring services like planting, fertilizing, pruning and harvesting, are preferred most by ramps as credit clients, as their already embedded relation gets further strengthened (personal observation; interviews; GIZ, 2014). Compared to other creditors and to the mills, ramps that offer harvesting services can more easily provide their customers with credit facilities, because they have a guaranteed collateral that prevents debtors from defaulting: the harvested FFBs (ramp9, 17/3/2014). Through this credit policy, producers are tied not only to a buyer, but also to a creditor, a technical assistant and a service provider.

Ramps combine many different roles in one and this cannot be easily abandoned or disentangled. Because of the dominance of ramps, as the centre of local horizontal networks, vertical integration in the supply chain is absent and material as well as information flows are disrupted. As a consequence, the information producers receive is determined by their relationship with the ramp to which they sell directly or indirectly, through harvesting teams (see Figure 2.2). The linearity of the chain is broken by a disruption through horizontal networks composed of locally embedded relationships. Material and information flows pass through these horizontal networks and their continuity is therefore affected.

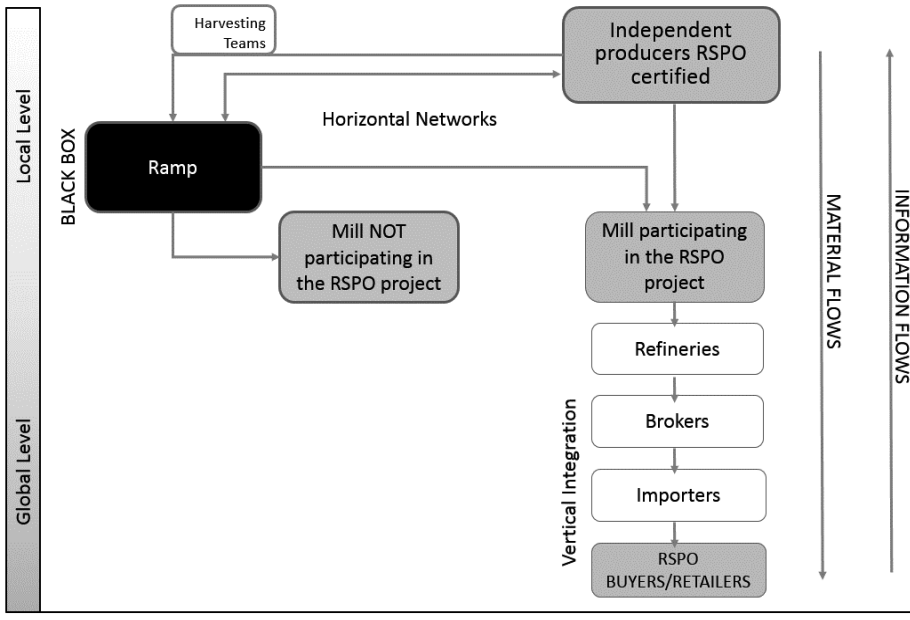


Figure 2.2: *Material and information flows and ramps in Thai palm oil supply chains*

When a ramp is established, village networks, usually composed of and supported by family relatives of the owner, facilitate the constitution of the first bulk of clients. These networks are responsible for establishing embeddedness and they break this when a farmer moves to another ramp: '20 percent of my customers move from a ramp to another one when their relatives open a new ramp, and they tell me they want to support their relatives' ramp' (ramp10, 16/03/2014). Secondly, recognition of a ramp by customers is related to long-standing village or business networks, or to local political positions of ramps owners (e.g. being the present or former head of the village). Embeddedness becomes increasingly important when ramps spread in number and their competition intensifies. 'Being well known helps in the business. I use the name of my husband for the ramp because everyone knows his name here and it's easier for the business' (ramp3, 20-03-2014). Being part of the rubber network (rubber was the dominant tree crop in the South of Thailand until the spreading of oil palm) or having a fertilizer shop, are other examples of locally networked positions that increase a ramp owner's access to a wide and reliable clientele.

According to ramp owners a way of creating embeddedness is offering a large range of services linked to oil palm cultivation (ramp8, 16/03/2014, ramp7, 19/03/2014, ramp10, 16/03/2014) and making customers confident that the scale is well-calibrated (ramp2, 19/03/2014, ramp6, 21/03/2014), or even giving a New Year's present (ramp1, 17/03/2014). Larger and longer established ramps tend to have comparatively higher amounts of regular customers. Ramps with the highest number of harvest workers are most likely able to cover a larger area and have a larger network of customers. For instance, for a ramp with 5 harvesting teams, in business since 5-6 years,70-80 percent of the customers have been permanent since the start-up (see Table 2.1).

***Table 2.1:**: Overview Ramps sample*

Ramp	Province	Services provided	Years in business	Regular/long-term customers	Total customers	RSPO customers
1	Surat Thani	5 Harvesting teams; pruning, fertilizing, credit	5-6	100 [a]	100	-
2	Krabi	N.A. [b]	0-1	10	20	-
3	Krabi	1 Harvesting team, pruning, fertilizing	3 [c]	30	30	2-3
4	Surat Thani	1 Harvesting team, pruning, fertilizing, transportation, credit	9 [d]	20-30	200-300	-
5	Krabi	Transportation, credit	1	20	50	-
6	Krabi	Transportation, credit	15	100	100	-
7	Krabi	2 harvesting teams, credit	15	10	100	6-7
8	Surat Thani	1 Harvesting team, planting/replanting, credit	10	90 [e]	90	11
9[f]	Surat Thani	1 Harvesting team, pruning, fertilizing, credit	20	50 [g]	70	14
10	Surat Thani	1 Harvesting, pruning, fertilizing, credit, transport of seedlings from the mill for customers	10	48	60	-

[a] 70-80 percent are customers since the start-up; [b] Due to the early age, this ramp has not established a harvesting team yet, but is planning to do very soon; [c] Pre-existing ramp for 3 years; [d] Pre-existing ramp for 10 years; [e] 78 percent receive harvesting service; [f] The owner owns 2 ramps; [g] 100 percent receive harvesting service.

Tailor-made approaches from ramp staff may further affect producer-embeddedness. For instance, the owner of a ramp selling to Univanich and in business since 15 years, explained how she is keeping track of customers' harvest schedules, calling them for harvesting arrangements every two weeks, in order to make sure her supply is guaranteed. Some producers do not fully trust the accuracy of the ramps in calculating the weight of their FFBs or in judging the FFBs quality and in determining the final price. However, the proximity and personal relationship with the owners of ramps make them easier-to monitor, when compared with the bigger scale and the more formal management style of mills. '*I sometimes let farmers take the weight by themselves, in order to show them that I am not cheating. I treat them like family*!' – states a ramp owner with 15 years of experience (ramp6, 21/03/2014). From their side, customers appreciate it when ramp owners show trust. For instance when, in light of past performance, the time spent for bunch selection is shortened, or when they receive a slightly higher price than the one posted in front of the ramp. '*In this way, we may lose some cents, sometimes, but we make sure the supply is constant!*' (ramp4, 16/03/2014).

2.6. A black box within the Thai certified global value chain

Black boxes alter the linearity of a value chain through interactions between chain actors in horizontal networks. The fragmented nature of the palm oil market in Southern Thailand represents an obstacle for mills to consolidate trusting relationships with smallholders. Also, the high transaction costs involved make mills dependent on ramps, as they rely on small-scale producers when trying to get their required supply. Frequent and constant flows of palm oil require the involvement of ramps because they assemble enough FFBs to fill a container truck and make the first selection of the produce.

Although all three mills that are part of this study would prefer to deal directly with individual farmers, they cannot deny the importance of ramps in supplying FFBs from small-scale

producers. Even if these mills offer discounts for seedlings and fertilizers or organize short training courses to farmers, there is no obligation for the producers to sell their FFBs solely to them. The Southern Palm Oil (SPO) mill, established in 1993, illustrates these erratic relationships. The company management decided after 18 years of contract farming to shift to "on-the-spot" purchasing because they realized that farmers lack reliability and sell to the most generous buyer, regardless of contract (SPO, 24/07/2013). As 50-60 percent of the harvesting teams belong to ramps, the plantation owners using services from ramps are most likely sell their FFBs to these ramps (SPO, 19/03/2014). In addition, there is overcapacity in palm oil milling. As one manager of Univanich states: '(this milling overcapacity) *is good for the producers because they have more choice for selling, but it is not good for the milling business. The supply is almost the same but the number of mills increased, so more competition is taking place. Before, one mill would have 20 percent quality FFBs but nowadays it only receives 14 percent. If Univanich rejects the bunches, customers go to another mill. There is overcapacity in the region and the quality of the fruits went down.'* (Univanich, 2014). Currently SPO is not able to collect enough produce every day and often machines run below capacity (sometimes at less than 50 percent). Buying FFBs from ramps promotes a constant flow of produce and a safer access to bulk quantities. The mill has 20 regular and around 300 irregular suppliers (SPO, 19/03/2014). This dependency on many irregular suppliers leads to a lowering of quality standards for FFBs in order to maintain a regular daily supply. The quality is, to the disappointment of the miller, pushed down to a level of 14 percent of CPO in FFBs supplied. According to a purchaser from SPO: '*We do not have problems with individual farmers; if farmers have unripe FFBs we will make a selection and get rid of them. However we will give them higher price for bunches with higher percentage of CPO*'. '*Ramps instead keep FFBs for periods up to 3 days. And they mix low and high quality; they have many strategies to hide older bunches among the recently harvested, so that when they dump them at the mill, the older*

bunches would be underneath the fresher ones, which will be on top. We usually separate FFBs from farmers and those from the ramps. To the ramp we will give maximum 14-15 percent CPO content related price. If the ramps receive bad quality FFBs and they mix bad and good quality, it is a problem for us, because we cannot spend too much time checking the entire load of a two container truck' (SPO, 2014). This mill gives an attractive price to ramps that supply good quality and quantity FFBs, in order to avoid them turning to more competitive mills. As such, the mill is able to collect the needed supply and to reduce the losses from processing below capacity. Farmers, from their side, criticise the double standards included in this policy, saying that producers receive low prices while ramps are given a higher price for a lower quality.

Mills would prefer to deal with producers directly, in order to shorten the supply chain and to maintain high quality in their FFBs. In reality, however, mills have to adopt a proactive approach towards ramps and SPO, for instance, has decided to involve ramps in RSPO certification. The mill is dealing with two ramp owners who are member of the RSPO farmers group in Surat Thani province, and one of them is even the leader of this group. As long as these ramps can provide the necessary records of RSPO volumes per farmer, SPO gives them a higher price for certified bunches, worth 0.20 baht/kg, which is paid at the end of the year (SPO, 2014). The two other mills, UPO and Univanich, seem less engaged with RSPO-certified ramp owners. Not only do they not pay the ramp a higher price for certified FFBs, but they even adopted a strategy discouragement for RSPO-certified producers who want to open a ramp. According to a RSPO certified producer who opened a ramp, the mill purchaser suspected she would mix RSPO and non-RSPO FFBs: '*The purchase staff told me: you have a ramp now, I cannot give you 10 cent RSPO premium anymore. But is it my fault that I own a ramp now! He should know my professionalism in this business and my product quality'* (ramp3, 20/03/2014). Like the others, also this ramp owner decides where to sell on the basis of the trade-off between the prices that a mill offers and their distance from the ramp. It is indeed a common policy for

ramps to have two mills as potential buyers (Univanich, 2014; ramp1, 17/03/2014). The owners call these mills every day to ask for their price and then decide, based on the amount of FFBs they have, whether it is worth to drive a longer distance for a better price. '*During peak season we do approximately 3 rounds per day, one truck full each. During low season only 1 round/day. Sometimes it is not full, but we have to send it anyway in 2 days otherwise we compromise the quality'* (ramp6, 21/03/2014). According to another respondent: *'Less than three tons per truck is not worth the transportation cost, so then we go to the closest mill'* (ramp2, 19/03/2014).

Refusing to recognize the produce from ramps as RSPO-certified means that all certified volumes are "lost" in conventional CPO. In other words, while producers have complied to RSPO requirements their FFB enters the chain as non-certified FFB. This compromises the possibility for farmers to sell their certificate upstream the value chain. Mills are reluctant to accept ramps' FFBs as RSPO-certified because producers may have already sold their certificate, and thus their volume records, to Johnson & Johnson (J&J). J&J is member of the RSPO since 2006, and is currently purchasing certificates to cover 100 percent of their estimated palm oil usage with certified palm oil. However, J&J buys their certificate but not necessarily their certified volumes through a Book and Claim system. This way J&J offers a financial reward for RSPO-certified growers who sell their certificate; while the farmers can sell their FFBs to any buyer they want and get a price solely based on quality (interview GIZ, 2014). This implies that the mill itself does not benefit from the certified product, but only from receiving better quality FFB. However, this benefit may be lost when FFBs from different customers are mixed at the ramp. This creates a disincentive for mills to engage proactively with ramps in the RSPO value chain and rely more on their own RSPO-certified plantations. In the case of UPO, over 93 percent of their total RSPO-certified FFB originates from their own plantation (GIZ, 2014, Univanich, 2014, UPO, 2014).

Interviewed ramp representatives responded that one mill can be perceived to be stricter or more flexible than another mill –with respect to quality and delivery time – depending on their relationship with the ramp.[8] Also here, social relationships and trust are important in the way business is conducted. '*I only send the FFBs to Univanich because it is not too strict and we can understand each other and negotiate'* (ramp5, 21/03/2014). While another ramp owner says: *'Univanich is stricter than Surat Thani mills, that's why they have better quality FFBs'* (ramp1, 17/03/2014). A longstanding relationship between the mill and the ramp allows for more flexibility, for instance, in case the ramp cannot bring all bunches in one day, they are allowed to sell the FFBs at the same price the next morning (ramp6, 21/03/2014, personal observation).

Next to the duration of the relationship, flexibility also depends on the amount of supply the ramp is providing to the mill, the number of competing mills and ramps in the area, and the season (peak or low season). During peak season farmers cannot stay in long queues because they need to continue working on their farms; therefore when mills see a surge in their supply from the ramps they are obliged to relax their quality control policy, at least temporarily. For instance, during peak season UPO increases the proportion from ramps from 7 percent to 30 percent of their total FFB supply (UPO, 2014). Although mills generally distrust ramps, they nevertheless depend on them. Ramps offer the mills the possibility to gather sufficient FFBs. On the one hand, this arrangement is very efficient, on the other hand it compromises the information and material flows necessary to promote high quality palm oil production.

Ramps are major actors in the selling practices of farmers, since the latter mostly value the

[8] If ramps wait more than the advised 24 hours before bringing the FFBs to the mill, the Free Fatty Acid (FFA) level of crude palm oil is increasing (Kardash and Tur'yan 2005). The FFA level increases with the time elapsing between the harvest and the first processing step which may result in deterioration of CPO containing FFA above the acceptable standard level of 5 percent; this problem cannot be fixed through further refinement (Tagoe et al. 2012). Ramps reply that producers harvest in the morning and bring their FFBs in the afternoon, making it sometimes impossible to transfer them to the mill on the same day (ramp3, 20/03/2014).

proximity of ramps and their speed in dealing with clients compared with the mills.[9] Given the perishable nature of FFBs, it is fundamental for producers to dispose of the harvest timely and safely. Ramps are the nearest available outlet for their FFBs while their buying price can easily be monitored by farmers—43 percent of the interviewed farmers obtained up-to-date price information primarily from the ramps.

Linking the labor market with the palm oil market increases the power of ramps enormously, and 47 percent of the interviewed farmers rated their negotiation power with ramps as "extremely weak". Also, 44 percent of the interviewed farmers considered ramps, or the harvest workers hired through the ramps, as the most powerful actors within their network, compared with a mere 20 percent indicating mills as most powerful.

The RSPO aims at creating more direct links and improved trust relationships between farmers and mills as a result of training, organising farmers, capacity building and ultimately from higher FFB yield and quality. While the strong connection between farmers and ramps is weakened by RSPO, this is certainly not eradicated. Among the non-RSPO respondents, 69 percent sells to middlemen/ramps, 18 percent is selling directly to harvesting teams, and only 11 percent to mills. When looking at the RSPO-respondents we observe that RSPO certification indeed increases the by-passing of ramps, with 44 percent of the respondents selling directly to mills. Yet, the majority of FFBs is still filtered through ramps, either directly (27 percent), or indirectly (26 percent) through harvesting teams that typically work for the ramps (see Figure 2.3). RSPO-respondents expressed their concern about the transport costs when selling to mills: '*Sometimes the cost of transport to the mill that buys RSPO is not worth the little price difference when selling to a close-by ramp*' (RSPO farmer, 20/09/2013).

[9] Both producers and ramps consider mills as extremely time consuming, because suppliers have to stay in a queue for a long time, especially during peak season, before being served. Participating in the RSPO certification program allowed producers to use a so-called fast access when showing their RSPO card. Nevertheless, respondents from ramps that are also RSPO-certified claim that this is not always possible.

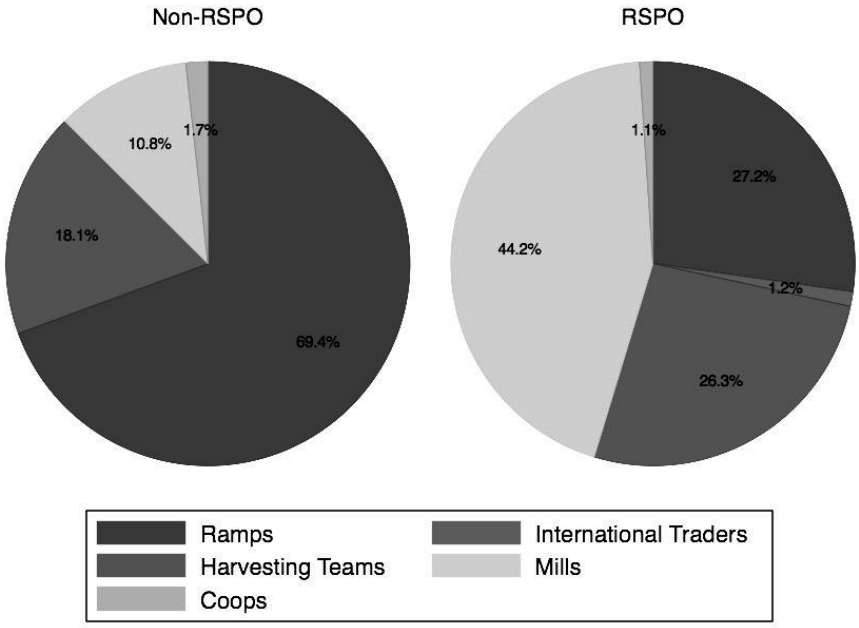


Figure 2.3: *Farmers' FFB sales to buyers in Southern Thailand*

The higher proportion of RSPO respondents selling to mills cannot be explained on the basis of socio-economic differences between the two samples, such as average age, household's composition, religion (which is in both cases Buddhism) and ownership of assets like mobile phone, fridge, radio, bicycle, motorcycle and auto (see Table 2.2). Significant differences can only be found in the level of education, expenditure in phone credit and average salary from other sources of income, where the RSPO group has higher scores (see Table 2.2). It seems that, on average, RSPO producers are richer, have better means to reach the mills, are getting a higher price for their FFBs, and bypass middleman/ramps.

Table 2.2:*Descriptive statistics and differences between RSPO and non-RSPO producers*

Variables	Non-RSPO (N=151)	RSPO (N=119)	Difference
Age	51.95	53.27	1.33
Male	0.629	0.765	0.136**
Buddhist religion	1.000	1.000	0.000
Years of education	1.75	2.18	0.43***
Household size	4.225	4.412	0.187
Mobile phone	0.960	0.958	-0.002
Radio	0.603	0.697	0.094
TV	1.000	0.916	-0.084
Refrigerator	0.993	0.992	-0.002
Car	0.874	0.933	0.059
Motorcycle	0.715	0.756	0.041
Bicycle	0.815	0.882	0.067
Other income	5220	9929	4709**
Phone credit	427	7489	322**

Group means (t-test): *** ↔ 99 percent, ** ↔ 95 percent, * ↔ 90 percent.

The average price for FFBs sold by non-RSPO respondents is 3.97 Baht/kg while RSPO respondents receive an extra 0.24 Baht/kg (see Table 2.3). Yet, these average prices cover a very large variation, indicating that the market remains significantly fragmented. Perhaps more importantly, RSPO farmers typically produce higher quality palm oil and are more aware of its current price and of the grading of their last sale. However, the RSPO certified farmers' supplying practices are limiting the potential benefits from this certification. Our data reveal that not all RSPO-certified farmers who are selling directly to mills are selling their FFBs to SPO and UPO (RSPO-certified mills). Many are selling to the mill nearby, which, if not part of the RSPO project, will not produce and sell CPO under RSPO certification. This is inefficient for both sides.

Table 2.3: *Prices, knowledge, and quality*

Variables	Non-RSPO	RSPO	Difference
Price at last sale (Baht/KG)	3.995	4.239	0.244***
Good quality or higher	0.300	0.558	0.258**
Know current price	0.074	0.168	0.094**
Know quality of last sale(1)	0.364	0.594	0.230***

Group means (t-test): *** ↔ 99 percent, ** ↔ 95 percent, * ↔ 90 percent.
(1): Respondents were asked whether they knew the grade of quality of their FFB at the last sale. The buyer should pay the FFBs per kilo according to a grading system. Grading is always applied although the methodology for assessing it is often conducted, as locally defined, "*by eye*".

Unlike the mills, ramps do not have a detailed grading system; they usually pay a standard price mostly based on the weight of the FFBs and the mills' buying price. The only quality assessment applied (albeit seldom) by ramps is judging the ripeness of the fruits. This absence of an elaborate assessment procedure hinders further improvement of the quality: *'sometimes it can happen that I harvest FFBs that are not mature enough and there are 2 scenarios: 1-The mill will give me a lower price; 2- The mill will reject the immature bunches. However, I can still sell the same FFBs to the ramp and the ramp will water them and sell them to the mill'* (RSPO farmer, 17/03/2014). Also, RSPO respondents complain about malpractices at the ramps: they see the quality of their FFBs being damaged by the rent-seeking behaviour of ramp operators, who may add water, sand or soil to increase the weight. Ramps may also detach the fruits from FFBs, as loose fruits are supposed to have a higher oil content and are unconsciously valued higher by the mills (SPO, 20/09/2013; participant observation; Forest People Programme, 2011).

RSPO certification potentially opens the door for export to Europe where demand for RSPO-certified CPO exists, but this will probably take some time. The main demand for Thai palm oil is from the domestic market and from India and China and they are still oriented towards not-certified palm oil. The management staff of the three mills participating in the RSPO project in Thailand revealed that mills, at the moment, do not have any incentive to separate certified from not-certified FFB and that they will continue applying Mass Balance or Book and Claim

arrangements. Separating certified and non-certified palm oil would imply increasing costs for transport, administration and processing, considering that the machinery should be different for both categories. This would therefore have to correspond with increasing profits coming from higher demand or a higher price for certified palm oil. In general, this would imply a change in the entire palm oil global value chain: refineries, brokers and retailers would have to make many efforts to align the standards.

Mill managers claim that Europe is a relatively unattractive market when compared with China and India. China and India are less distant and therefore cheaper outlets. However, both countries do not reflect a particular interests for certified palm oil yet. '*India offers a better price for mainstream palm oil while the cost for shipping the oil is lower'* (SPO, 24/07/2013). For this reason, mills are mostly interested in the higher quality offered by RSPO farmers, not in the certification per-se. Yet, currently half of the higher-quality FFB produced by RSPO certified farmers does not find its way to the mill without being downgraded and mixed with lower-quality produce at the ramp. Ramps thus remain a key player within the conventional and RSPO global value chains, but they are also responsible for a loss in quality and a lack of quality incentives.

2.7. Discussion and conclusions

We observed how the lack of established relationships in the palm oil value chain at the local level in Thailand gives bargaining power to ramps and generates a "missing link" between the actors in the RSPO GVC. Mills participating in RSPO can adopt different strategies depending on their daily CPO processing capacity, the availability of FFBs in terms of suppliers and seasonal changes in production. To a certain extent, these mills need to keep good relationships with the closest and most strategic ramps, because they are more important than the producers themselves. Including strategic ramps as main physical nodes in their supply network is crucial

for the survival of the mill, as mills can reach many producers through one ramp. As a consequence the price they pay to FFBs supplied through strategic ramps is, in some cases, higher than the one offered to producers that bring their FFBs directly to the mill. Ramps might be seen as a form of networking power, as they connect producers with mills and thereby control the network of smallholders as part of the palm oil value chain (Castells 1998, 2008). However the nature of their power is not limited to their controlling position within the network, because their position also influences the material standards and information flows, with related socio-economic consequences.

Ramps can be seen as rent seekers that limit the income of farmers, drive up the costs for mills and drive down the price producers receive. Mistrust appears to be a common denominator with respect to ramps. Mills and producers do not trust the way ramps handle FFB supply, and ramps claim not to trust producers. On the other hand, ramps fulfil a key role because they collect a quantity of FFBs that mills would not practically be able to access nor to handle alone, considering the time needed to check individual producers and the willingness of the latter to wait in long queues at the mills. Ramps are also socially embedded actors that facilitate market access and material flows: farmers find buyers and service providers nearby, while mills find easily manageable sellers. Around half of the RSPO respondents in our study are therefore still selling to ramps either directly or indirectly (through harvesting teams).

In the Thai RSPO GVC long standing relationships between different actors are exceptional, while the material and informational flows that should go along with them are lacking as well. Although four RSPO certified farmers are also owners of a ramp, their relation with the mill has not improved since becoming RSPO certified and even worsened because the mill's trust in their product had diminished. The result is that these ramps would rather sell FFBs to the best offer instead of selling them to mills participating in the RSPO project, which implies a loss of RSPO products for these mills (material flows) and reduced information exchange

among actors in a certified chain (information flows). This may compromise the development of an integrated RSPO certified chain from upstream to downstream.

Informational flows, such as records of certified production, are linking producers and end users worldwide, whereas the material flows are not necessarily coming along with these. Diverse horizontal networks interact with the local material flow of RSPO FFBs and within them ramps are black boxes that compromise coordination in the RSPO value chain. Ramps represent a peculiar node of translation in the chain for both formal and informal flows of information (Bush and Oosterveer 2007), both necessary to enhance the expected outcome of RSPO certification. Knorringa et al. (2011) reach the conclusion that for RSPO to allow up-scaling of sustainability programs, better inclusion of smallholders as stakeholders are necessary. A more equal stakeholders' representation at the RSPO is a must to achieve legitimacy of the standard (Schouten and Glasbergen 2011). This study analysed where a voluntary standard like the RSPO-standard is located within the global value chain (Bush et al. 2015) and we showed that the position of smallholders in this chain has specific local characteristics. We identified the ramp as a key node in the Thai palm oil chain connecting smallholders with the rest of the supply chain and embedding their activities in wider social and economic networks. Translating a global standard, such as the RSPO sustainable palm oil standard, into a local context therefore requires in-depth understanding of the relevant local dynamics and active engagement with the relevant local actors. Further research should investigate the potential of mills to participate in the RSPO certification program and to increase their collaboration with ramps to better channel the information flows that comes along with the material flows. The Thai government could play an active role in facilitating this process. At the global level, understanding and addressing the role of black boxes in GVCs and certification programs is necessary in order to feed the debate on the integration of marginal and remote producers in global certified value chains.

Chapter 3

Sustainability and Palm Oil Supply Chain Dynamics; the Role of Transparency and Price Incentives for Independent Smallholders in RSPO-Certified Palm Oil Production in Indonesia

Abstract: Palm oil production is increasingly under scrutiny because of its role in deforestation and biodiversity loss. Most attention is thereby being paid to oil palm cultivation practices and their environmental impact, but the role of market structures and power dynamics in the supply chain has been addressed much less. Understanding the latter is however important to determine what conditions encourage smallholders to adhere to a sustainability program, remain part of it and be committed to implement recommended practices. This paper addresses these dynamics, the complex price determination mechanism in Indonesia and other dynamics, using a case study in Indonesia. It analyses how the market structure of RSPO-certified smallholder-based supply chains in Indonesia affects transparency and information about farm gate prices, and how this in turn is reflected in the smallholders' compliance with sustainability standards. In the conclusion we argue that efforts towards greener supply chains should not focus only on training on sustainable production practices, but also include the upstream supply chain dynamics where price and production flows, as well as the ensuing incentives, are determined.

(to be submitted)

3.1. Introduction

Palm oil is a perennial crop with the highest yield per hectare compared with other vegetable oils (Mattsson et al. 2000). In 2005, it was expected that the global consumption of oils and fats in 2020 would be 184.4 million tonnes, of which 43.2 million tonnes for palm oil (Basiron & Simeh, 2005). In fact, however, by 2020 global consumption of palm oil reached already 75.5 million tonnes, surpassing the 2005 predictions by far. Indonesia alone would have been able to supply the predicted demand entirely, as its palm oil production grew from 15.5 to 43.5 million tons between 2005 and 2020. Indonesia palm oil production is currently growing at a rate of 2.3% per year (Indexmundi, 2020a), making it the largest palm oil producing country in the world (Prabhakaran Nair, 2010). This position can be explained by its perfect location within the region suitable to oil palm cultivation and the implementation of an effective expansion strategy.

Indonesia's expanding palm oil production has raised concerns among scholars, environmental activists, and NGOs. They argue that this growth is translated into more extended production systems, impacting land use change, and more intensive ones, potentially affecting the sustainability of plantations themselves through loss of soil fertility, contamination of soil and water, and other environmental harms (Fitzherbert et al., 2008; Koh and Wilcove, 2008; Wilcove and Koh, 2010). Indonesia has been especially under scrutiny for land use changes converting natural forests into oil palm plantations. At the same time, it has also been the first country implementing the Round Table on Sustainable Palm Oil (RSPO) requirements for sustainable palm oil production. The introduction of RSPO-certified palm oil has triggered a large number of studies assessing production practices and environmental impacts (e.g. Fitzherbert et al., 2008; Koh & Wilcove, 2008; Wilcove & Koh, 2010), but less attention has been devoted to the palm oil value chain and its interactions with sustainability initiatives such as the RSPO.

For the RSPO, it is important that the acceptance of its standards is incentivised through price differentiation to cover, at least partially, the additional costs incurred by farmers who adhere to them. In this paper we explore whether the adoption of RSPO-certified production practices by farmers is followed by an increased share of the price of palm oil that is passed on to them. We do this by investigating the relationship between the first independent association of smallholder farmers that received RSPO certification and the palm oil processing mill. For this, we conducted a survey among the association members to understand their relationship with the mill, and the larger cooperative they belong to, and complemented these quantitative data with qualitative interviews with various stakeholders.

The remainder of this paper is structured as follows. In Section 2 we present our theoretical framework and in Section 3 our methods. In Section 4 we provide a background on the palm oil value chain in Indonesia, followed by Section 5 where we present our analysis. We conclude the paper with a discussion and our conclusions.

3.2. Theoretical Framework

This study builds first on the informational governance literature, in particular on the relationship between information sharing, incentives, and sustainability in production processes. Second, we make use of the economic literature on markets structures and their effects on price determination and rent distribution.

3.2.1. Transparency and upstream power structures

Due to the international nature of many contemporary value chains, including palm oil, and the growing pressure to perform more sustainably, the concept of transparency has become increasingly relevant (Auld & Gulbrandsen, 2010). Major players in global value chains are under pressure to share information about the environmental sustainability of their products and

production processes (Gupta, Boas, & Oosterveer, 2020; A. Mol, 2010). Mol defines this as informational governance, which is a new way of conducting environmental governance where information is the driver of change (Mol, 2008; Mol, 2006), or 'regulation by information' (Case, 2001; Florini, 2003; Tietenberg, 1998). Production, processing, usage and flows of, as well as access to and control over information are progressively becoming critical in contemporary environmental governance (Mol, 2010). Mol distinguishes between four ideal types of transparency in value chains and networks: management, regulatory, consumer and public transparency. In this paper, we apply a modified version of the first type, transparency management, which refers to the disclosure of information by upstream economic actors to economic actors downstream within the chain (e.g., total quality management). In this paper, we do not focus on the sustainability information flows from upstream to downstream in the value chain, but rather on the opposite: the transparency of information flows from downstream buyers to upstream producers.

Research has shown that transparency can give more power to the already powerful actors leading to increased inequality. If infrastructures for sharing information are based on sophisticated reporting, measurement tools and auditing systems, this may occur at the detriment of those actors who lack the necessary literacy (Bush, Toonen, Oosterveer and Mol, 2013; Glin, Mol, Oosterveer and Vodouhe, 2012; Haufler, 2010; Gulbrandsen, 2010). Also in food supply chains, more powerful actors may be able to negotiate transparency requirements according to their particular interest (Bush, Belton, et al., 2013). More so, imperfect information and unbalanced market power may lead to the fulfilment of sustainability standards without real buy-in from upstream actors. The assumption that consumer pressure towards producers is driving the right responses and impact (Mol, 2015) does not necessarily match the complex reality of power dynamics at different spatial, temporal and jurisdictional scales. This reality cannot be revealed using only transparency governance instruments such as audits (McCarthy,

2012). For instance, some scholars argue that sustainability governance pays too much attention to the environment and not enough to producers' benefits (e.g. Colchester et al., 2003; McCarthy, 2012). However, these goals do not need to be competing, provided that price and regulatory incentives are aligned. In order to understand the producers' position with respect to sustainable production it is important to analyse the institutional structure they are involved in. This institutional structure is important in the success of a sustainability initiative (Sawyer & Gomez, 2008). An inappropriate institutional structure, and related rules, means that the targeted group does not benefit (Raharja et al., 2020). Therefore, to contribute to this debate we explore in more detail the role of market price transparency in enabling sustainability governance.

Current sustainable supply chain initiatives are mostly framed in the context of the market. They seek the most effective model in the specific context of the transactions they are part of and try to minimise the costs involved. Costs derive from uncertainty, the frequency of the transactions and the specific investments involved (Williamson, 1991). *Uncertainty* can be caused by opportunistic behaviour and bounded rationality. Trading agents may act out of self-interest, unconstrained by morality, and may be selective in the type of information communicated. They may even distort information or make promises they do not intend to keep (Slangen et al., 2008). Bounded rationality refers to the limited capacity of agents to correctly assess all potential benefits and drawbacks from a specific decision in the market (Simon, 1961). Satisfaction of both contracting parties, however, increases the chances of more frequent transactions, which can lead to better communication, higher levels of trust, long-term relationships and reduction of side selling (Cropanzano and Mitchell, 2005). Transaction frequency together with asset specificity and uncertainty determines the level of transaction costs, as well as the consequential governance structure of the exchange (Williamson, 1985). Necessary *investments* for sustainability certification vary but contracts, creating long-term

relationships, may reduce costs, in particular transaction costs (Sáenz-Segura et al., 2010). Ha and Tong (Ha & Tong, 2008) describe how a contract can become a driver for information sharing, thereby creating a source of competitive advantage in supply chains.

Smallholder farmers face asymmetric access to information compared with buyers, which forces them to be price takers. Price uncertainty may lead to opportunistic behaviour or defaulting on contracts by farmers (Sáenz-Segura et al., 2010). Farmers may also form groups to compensate for this, because this offers them improved information and market access, as well as access to labour for harvesting, sorting, packaging and transport (McCormick, 1999). Groups can offer farmers benefits like a premium price for better quality or price certainty by setting a fixed price at the beginning of the season.

3.2.2. Information sharing, market structures, and sustainability

Some studies on Indonesia have defined the relationship between farmers and scheme companies as contract farming (Cahyadi and Waibel, 2016; Euler, Siregar, Hermanto, and Qaim, 2016; Gatto, Wollni, Asnawi, and Qaim, 2017). Contract farming is a tool to reduce market uncertainties and incentivise smallholder farmers' investments, potentially resulting in higher yields and profits (Eaton and Shepherd, 2001; Key and Runsten, 1999; Simmons, Winters, and Patrick, 2005), and reduced poverty (Bellemare and Lim, 2018; Otsuka, Nakano, and Takahashi, 2016; Wang, Wang, and Delgado, 2014). Moreover, contract farming links small-scale farmers to global value chains (Nguyen, Dzator, and Nadolny, 2015). Contracts contribute to increasing farmers' income (Miyata, Minot, and Hu, 2009; Warning and Key, 2002), increased productivity and stable chain relationships (Ruml and Qaim, 2020), reducing income volatility (Bellemare, 2012), lower price risks (Tripathi, Singh, and Singh, 2005), and positive labour market effects (Simmons et al., 2005). These effects are also observed with respect to contract farming between oil palm producers and the agroindustry (da Silva, 2005; Eaton and Shepherd, 2001; Setboonsarng, 2008).

Despite the positive outcomes described above, contract farming may also result in unfair benefit sharing (Glover and Kusterer, 1990; Warning & Key, 2002), increased concentration of land ownership, intensified social differentiation and dominance by companies over smallholder farmers in decision making (Cahyadi and Waibel, 2016). Contract farming can be a highly selective process (Barrett et al., 2012) in favour of the most advanced farmers (Glover, 1984) and those with low transaction costs (e.g. large plantations) (Simmons et al., 2005).

Contract farming is a form of imperfect competition. While in markets with perfect competition, firms can only reach a profit when producing cheaper than the average total cost, under imperfect market competition a firm can set prices above the average total cost to maximise profits (Masliani, Muslich Mustadjab and Ratya, 2014). This is a case of monopsony when there is only one buyer in the market and producers' bargaining power is limited (Sáenz-Segura et al., 2010). Masliani et al. found that in Kalimantan the market for palm oil is an oligopsony and inelastic, both in terms of price and of supply and demand. If farmers would sell through cooperatives, they could increase their price up to 34.9% (Masliani et al., 2014). Monopsonies and oligopsonies have also been flagged as a problem in other countries (Oya, 2012; Ruml and Qaim, 2020) as they may lead to dependence and vulnerability towards the contractor (Cai, Ung, Setboonsarng, and Leung, 2008; Eaton and Shepherd, 2001) and to asymmetric power relations (Adams, Gerber, Amacker, and Haller, 2019; Key and Runsten, 1999).

Initially, farmers may find it beneficial to enter into long-term contracts with established buyers, because they are attracted by their (perceived) reduced income volatility, but later this may become problematic (Glover, 1987). Problems may include a lack of information and transparency, a lack of clarity in land tenure and a lack of contractual compliance by both parties (Rist, Feintrenie and Levang, 2010). When their contract literacy is low, farmers may also experience discrimination with regard to contracts (Cahyadi and Waibel, 2013). Lack of

transparency in contracts and agreements may reduce smallholders' autonomy in deciding about their land and output (Key and Runsten, 1999).

Whether the current structure of the palm oil market is impoverishing smallholders is still debated. Some studies find a correlation between a decline in the poverty rate in oil palm communities and the success of contract farming (Cahyadi and Waibel, 2016; Colin, Zahari, & Gondowarsito, 2003; Zen, Barlow and Gondowarsito, 2005). Other scholars call this 'static poverty', and propose the concept of vulnerability to poverty as a dynamic poverty measure instead (Calvo and Dercon, 2005; Carter and Barrett, 2006; Chaudhuri, 2003; Chiwaula, Witt, and Waibel, 2011; Christiaensen and Subbarao, 2005; Klasen and Waibel, 2015; Ligon and Schechter, 2004). For instance, Cahyadi and Waibel (Cahyadi and Waibel, 2016) found contract smallholders to be more vulnerable to future shocks than non-contract farmers as the latter tend to have a more diversified range of income sources. They concluded that for smallholders with a contract, vulnerability to poverty persists with the exception of those with more assets.

In a monopsony, contracted farmers face the risk that the contractor lowers the price or increases quality requirements (Bijman, 2008; Glover, 1987; Huacuja, 2006). Farmers perceive such behaviour as unfair, for example when they have to queue before delivering FFBs, which leads to a deterioration of the quality and thus to lower grading and a lower price (Glover, 1987). In Ghana, 34% of the oil palm farmers had the impression that they were measured and paid for a smaller quantity than they actually delivered (Ruml and Quaim, 2020). Such experiences may trigger farmers to breach contracts (Rum and Qaim, 2020; Huacuja, 2006; Ochieng, Veettil and Quaim, 2017), especially when they are not able to observe the weighing and grading.

Such problems (Isager, Fold, and Nsindagi, 2018) may contribute to mistrust and feelings of unfairness among farmers (Eaton and Shepherd, 2001; Glover, 1987; Rist et al., 2010; Saenger, Torero, and Qaim, 2014; Schipmann and Qaim, 2011). Farmers may base their decisions on

this perception, for instance when deciding how much to invest in the crop (Ruml and Qaim, 2020) or whether or not to participate in a contract (Fischer and Wollni, 2018; Schipmann and Qaim, 2011). As a consequence, farmers may have a preference for contracts that offer low risk of product rejection (Abebe, Bijman, Kemp, Omta, and Tsegaye, 2013; Ochieng et al., 2017).

3.2.3. Organisation of the study

In order to investigate the importance of informational governance in regulatory transparency for the long-term success of contract farming and for improved sustainability, we use a case study on Indonesia.

We explore the disclosure of information by upstream economic actors in the supply chain (i.e., Mol's (2010) first type of transparency). We look at RSPO-certified smallholders as price takers and investigate the relationship between management transparency and price setting and how this affects smallholders' behaviour towards sustainable practices.

We further investigate how certain sustainability outcomes are affected by transparency and study the local context in which the upper part of the palm oil value chain in Indonesia operates.

3.3. Methodology

The study includes the first group of independent smallholders in Indonesia certified against RSPO sustainability standards. In 2011, supported by WWF Indonesia, the RSPO, the Ministry of Agriculture, the Riau Provincial Government, and the International Carrefour Foundation, the Amanah Independent Palm Oil Smallholders Association started the process of acquiring RSPO certification for all its 349 members. The group cultivates 763 ha around the villages of Bukit Jaya, Trimulya Jaya and Air Mas, in Riau Province (Degli Innocenti & Oosterveer, 2020).

We conducted a survey among the members of the Amanah group on their relationship with the Inti Indosawit Subur (IIS) mill, a subsidiary company of the Asian Agri Group. Next to this, we conducted semi-structured interviews with various stakeholders, including the Amanah association, the RSPO, the following institutions AidEnvironment, Daemeter, IDH, LINKS, SPKS, and the following NGOs: WWF Indonesia, SawitWatch, SETARA, and Friends of the Earth. In total we conducted 12 interviews and 3 informal meetings with the above stakeholders and farmers. Furthermore, we engaged in participant observation in the field, for a total of two months in 2013 and 2014. We use these qualitative data to corroborate and triangulate the quantitative evidence that we gathered through the survey, to get a clearer picture of the dynamics at play. As much as possible, we add a reference to qualitative evidence to the quantitative information found.

Besides these primary data, we were given access to a fine-grained dataset of monthly farm gate prices paid by the mill to the Amanah group, for selected periods between 2002 and 2013. This data is stored by the group in a paper version in its archives and was converted into soft-copy data for econometric analysis. We accessed and transcribed data from May 2002 to March 2005, and from December 2010 to June 2013. The data corresponding to April 2005 to November 2010 was unavailable in the cooperative's offices at the time of fieldwork. Still, the two periods are long enough to study the farm gate prices paid to the smallholders. Moreover, the second period corresponds to the time of adopting RSPO practices by the farmers, including the additional costs and investment choices that this entailed.

Formally, farm gate FFB prices use the market price for Crude Palm Oil (CPO), and Palm Kernal Oil (PKO) as reference, and our dataset includes CPO and PKO market prices in the monthly update. However, other data sources for the same period use different *international* CPO and PKO prices. For this reason, we complement the Amanah dataset with these international prices for the same period, as retrieved from Indexmundi (2014). In our analysis,

we first explain in detail the price determination formula and dynamics, then we describe the price trends over the time and contrast the pre- and post-RSPO price data. Then we compare the international PKO and CPO prices, both in absolute and relative terms, to the farm gate prices in our dataset. Finally, we present an analysis of the discrepancy between claimed market prices and actual international prices over time.

3.4. Background of the case study

In Indonesia, smallholders cultivating oil palm (Feintrenie, Chong, and Levang, 2010; Rist et al., 2010) can operate as independent, or as 'scheme' farmers. Independent smallholders do not have compulsory market relations with mills and are free to sell to any mill or trader. Schemes are systems of production where a company gets a license from the Indonesian government to use the land for oil palm cultivation. In part, this land is managed as firm plantation – "*inti*" – and the rest is divided in smallholdings of around two hectares and handed back to farmers through contract farming, – "*plasma*" – (Gatto et al., 2017; Rist et al., 2010). Despite many farmers signing a Memorandum of Understanding (MoU), stating rights and duties with companies, it is questioned to what extent they completely understand what they are signing for and get a proper explanation of the content of these agreements such as the Free Prior Informed Consent (FPIC)[10] (SPKS, 2014).

In the Indonesian palm oil value chain, plantations form the upstream part and crude palm oil (CPO) processors, or mills, the downstream part. Mills need to secure a continuous and sufficient supply of fresh fruit bunches (FFB). They mostly have their own plantation which they supplement by purchasing from smallholders (McCarthy, 2012). FFBs are harvested every

[10] Sometimes the Free Prior and Informed Consent (FPIC) form or even the complete documentation of an MoU is missing and only the last page is provided to farmers for signing. This means that farmers do not get a proper explanation of the content of these agreements (SPKS, 2014).

two weeks and their weight and perishability involves logistical challenges for smallholders (Degli Innocenti and Oosterveer, 2020). Mills willing to process RSPO-certified FFB, need to comply with a Code of Conduct that contains the RSPO principles and criteria (McCarthy, 2012). They then have to make sure smallholders are also complying. For individual smallholders it is hardly possible to certify against the RSPO guidelines. Instead, groups, associations and cooperatives may opt for collective certification and the Amanah group initiated the process towards RSPO certification in 2011.

The Amanah group agreed that the local mill would continue purchasing their FFB, process them and sell them as RSPO-certified CPO or KPO. An RSPO staff member skilled a facilitator from the government extension service would train the smallholders on different topics related to sustainability practices propaedeutic to certification.

Smallholders are generally dependent on one single mill, given that mills are scattered, and smallholders often lack means of transportation. As FFB has to be processed within 24 hours (Sudradjat, Sugianta, Siregar, and Purwanto, 2021) there is little flexibility in whom to sell the produce to and therefore competition is extremely reduced.

Despite the advantages of close monitoring smallholders with respect to environmental sustainability and while stable supplier-buyer relationships facilitate sustainability practices implementation (Rist et al., 2010), the weak bargaining power of smallholders and the lack of transparency may represent a challenge to sustainability (Masliani et al., 2014). Independent smallholders are likely to engage in sustainability practices only if: 1) this is imposed by an actor down the supply chain that otherwise refuses to purchase their product, or 2) there are clear advantages and incentives that compensate for the additional costs and constraints that RSPO guidelines impose. As both of these conditions are essential it may be expected that many independent smallholders shy away from certification when only the first one is fulfilled. This

is confirmed by the fact that as of 2021, the majority of RSPO-certified smallholders in Indonesia belongs to a scheme—151.260 scheme farmers versus 12.753 independent smallholders, (RSPO, 2021).

This imbalance is exacerbated by a recent fluctuating/more oscillatory trend in the international palm oil price. Although prices have increased during the period 2001-2008 – reaching a peak in 2008 with 1,380 USD $/MT – prices dropped to 577 USD $/MT in 2020, partially due to the strong increase in supply (Indexmundi, 2020b) and after a new peak in March 2022 (1,780 USD $/MT) it dropped again to 940 USD $/MT in December 2022 (Indexmundi, 2023). Moreover, while RSPO-certification gives certified farmers the possibility to get a premium from other actors in the chain, in exchange for their sustainability effort through the Greenpalm platform, this is separated from the sale of their FFB to the mill (GreenPalm, 2021).

3.5. Results

3.5.1. The Amanah smallholder group, the cooperative, and the mill

The survey included 102 Amanah respondents, of which 93% men, on average 44 years old, with four years of formal education, living in households with slightly less than four members that in 43% of the cases also had non-farm income. On average, they had been member of the cooperative for 5.73 years, farmed 3.5 hectares of oil palm, located at 12 Km from the mill.

From these respondents 48% responded to feel a lot or even completely dependent on the mill, while 52% responded that they felt only little pressure or none at all. These response rates are comparable with responses given with respect to the cooperative (see Table 3.1).

***Table 3.1:**: Economic dependency towards the mill (%)*

Self-declared dependency	Mill	Cooperative
Completely	22.6	20.6
A lot	25.5	29.4
Little	48.0	38.2
Not at all	3.9	11.8
Total	100	100

The central role the mill and the cooperative play in the lives of the oil palm smallholders is confirmed when respondents ranked various stakeholders in terms of power and influence on their decision-making (see Table 3.2). Mills are ranked as the most influential actor by 27.5% of respondents, second only to the cooperative to which the farmers belonged, which is ranked first by 60.8%. Nearly all other actors were ranked as third or lower. Collectors and wholesalers are shown to play a minor role in the daily decision-making of growers. This confirms that the mill is practically the only buyer considered important by the independent farmers. Nearly all (99) farmers answered they sold their FFB to Asian Agri - Indo Sawit mill, while three did not respond.

Table 3.2: *Ranking of power and influence of stakeholders (%)*

Stakeholder	Most important	Second most important	Other ranking
Cooperative	60.8	31.4	7.8
Mill	27.5	63.7	8.8
Government	1.0	1.0	98.0
Local trader (collector agent)	0.0	0.0	100.0
Local traders (wholesaler)	0.0	0.0	100.0
Certification bodies	0.0	0.0	100.0
NGOs	0.0	0.0	100.0
Other	10.9	3.9	85.2

One reason why independent smallholders seem to have a hard time finding alternative buyers is that once harvested – often by harvesting teams arranged either by the mill or the cooperative – the transportation of FFB is managed by the cooperative. The Amanah smallholders harvest every 10 days, organized in groups (called KT in local language), each containing around 35 members. The farmers of a KT rent the means of transport together to bring the FFBs to the mill (WWF, 2014a). In 76% of the cases, FFB transport was managed by the cooperative and in 15% percent directly by the mill. Only 7 farmers claimed to transport the FFB themselves. These responses confirm the smallholders' dependency on the cooperative and the mill.

Cooperative facilities are used for both the scheme and the Amanah group smallholders. The cooperative chair, a much-respected leader, is at the same time head of the Asian Agri mill scheme farmers association and leader of the Amanah independent smallholders' group (WWF, 2014a). The cooperative is considered a separate entity within the community and doesn't belong to the scheme nor to the independent farmers. It is divided into different business units, each with separate financial management: 1) FFB production, 2) Retailing: shops, providing food products for people in the village, including to non-members, 3) Credit: for everyone who is or wants to become a member of the cooperative. The FFB production unit manages two different payments: one for scheme and one for independent smallholders. Farmers pay a fee to the cooperative, including for services like transportation of FFBs to the mill (WWF, 2014b). Also, for access to and use of inputs, the cooperative and the mill are central for about 75% of the respondents (See Table 3.3).

Table 3.3: Most important stakeholder in input access and use (%)

Input	Mill	Cooperative	Others
Farming input access	49.0	35.3	15.7
Farming input use	24.5	56.9	18.6
Credit access	12.8	58.8	28.4
Production technology access	22.5	52.0	25.5
Production technology use	25.5	50.0	24.5

Interestingly, the level of trust in the cooperative is considerably higher than in the mill, as 42.2% trusts the cooperative, 26.5% the cooperative chair and only 15.7% the mill (Table 3.4).

Table 3.4: *Trust in stakeholder (%)*

Stakeholder	A lot or completely	Little or not at all
Cooperative	42.2	57.8
Cooperative chair	26.5	73.5
Mill	15.7	84.3

3.5.2. The Amanah group smallholders and the RSPO

When the Amanah group initiated the process of RSPO-certification in 2011, they agreed that the local mill would continue purchasing their FFB using an existing contractual agreement.

The mill would process and sell their produce as RSPO-certified CPO or PKO. The group's smallholders received a total of 11 training sessions on different topics related to sustainability practices, including on Best Management Practices (BMPs), high conservation value, biodiversity and first aid (Amanah, 2014). In 2012, the certifying agent BioCert provided an Internal Control System (ICS) training and the mill a BMP training (WWF, 2014a). This is interesting, because, contrary to scheme smallholders, independent smallholders generally do not receive training from the mill (SPKS, 2014). In the survey, we found that 62% of the smallholders mentioned undergoing at least one RSPO-certification training. However, this does not necessarily mean that the rest did not attend an RSPO certification training. According to the cooperative chair, they all did, but maybe some did not remember the training or did not realize it was RSPO-focused.

As the RSPO certificate is at the group level, palm oil from all group members is considered RSPO-certified, regardless of their self-reported training recollection status. 92.2% of the interviewed farmers were aware of being RSPO-certified at the time of the interview, and 86,3% claimed to implement at least one RSPO principle.

Although the group considered the RSPO project a satisfactory experience, not all goals were achieved. The group's chair said: "we would like to improve farmers' welfare and agricultural practices. Also, we do not manage to pay ICS staff who have to work for free while they have to look after their own oil palm fields" (Amanah, 2014). The group needs to pay for the audit costs and RSPO membership, while the profits from the sale of GreenPalm certificates are low (WWF, 2014a; SETARA, 2014). Hutabarat et al. (2018) calculated that despite the participation in the RSPO certification program sales value increase by 16,2% (due to additional yield, 9,8% and higher FFB price, 5,8%), the net farm income was 5.3% lower than before certification due

to the higher prodution costs per hetare in the first year plus the costs of certification[11]. Without a guaranteed FFB price and the sale of the GreenPalm certificate the loss would have been even higher (Hutabarat, Slingerland, Rietberg, & Dries, 2018).

The smallholders claimed that a fixed price for FFB reduced the incentives for producing better quality FFB and for adopting farming practices that are more in line with the RSPO criteria. The dominant position of mill renders these *de jure* independent farmers to be *de facto* dependent on the mill and the cooperative.

3.5.3. FFB price determination

The Indonesian government released its first policy in 1997 to reduce price disturbances by introducing a formula for calculating the FFB price (McCarthy, 2010). In Indonesia this price is calculated by provincial price committees that take into account among others the palm oil world market price, the conversion rate of fresh fruit into palm oil, transaction costs such as transportation costs, processing costs and the company's overhead costs. The farm gate price calculation starts with the world market prices for CPO and PKO. These are multiplied by the amount of oil that the FFB is assumed to contain, on the basis of the age of the palm tree. The result is then again multiplied by the K-Index (an index monthly calculated on the basis of taxes, marketing and transportation costs, selling volumes, and processing costs like loading ramps and machines; see below for more details). (See Figure 3.1)

[11] Certification costs for Amanah as 86 euros/ha. and the mean cost increase for fees and improvements to meet the standards at 336 euros/ha (Hutabarat, 2018).

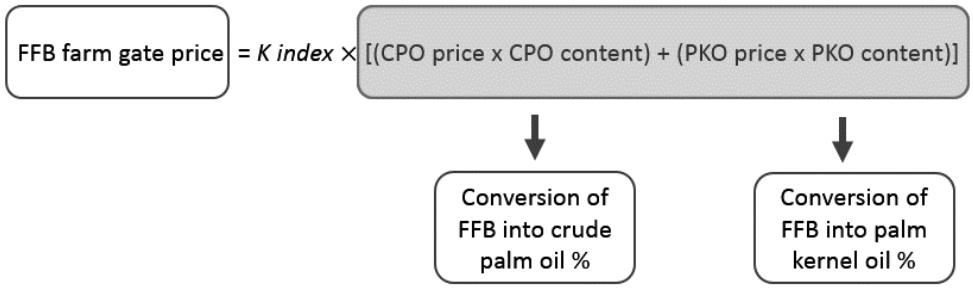


Figure 3.1: *FFB Gate Purchase Price*

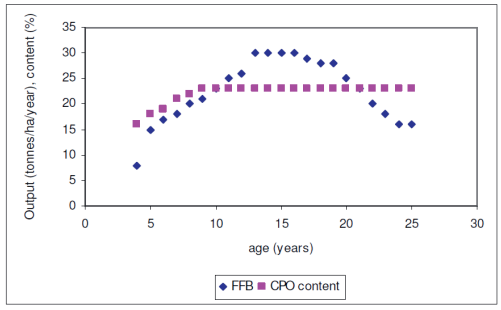
Although this formula seems logical and transparent, the implications of the method selected to determine the assumed oil content are large. The oil content rate used in the calculation is estimated on the basis of the age of the palm tree and not on the actual management practices applied (although they may influence the actual oil content). Table 3.5 shows the estimated oil contents for CPO and PKO as used in the formula.

Table 3.5: *Estimated CPO and Kernel oil content used in FFB price determination (%)*

Palm age	Estimated CPO oil content	Estimated PKO oil content
3	0.156	0.037
4	0.175	0.041
5	0.188	0.043
6	0.193	0.045
7	0.200	0.047
8	0.206	0.048
9	0.213	0.050
10>20	0.219	0.051

For the miller it is important that the difference between the actual oil extraction rate and the extraction rate used to determine the purchase price is positive. When the oil content is lower than the one calculated at the moment of purchase, the mill incurs a loss. On the one hand, there are good reasons to adjust the assumed oil content to the age of the palm trees. Figure 3.2 shows for example the output per hectare per year for Marihat—the variety most commonly used by Amanah smallholders (our survey). When the palm is four years old it starts to have fruits, with increasing yields up to year 13 and then the yield per palm stabilizes until year 16, after which

the output starts to decrease. The oil content per palm fruit seems to remain, however, steadier, with an increase between four and ten years of age, after which it stays the same (CIC, 2004). The figures presented in Table 3.5 closely mirror the figures observed in Figure 3.2, based on the estimates made in the Marihat and Plantation Centre (CIC, 2004).



Source: Marihat and Plantation Research Centre, cited in CIC (2004, p. 22)

Figure 3.2: *FFB and CPO content per hectare per year according to age of the plantation*

On the other hand, however, the oil content is, not only determined by palm age. Other variables affecting oil content are: variety, pre- and post-harvest practices, and milling extraction technology (FAO, 2024; MPOB, 2020). Concerning the planting material, some varieties have higher yields than others (also taking into account the geographical conditions). Implementing practices such as increased fertilizer efficiency and reduction of losses, or Integrated Pest Management can lead to higher yields too. Evidence therefore shows that yield and oil extraction rates do not just depend on age. Some authors highlight the positive effects of yield intensification (Fairhurst, 1996; Jelsma et al. (2017), while others address the negative effects of poor management practices, including limited fertiliser use (Papenfus, 2002; Koczberski and Curry, 2003; Euler et al., 2016), infrequent harvesting (Lee et al., 2013; Euler et al., 2016), and bad post-harvesting practices (Tagoe, Dickinson and Apetorgbor, 2012). RSPO includes BMPs in their standard (RSPO, 2013) and Hutabarat et al. (2018) conclude that increases in oil yield are possible if Good Agricultural Practices (GAP) instructions are followed (Hutabarat et al., 2018).

On top of this, harvesters have to be knowledgeable or supervised to identify the right moment for harvesting. Post-harvesting practices are also relevant because FFBs develop Free Fatty Acid (FFA), which affects the quality of the processed oil if the rate is higher than 5%, and results in a lower CPO price. As FFBs have to be processed within 24h to control the presence of FFA, mills have to minimize the time FFBs remain in the loading ramp prior to processing. Finally, fruits in bunches have a lower oil content than loose fruits. Loose fruits are fruits that have fallen from the palm tree because they have achieved maximum ripeness. Ripe loose fruits may reach a 48% oil content compared with an average of 22% of fruits on bunches[12]. In the price calculation formula (Figure 3.1) these factors are not taken into account. So, in case applying RSPO sustainability practices would increase the quality and quantity of the oil content in FFB, this would not be reflected in the price farmers receive. This, in turn, has consequences for farmers considerations when deciding on production and sustainability practices.

3.5.4. The K-index

In the price formula the oil content is fixed (based on the palm age) and CPO and PKO prices are based on international market prices, and only the K-index is not fixed. The K-index is adjusted at least once a month by a provincial committee composed of the following stakeholders: provincial government, forestry and plantation office, the mill, the farmers (suppliers), research centres and other institutions (Amanah, 2014). The K-Index is determined taking into consideration taxes, marketing and transportation costs, selling volumes, and processing costs like loading ramps and machines. However, according to Sawit Watch there is no transparency about what costs are exactly included (Sawit Watch, 2014).

12 http://www.ipni.net/ppiweb/filelib.nsf/0/9BF9AC573FE5E3DB48256B49002F64E7/$file/OP%20HB%20Mat%20p1-8.pdf

According to SawitWatch, the K-index is calculated based on the mills' production costs. All mills propose a certain value of the K-index, and their average is the one assigned by the provincial government. The K-index is calculated by adding up the processing, maintenance and indirect costs, which are then divided by the monthly production. Details of the precise calculation seem to be missing in the contract, which makes understanding the intricacies of determining the price challenging. Details on how FFBs should be graded by the buyer, and which technology and methodology hereby should be used, are not included in the contract either. This lack of transparency creates a potential for opportunistic behaviour not only in terms of the price of FFBs, but also in the weighing using scales, and in calculating the Oil Extraction Rate (OER) (Cahyadi and Waibel, 2016; Maryadi, Karim and Mulyana, 2004).

The K-index is used to allow the mill to deduce its operational costs from the FFB price: including costs for transport, maintenance of plantations and roads (LINKS, 2014), which can reach up to 80% (SPKS, 2014). Through the K-index, all smallholders, including independent smallholders, take on the mill's operating costs. The government set the permitted range of processing costs but there is a lack of clarity about what indirect costs are included. In the words of a SawitWatch representative: "It could even be that a person from the mill is declaring travelling costs, lobbying/entertainment costs as indirect costs. We need transparency on the K-index. This is a long debate because it does include big money. Farmers should have a role in calculating the company K-index" (SawitWatch, 2014).

3.5.5. Comparing FFB farmgate prices

Amanah farmers received varying prices for their FFB. Figure 3.3 shows the FFB farm gate prices for the periods 2002-2005 and 2011-2013, before and after RSPO certification, for palm trees three years old and 10-20 years old. These two palm age categories represent the price extremes, i.e., three-year-old palm trees receive the lowest price, and 10-20-year-old palm trees the highest price. The differences in prices between the three and the 10-20-year-old palm trees

remains constant over time which can be attributed to the estimated difference in oil content, which remains fixed. These farm gate prices fluctuated significantly over these two periods, with an average (across all palm ages) FFB price of 628.41 Rupiah/Kg between 2002 and 2005 and 1400.34 Rupiah/Kg between 2011 and 2013, according to the contractual data. This is in line with the price claimed by the farmers participating to the survey: their average price in 2013 was 1224.83 Rupiah/Kg, with a minimum of 1000 and a maximum of 1477 Rupiah.

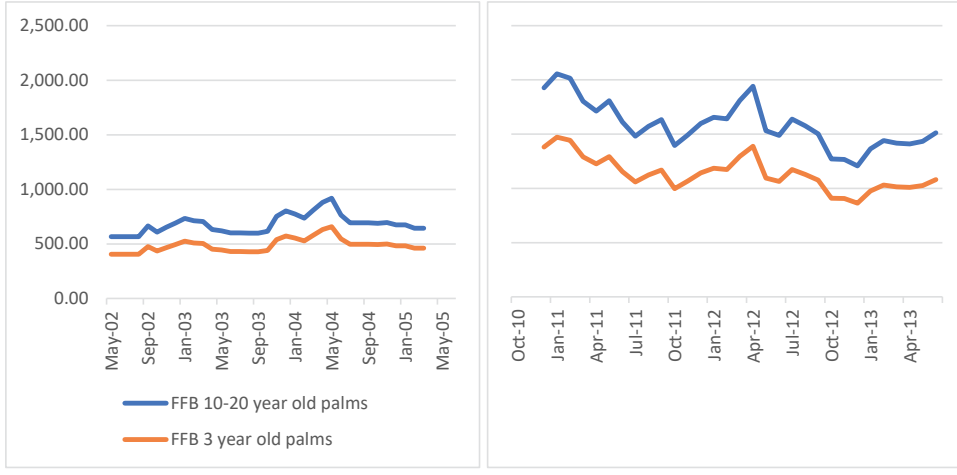


Figure 3.3: *FFB farm gate prices for Amanah (2002-2005 and 2011-2013)*

Across the two periods, the K-index varied substantially: between 2002 and 2005 the average K-index was 82.1% (Figure 3.4) and between 2011 and 2013 it had increased to 87.4% (Figure 3.5).

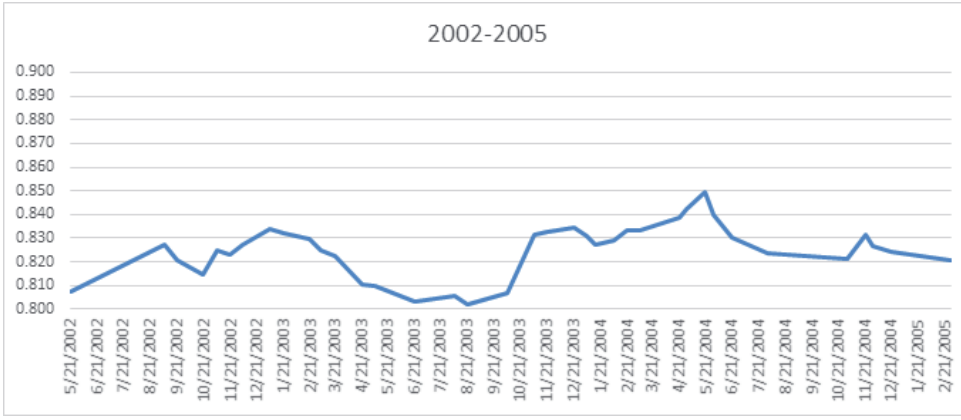


Figure 3.4: *K-index over time (pre-RSPO, 2002-2005)*

Figure 3.5: *K-index over time (post-RSPO, 2011-2013)*

Given that the estimated oil content of FFB remained constant over these periods, this implies that the share of the CPO and PKO price that was transferred to the farmers increased proportionally to the increase in the K-index. As the K-index went up by 5.3 %, the share of the

price going to the farmers should have increased by 6.5%, calculating from a base of 82.1%. This suggests that the adoption of RSPO practices shifted the K-index in favour of farmers.

3.5.6. Farm gate prices compared to international prices

When comparing the farm gate prices Amanah farmers received with the international CPO and PKO prices, we need to perform two conversions. First, international prices for CPO and KPO are estimated in US dollars per metric ton and need to be converted to Rupiah per kilogram. To this end, we utilized the US Dollar to Rupiah exchange rate for each monthly contract price as identified by Indexmundi (2014). Second, we need to aggregate the CPO and KPO prices after scaling them with respect to the assumed oil content, to generate international FFB prices—or the price that would be paid to farmers if they sold on the international market to buyers that assume the same oil content for their FFB, and apply a fixed K-index of 1 (100%). To do so we need to multiply the CPO and PKO prices by their oil contents as estimated in Table 3.5, and combine them. Figure 3.6 presents the outcome of these conversions, visualizing the gap between the prices paid to smallholders and the international prices over the two periods.

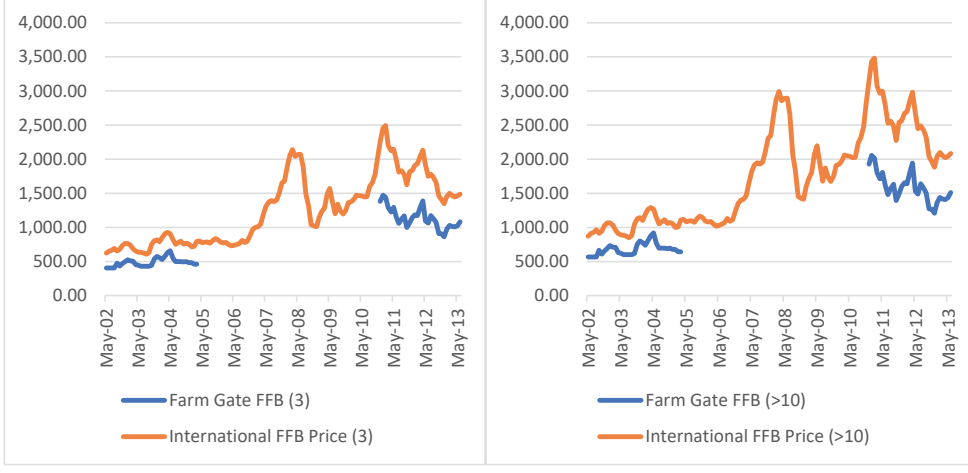


Figure 3.6: *International vs. Farm Gate FFB prices, 3 (left) and 10-20 year (right) old trees*

It is clear that the gap in prices has increased between over the two periods. In the case of 10–20 years old palm trees, the average international FFB price in the pre-RSPO period (2002-2005) was 1031.47 Rupiah/Kg, against an average farm gate price of 681.15 Rupiah/Kg; equivalent to an average gap of 34.0%. In the post-RSPO period (2011-2013), the average international FFB price was 2536.59 Rupiah/Kg, while the farm gate price was 1587.25 Rupiah/Kg; equivalent to an average price gap of 37.4%. Thus, in absolute terms, the price gap increased from 350.32 Rupiah/Kg to 949.34 Rupiah/Kg. We then performed a regression analysis comparing the price gap data over the two periods in relative terms. This reveals that the price gap has increased by 10.2%, (significant at 1% level ($t=3.06$, $p=0.03$)). Thus, farmers received a significantly smaller share of the international price after RSPO practices were introduced.

This is in sharp contrast with our finding that the K-index had increased over time. If, as we have seen, the CPO and PKO content is fixed (at any given palm age), and the K-index has increased by an average of 6.5% over the two periods, the question is how the share of the international price smallholders receive could drop by over 10%?

The only plausible explanation behind this apparent contradiction is that the 'claimed' market price used in the formula and contract is different from the 'actual' international market price. This difference may be explained by the costs incurred by other actors downstream in the value chain, before the palm oil is sold on international markets. For example, transportation to refineries, refining costs, packaging etc. However, it is hard to understand why and how such costs should increase so dramatically. In the 2002-2005 period, the 'claimed' CPO market price as per the contracts, divided by the 'actual' international price, as found on Indexmundi, is 93.6%. In the 2011-2013 period, after RSPO practices were introduced, the claimed CPO market price divided by the international CPO price fell to 83.3% on average. There is almost a threefold increase in the share of international price taken away from the contract price. This

study could not establish the reason for this increase in the price gap between the 'claimed' and the actual international CPO and PKO market prices.

3.6. Discussion and Conclusions

We found a lack of transparency in determining the price of palm oil, which limits the capacity of farmers to contest the prices offered by the mill. Second, there is dependency – not only in terms of sale but also in accessing inputs – of the Amanah group towards the cooperative and the mill. This means that even with a more transparent oversight over the way in which the 'claimed' CPO and PKO prices are determined, it is likely that independent smallholders do not have the power to reject the price offered by the mill.

Studies on transparency tend to focus on the regulatory system and information sharing related to environmental impacts – with a particular attention to environmental indicators at production level – while other aspects that may affect sustainability of value chains and responsiveness of upstream actors are less investigated. However, as this study showed, it is important to go beyond the environmental indicators and analyse market and supply chain dynamics to understand the presence of enabling conditions for farmers motivating them to commit to sustainability practices and remain part of sustainability certification programmes.

This paper analysed how the market structure in which the first RSPO-certified independent smallholder association in Indonesia finds itself, may affect farm gate prices and the transparency in establishing them. We found that price determination in Indonesia follows a system in which monopsonistic buyers calculate the price based on the age of palms, regardless of the cultivation and harvesting practices and multiply this by a K-index for which the calculation is not transparent. Although the K-index is determined by agreements between the

government and the sector, not all actors have the same power. While the K-index was increasing substantially between 2002 and 2013, implying that a greater share is flowing towards smallholders after RSPO practices were introduced, actually the portion of the international market price received by smallholders decreased significantly. We argue that this reduces incentives for smallholders to increase quality and implement environmental sustainability practices. Without a clear price incentive, it remains doubtful why other independent smallholders would follow the example set by the Amanah group and engage in the costly transition to sustainable farming practices. Without such incentives, the penetration of RSPO practices into the Indonesian palm oil value chain can probably only occur through top-down impositions from processing mills.

We argue that transparency governance for green supply chains should not only focus on training or adoption of best management practices, but also include the upstream value chain structure where price and production flows are determined. Indeed, the RSPO needs to reflect on the advocacy role it can play with regards to the potential constraints to sustainability promotion resulting from price determination mechanisms. Including smallholders in the debate around pricing policies within the RSPO framework would help solve some of the intricacies that local power dynamics bring to the sustainability arena. Modern transparency brokers such as certification bodies, standard organizations, International Organization for Standardization (ISO) and others, should also take into account price transparency, local power and dependency dynamics around the upstream part of the value chain when aiming for the increased uptake of environmental sustainability programmes.

This paper opens a debate on the role of value chain transparency, and in particular price determination mechanisms and upstream chain dynamics, in determining the uptake of environmental sustainability practices. These mechanisms and dynamics affect the long-term chances of success and growth of sustainability standards themselves. Sustainability

transparency cannot be interpreted only as a necessity for upstream actors to report on environmental indicators. There should be a transparent two-way information flow that creates an enabling environment for sustainability practices to self-sustain.

Chapter 4

Opportunities and Bottlenecks for Upstream Learning within RSPO Certified Palm Oil Value Chains: A Comparative Analysis between Indonesia and Thailand

Abstract: Smallholders play a key role in implementing best management practices that increase productivity and reduce environmental effects. However, they often lack the knowledge to implement these standards. This study investigates if and how RSPO certification fosters upstream learning to improve farming practices. Taking a comparative approach between Thailand and Indonesia we find that the current structure of the value chain is not always well-suited for upstream learning beyond knowledge transfer. In particular, farmers in Indonesia suffer from the delegation of practices to the mill and cooperative, and from incentive-incompatible pricing practices, limiting the extent to which farmers absorb new knowledge on farming practices. In Thailand instead, price incentives based on quality are more developed, and only hindered by the presence of intermediary collectors. This makes that Thai farmers aresystematically more aware of farming and environmental practices, and more likely to report compliance with RSPO principles and criteria. Their relatively higher independence in farming decision-making, however, results in weaker peer-to-peer interactions and higher deviations from best management practices, with consequences both for productivity and quality. This research highlights the major bottlenecks in upstream learning within RSPO-certified palm oil value chains in Indonesia and Thailand. Addressing such bottlenecks is a precondition to improving smallholders' farming practices.

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4.1. Introduction

The continuously growing global demand for palm oil translates into increasing conversions of forests and encroachment of fragile ecosystems rich in biodiversity—exacerbating climate change impacts (Barthel et al., 2018; Butler & Laurance, 2011; Fargione, Hill, Tilman, Polasky, & Hawthorne, 2008;Koh & Ghazoul, 2008; Sanders, Balagtas, and Gruere, 2013; Saswattecha, Hein, Kroeze, and Jawjit, 2016b; Saswattecha, Kroeze, Jawjit, and Hein, 2015b, 2016c). In order to minimize these impacts, researchers and stakeholders have suggested a more sustainable mode of palm oil production: maximizing the use of existing plantation areas, partially through the adoption of more efficient andsustainable farming practices, and partially through choosing optimal planting materials and strategicland management. This transition is, however, not universally applicable. And even where possible, implementation may be faced with delays and challenges (Azhar et al., 2015; Azhar, Saadun, Prideaux, & Lindenmayer, 2017). The implementation of innovative practices, such as Best Management Practices (BMPs), requires knowledge (World Bank & IFC, 2011) and a shared understanding of what sustainability means and, in particular, what it entails in practice for smallholder farmers (Saadun et al., 2018). These complications have received insufficient attention as most attention has been given merely to providing training to smallholders.

This study seeks to close this gap by providing an empirical understanding on how different upstreamchain contexts, and related actor relationships, affect knowledge transfers, as well as the prospects that knowledge evolves into learning towards sustainable palm oil production. In doing so, our studyintends to contribute to the debate and conceptualization of social learning. It does so by exploring how this takes place among oil palm farmers in Indonesia and Thailand in three cases. We compare smallholders from Indonesia and Thailand participating in the process of certification through the Round Table on Sustainable Palm Oil (RSPO)—an

international voluntary sustainability standard. Indonesia and Thailand are important actors in palm oil production, but with very different historicaland present dynamics. Indonesia is a country with a long history of palm oil production, while Thailand is a country with a more recent expansion of palm oil. Indonesia is the world's leading palmoil producer with 42 million tons, while Thailand is ranked third with 3 million tons (Indexmundi, 2020). However, Thailand had the highest growth rate of palm oil production worldwide between 1999 and 2019—the only country averaging a growth of over 10% per year over this period (Indexmundi, 2020). Furthermore it expects to expand its plantation area to 1.6 million hectares by 2029, compared with 650,000 hectares in 2011 (Yangdee, 2007).

The rest of the paper develops as follows. The next section discusses the theoretical framework applied, section 3 gives an overview of the palm oil supply chain in Indonesia and Thailand. Section4 presents our research methods and introduces the selected case studies. Section 5 presents the analysis of the data. Section 6 discusses these findings while section 7 draws the overall conclusions.

4.2. Theoretical framework and literature

Sustainability remains a seriously debated concept in science and politics. The concept of sustainability is *contestable* because of the lack of an authoritative and universally valid definition, itis *normative* given that it generates pathways for which action to follow and it is *revolutionary* because it requires transformation of existing systems and institutions (Laws & Loeber, 2011).

In this study, we discuss sustainability within the context of the global palm oil value chain (Gereffi,1995; Kaplinsky & Morris, 2000). In this globalised value chain producers are linked with distant buyers (Siregar & Sugino, 2008) and these buyers transmit demands and requests

to the primary producers (Bolwig, Ponte, Du Toit, Riisgaard, & Halberg, 2010). It is important to analyse whether and how these demands, in particular those related to sustainability, are transformed into innovative producer practices.

The adoption of sustainability practices by oil palm smallholders is an interesting case of knowledge transfer and social learning. Implementing sustainable standards by oil palm smallholders requires supplying technical knowledge on these standards and the capacity to transform the transferred knowledge into practice. Initiatives that focus only on knowledge transfer have been repeatedly unsuccessful in changing smallholders' practices (Mancini, Termorshuizen, Jiggins, & van Bruggen,2008; Martin, Rieple, Chang, Boniface, & Ahmed, 2015), especially if the change involves shifting from a well-established set of economic relationships (Deans, Ros-Tonen and Derkyi, 2018).

In this study we use the concept of knowledge transfer as being part of the more general concept of learning. In a system innovation context, the learning process through communicative interaction is represented by discursive exchanges of knowledge, actions and relations (Beers, van Mierlo, & Hoes,2016). Hereby, knowledge refers to context exchanged (Wals, 2007), actions to agreements, decisions, and other forms of action that are voiced during communication, and relations refers to roles, identities and positions (Leeuwis & Aarts, 2011; Pahl-Wostl, 2006; van Mierlo, Arkesteijn, &Leeuwis, 2010). Learning outcomes occur when knowledge, actions and relations become substantively intertwined (see Argyris & Schön, 1978). The learning process may, however, have different outcomes depending on the specific discursive setting, which deserves as much attention.

The potential for internalizing new practices is affected by the specific organizational context in which smallholders operate, which depends in turn on the relevant material (tangible goods) and non- material (e.g. information and knowledge) flows (Granovetter, 1985; Murdoch,

Marsden, & Banks, 2000). The success of a system innovation initiative depends on the capacity of the institutional setting to change along with the initiative itself (Elzen, van Mierlo, & Leeuwis, 2012; Regeer, Hoes,& van Amstel van Saane, 2009; van Mierlo, Janssen, Leenstra, & van Weeghel, 2012).

We also use the concept of *social* learning, which has its origin in behavioural psychology, and whichBandura (Bandura, 1977:39) defines as "*casual or directed observation of behaviour as it isperformed by others in everyday situations*". Learner and environment affect each other in acontinuum of feedback iterations; the learner changes the environment, which in turn changes the learner (Pahl-Wostl et al., 2008). The environment is composed of individuals and organizations andtherefore learning takes place through interactions with them (Lave & Wenger, 1991). Social learning processes imply a change in understanding derived from those interactions (Reed et al., 2010).

Although social learning has been framed in general as a form of learning that relies on inputs from others (Glasser, 2009), we want to specifically study the contexts in which social actors change their minds after interacting with others (Schneider, Fry, Ledermann, & Rist, 2009) and whether this happens as an act of imitation or as a process of 'learning together to manage together' (Tran, James,& Pittock, 2018). We study the specific settings that may or may not create social learning. Accordingto Gereffi (1995) knowledge transfer and social learning in value chains are embedded in an institutional framework that directly influences the possibilities for actors lower in the chain to acquire information and technology from actors higher up in the value chain (Fromm, 2007; Gereffi,1995).

We intend to contribute to the literature on social learning, by studying its dynamics in the specific context of oil palm smallholders in Indonesia and Thailand. To the best of our knowledge –notwithstanding the growing importance of palm oil certified value chains and

their potential impacton global environmental challenges – this is the first study to investigate how upstream arrangementsin these chains, resulting in information and material flows, create opportunities (or not) for social learning. In fact, this study goes beyond the concept of knowledge as exchange of content between actors, and applies the concept of knowledge transfers as used in organization theory (Argote, Ingram,Levine, & Moreland, 2000; Blackler, 1995). It focuses on the extent to which knowledge can be "embodied", rather than merely encoded. *Embodied knowledge* is engendered by interactions between actors and their (interpretation of the) environment, as well as by explicit and non-explicit informationflows.

We operationalize the concept of *social learning* by analyzing learning by *experience* and learning by *interaction*. First, learning by experience is further operationalized as learning *by doing*: experiencing (actions) and reflecting (on actions taken) (Arrow, 1962; Rosenberg, 1982). This is single-loop learning: from experiment-based practices to improvement of routines and performances(Pahl-Wostl, 2009; Tàbara & Pahl-Wostl, 2007). To study this we analyse to what extent smallholdersare exposed to the doing themselves and what is delegated to other individuals or entities. Learning *by deciding* (deciding on the next actions based on previous actions and their effects) (Kolb, 1984) isthe second part of learning by experience and this is studied by observing to what extent smallholdersare making choices and are able to reflect on choices previously made. Secondly, learning by interaction is understood as interacting with other individuals (Lundvall, 1992) operating in the samecontext (C. Argyris, 1990; Forester, 1999; Grin, J. and Hoppe, 1995; Grin, J. and van de Graaf, 1996;Leeuwis, C., 2004; C. Leeuwis, 2000; Mendes Betim, Resende, De Andrade Junior, Joseane, & PetterHermes, 2018; Schön, 1983; Wals, 2011). These other individuals may be horizontal actors,involved in the same production steps, or vertical actors downstream in the chain (Bolwig et al., 2010;Marsden, 2013; Ros-Tonen, Van Leynseele, Laven, & Sunderland, 2015; Verschoor, G. M. Muradian, Bolivar, & Ochoa, 2011). According to Deans (Deans et al., 2018) both farmers and buyers profit from

being part of a certified chain. Finally, double- and even triple-loop learning may occur as well. Double-loop learning consists of transforming, innovating and creating forms of institutional interaction, whereby not only new actions are taken but where also the assumptions behind those arenew (Sol, Beers, & Wals, 2013)**.** It is an exploratory process through which social actors experiment with innovations and try to overcome constraints. Triple-loop learning involves changes of the values,beliefs or norms that are behind operational assumptions and actions (Argyris, 2003; Keen, Brown, & Dyball, 2005; Pahl-Wostl et al., 2011).

The research identifies opportunities for learning during the following critical phases of oil palm production: planting, farming, selling and grading (Figure 4.1). The analysis results in a score on the learning opportunities for each type. The score is based on: 1) the capacity of the operator and 2) the opportunities for learning loops in the institutional context.

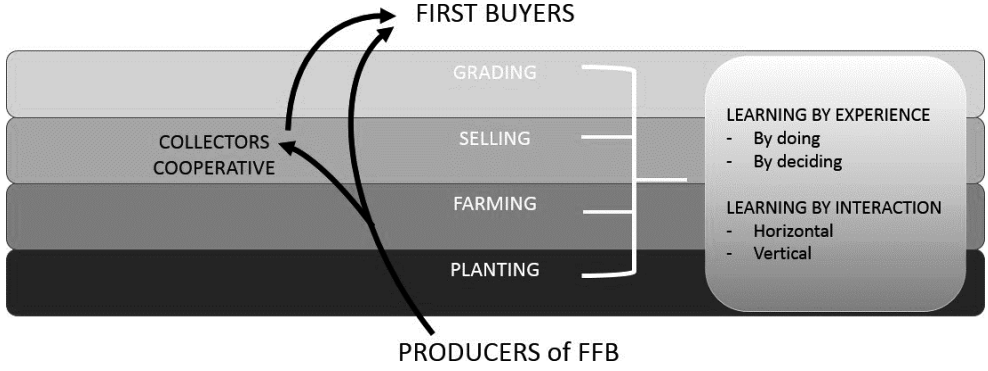

Figure 4.1: *Analytical framework: potential for learning in the value chain phases*

First, we study which specific dynamics and conditions allow the individual farmer to move from knowledge acquisition to learning; we assess whether farmers who take decisions independently aremore exposed to learning compared with farmers participating in value chains managed by the mills.Secondly, we study whether different value chain structures lead to different opportunities for learning. We look at the relation between the local institutional framework and the opportunities forsocial learning. We explore whether interaction is a matter

of proximity, whether learning results from a set of instructions, from mistakes (Argyris & Schön, 1978) or from dissonance and co-creation(Wals, 2011), and what the conditions are that create dissonance. We do this with the pre-assumptionthat our case studies represent a range from scheme farmers with very formalised vertical interactionsto independent farmers with less structured interactions with buyers.

4.3. Palm oil upstream in Indonesia and Thailand

In Indonesia the area of smallholder oil palm cultivation more than tripled between 2000 and 2011 (Aidenvironment, 2013). Oil palm cultivation expansion is the 'greatest single driver of deforestation in Indonesia, accounting for about a quarter of all forest loss' (Greenpeace International, 2014). In Thailand around 76 per cent of the land under oil palm cultivation is managed by smallholders (OAE,2020; Teoh, 2010; World Bank & IFC, 2011) and 75% of Thai oil palm growers are small scale working plots (Chuasuwan, 2018). Smallholders tend to underperform in terms of productivity per hectare compared with larger plantations. For instance, Indonesian scheme and independent smallholdings yielded respectively 6% and 40% lower compared with scenarios for good management practices for smallholders (Aidenvironment, 2013).

The RSPO provides an institutional framework for social learning towards sustainable intensification,also for smallholders. The RSPO is a global stakeholder-based association that developed a voluntarystandard for sustainable palm oil and both Indonesia and Thailand have been incorporating this standard through co-supported projects. Thailand has been a pioneer with a stakeholder project resulting in the first RSPO-certified group of independent smallholders (RSPO, 2012). In Indonesia,RSPO certification was initially undertaken by a scheme of Musim Mas (2011) and later by a group of independent smallholders in Riau district (2013). However, after these initiatives, the expansion of RSPO-certification among

independent smallholders remained limited.

4.3.1. Indonesian palm oil sector

Indonesia has 'scheme' and 'independent' smallholders in oil palm cultivation.[13] Schemes connect smallholders to a particular mill and its plantation (Sawit-Watch, 2014). In these so-called "Nucleus Estate Schemes" (NES) (Zen, Barlow, & Gondowarsito, 2005) a private company receives a portionof land from local farmers and constitutes a core (estate) plantation, locally called *'inti'*. The rest of the land where the company also plants oil palm, is divided into smallholdings and returned to the scheme farmers and their households, locally called '*plasma*' (McCarthy, 2010; Rist, Feintrenie, & Levang, 2010). In addition, these households receive a small piece of land for food crops around theirhomestead. Until the palm trees are mature, farmers may work occasionally on the nucleus estate. Farmers have to return the preparation costs when the palms are in their fifth year by selling their FFBs to the plantation mill. The exact mode of these arrangements has changed since the start in the 1960s (Pramudya, Hospes, & Termeer, 2017) but the model remains being used by the Indonesian government and private companies as a vehicle for supporting smallholder participation in the sector.

Independent smallholders do not have direct relations with mills. They may sell to any mill but theyare constrained by the requirement to process FFBs within 24 hours after harvest to preserve the quality, because a larger time gap would increase the Free Fatty Acid (FFA) content in Crude Palm Oil (CPO) (Tagoe, Dickinson, & Apetorgbor, 2012). Moreover, smallholders usually have a contractwith a collector (a larger producer or a local trader) as mills prefer to deal with larger volumes (Aidenvironment, 2014).

[13] Scheme Smallholders are farmers, landowners or their delegates that do not have the: 1) Enforceable decision-making power on the operation of the land and production practices; and/or 2) Freedom to choose how they utilise their lands, type of crops to plant, and how they manage them (whether and how they organise, manage and finance the land). (See also smallholder and Independent Smallholder). All smallholder farmers that are not considered to be Scheme Smallholders are considered Independent Smallholder farmers (RSPO, 2019).

4.3.2. Thai palm oil sector

Thailand's oil palm growers are predominantly independent smallholders (Aidenvironment, 2013; Colchester et al., 2011). Smallholders (owning less than 50 ha of land) cultivate on average around 4ha while large plantations cover on average 800 ha. Most farmers do not have a contract with a mill and FFBs are collected through local intermediaries, so-called ramps. Ramps are usually equipped with large trucks bringing FFBs from several smallholders to the crushing mills. They also have become providers of a wide range of services, including transportation, as well as support in harvesting, fertilizing, pruning and planting. Ramps collect large volumes of FFBs and can bargain a higher price with the mills. Mills may have relationships with several ramps in order to ensure their supply is met throughout the year.

4.4. Materials and Methods

4.4.1. Data

For this study, data has been collected in 2013 in Thailand and Indonesia. Respondents for the survey have been randomly selected from areas with early RSPO certification and they are divided into three samples that we used as case studies. We selected Musim Mas, the first RSPO certified scheme in Indonesia, the Amanah Group, the first independent smallholder certification project in Indonesia, and the (first) GIZ-RSPO project in Thailand. The research area in Indonesia is Sumatra, where 70% of the country's oil palm plantation area is located (McCarthy, 2010). For Thailand the provinces of Surat Thani and Krabi were selected being the major production sites (OAE, 2012). In total, we selected 307 RSPO-certified farmers (101 in Thailand and 206 in Indonesia, of which 104 from the scheme and 102 from the independent group). Survey data were analysed using STATA software, to conduct descriptive statistics and regressions. In addition, 31 qualitative interviews were held with farmers (4), ramp owners (10), management of mills (4), a palm oil refinery, GIZ (2), an expert from Prince of Songkhla

University (Thailand), NGOs (5), consultants (2), an RSPO representative and theTrade Union Association for palm oil producers (SPKS) in Indonesia.

By studying the context and interactions between actors, we assessed the opportunities for (social) learning within RSPO-certified value chains in Indonesia and Thailand. We used the RSPO-defined Best Management Practices (BMP) as a reference standard. We particularly studied learning with regard to the following issues: variety of oil palm tree when planting, tree density, weeding and pruning, water and soil management, pesticide use, harvesting and post-harvesting practices. We alsoanalysed the criteria for FFB-grading because they may also influence farmers' farming and harvesting practices.

4.4.2. The case studies

4.4.2.1. Musim Mas scheme (Indonesia):

Musim Mas is the first RSPO-certified scheme in Indonesia (certified in 2011). The private companyMusim Mas provided financial and technical assistance to develop villagers' arable land into oil palmsmallholdings. The project has two sites: one in West Sumatra Province with PT Agrowiratama (1524 ha and 762 smallholdings) and one in Riau Province with PT Musim Mas (1667 ha and 819 smallholdings). The project was designed with a strong involvement of the Musim Mas company in the cultivation of the oil palm plots owned by the smallholders. Smallholders work on the company plantation where they learn best agricultural practices. The company also assisted in the constitutionand management of a smallholder cooperative. The company adopted two models: in West Sumatra a low-involvement KKPA scheme (Koperasi Kredit Primer untuk Anggota: Primary Members Credit Cooperative), in Riau a high-involvement KKPA scheme. In both cases, the company was responsiblefor clearing the land and planting. In the first model smallholders would not need to conduct any activity on their plot but would receive a monthly payment corresponding to the production coming from their

plot. They could, however, work on their own plot under Musim Mas Group managementto increase their income. The second model encouraged the active involvement of smallholders so training and extension services on oil palm practices and techniques were provided. In 2007 a Sustainability Department was constituted to support, coordinate and monitor the implementation ofRSPO sustainability requirements. A gap analysis was conducted in 2009 and corrective actions, including trainings, were planned to end non-compliance. In 2010 a second gap analysis was conducted and progress was measured. After an external audit in 2010, the scheme was certified on March 2, 2011 (The Planter, 2012).

4.4.2.2. The Amanah Group (Indonesia):

In 2011, the Amanah Independent Palm Oil Smallholders Association started with the objective of acquiring RSPO certification, as the first group-certification of independent smallholders in Indonesia. The project was supported by WWF Indonesia, the RSPO, the Ministry of Agriculture, theRiau Provincial Government, and Carrefour Foundation International. The mill involved was Inti Indosawit Subur (IIS), a subsidiary company of the Asian Agri Group. The group received certification on 29 July 2013. The group is composed of 349 members organized in 10 sub-groups, cultivating 763 ha in three villages (Bukit Jaya, Trimulya Jaya and Air Mas). RSPO staff trained a facilitator (from the government extension service) to train smallholders and since 2012 they have received 11 trainings on different topics.

Most farmers participating in this project are also scheme-farmers under IIS (thus they own land bothoutside and inside the scheme). Only 70 out of 349 RSPO certified independent farmers were not partof the IIS scheme. Being part of the scheme facilitated the implementation of the RSPO standard given that the group could use the existing setting of an organized cooperative to structure different services including the collection and sale of FFBs. So, although the Amanah farmers are free to sell to any mill, they have arrangements for selling to Asian Agri

IIS only, provided that the latter is interested in certified FFB (WWF, 2014).

4.4.2.3. The RSPO-GIZ project (Thailand):

In Thailand, RSPO certification was promoted in 2010 by the German agency for development cooperation (GIZ) in order to achieve sustainable palm oil production for bio-energy. GIZ together with the Thai government Office of Agricultural Economics (OAE) and other partner institutes started a project to increase productivity, improve FFBs quality and internalize sustainability through BMPsby organizing trainings. In collaboration with four mills, United Palm Oil and Univanich in Krabi province, Southern Palm Oil in Surat Thani province and Suksomboon Palm Oil in Chomburi province, plus the Aoluek cooperative (GIZ, 2012). In total, around 500 farmers were certified (GIZ,2014).

4.4.3. Characterising the sample

To characterise respondents, we collected information on standard demographic statistics, which are also commonly used in literature to assess drivers of environmental behaviour (Burton, 2014). Thesegeneral characteristics provide the background necessary to analyse the learning process. There are several statistically significant differences between the three case studies (See Table 4.1).[14] The Thai sample is significantly older than the two Indonesian ones and their education is significantly higher.

Most Indonesian scheme farmers are male (93%) compared with the other two samples (74%). Usingan asset index as a proxy for wealth (O'Donnell, Doorslaer, Wagstaff, & Lindelow, 2008), standardized across all samples, we found that the Thai farmers have significantly more assets and Indonesian scheme farmers significantly less than the independent smallholders. The Thai sample hasa lower prevalence of income generated from non-agricultural activities (32%

[14] We do not make specific assumptions or derive direct conclusions based on these statistics. However, we use them to provide a picture of how different the starting point of each sample is as part of the in-depth analysis of context.

against 43% for both Indonesian groups), meaning that for many of them agriculture is the main way of generating income. They also have larger oil palm areas. Finally, the Thai sample contains more respondents certified against other standards and is also the group which received most RSPO trainings, with 98% of farmers having attended at least one training compared with Indonesian scheme farmers only 41%.

Table 4.1: *Characterising the respondents*

	Thai independent	Indonesian independent	Indonesian scheme	Differences		
Variables	A	B	C	B-C	B-A	C-A
Age	51.37	44.01	46.54	-2.53	-7.36***	-4.83***
Education	7.22	4.15	1.99	2.16***	-3.07***	-5.23***
Gender	0.74	0.93	0.74	0.19***	0.19***	-0.00
Household Size	4.38	3.75	4.38	-0.63***	-0.63***	-0.00
Asset Index	0.80	-0.23	-0.55	0.32**	-1.03***	-1.36***
Non-farm Income	0.32	0.43	0.43	-0.001	0.12*	0.12*
Other Certification	0.11	0.03	0.02	0.01	-0.08**	-0.09***
RSPO Training	0.98	0.62	0.41	0.20***	-0.36***	-0.57***
Observations	101	102	104	-	-	-

Note: Stars refer to t-test results on differences: *** = p<0.01, ** = p<0.05, * = p<0.10

4.5. Analysis: learning opportunities and bottlenecks

4.5.1. Planting

Choosing the right planting material (variety, size and height of seedlings, from reliable sources) anduse the correct plot design (tree patterns and density) affect the potential yield of the future plantation and requires prior knowledge. On average, Thai and Indonesian independent producers have 12 yearsof experience in oil palm production and Indonesian scheme producers 9 years.

Most Indonesian scheme farmers engage for the first time with the oil palm trees only four years afterthey were planted because mills prepared the land that farmers received when the trees were mature (Zen, Barlow, & Gondowarsito, 2005). Therefore, scheme farmers have limited knowledge on land preparation and good quality seedlings and no opportunities for learning.

Independent smallholders in both Indonesia and in Thailand have the freedom to select planting materials and choose agricultural practices, which allows them to experiment and learn-by-doing. Among respondents in Indonesia we found that the percentage of independent smallholders (Amanah sample) that know theoil palm variety they are cultivating and could name at least one good variety is distantly higher thanfor the scheme farmers (Musim Mas). All independent smallholders in Thailand know the variety used and could mention a good variety in 66.3% of the responses (Table 4.2).

On the other hand, independent smallholders face greater technical problems and are often confrontedwith their lack of knowledge on oil palm (GIZ, 2014). For example, it is not uncommon for independent smallholders to buy oil palm varieties sold at low prices but often of poor quality. Sometimes they even collect hybrid seeds from the ground, which are actually sterile, and only discover this once the trees are already four years old, and turn out to be unfruitful (interviews, RSPO independent Indonesia). Some good practices concerning the preparation of the plantation (e.g. triangle patterns, distance between palms, distance between rows of palms) cannot be applied once the palm trees have already been planted. In case independent smallholders get to know these BMPsafter planting, they can only apply this when they replant (around twenty-five years later).

We found no difference between scheme and independent smallholders in Indonesia regarding the average number of trees planted on one hectare (around 130). Yet, there is a clear difference in the variation around this number. The 50% higher standard deviation for independent farmers indicates their greater freedom of choice, but also their potential lack of knowledge about the recommended number for optimizing productivity. Among farmers in Thailand this is even higher; while the “average” Thai farmer is in line with BMP about planting distance, only 42.6% of them actually comply with the recommendation. For all cases, learning seems quite limited for this phase of the value chain (see standard deviation Table 4.2).

Table 4.2: *Knowledge of planted variety, good variety and palm trees per hectare*

Knowledge of:	Thailand	Indonesia independent	Indonesia scheme
Variety planted	100%	89.2%	24.0%
Good variety	66.3%	71.6%	29.8%
Palm Trees/hectare	127.1	129.5	132.5
Min-Max	28-208	60-163	115-148
SD* palm trees/ha	32.9	9.1	6.8

Note: *Standard Deviation

4.5.2. Farming

Indonesian scheme farmers are not necessarily the main workers on their plots and this may affect learning on farming practices and maintenance 'by-doing'. Maintenance includes clearing theplantation site, removing tree stumps and maintaining the roads, for one week per month. Accordingto SPKS, smallholders rarely receive training on maintaining the oil palms and monitoring maintenance practices was hardly ever conducted (SPKS, 2013).

The awareness among farmers of their RSPO-certification status is low as only 60.6% of the respondents participating in the Musim Mas scheme was aware of this, compared with 92.2% for theindependent smallholders in Indonesia and 98% in Thailand.

Important farming activities relate to fertilizer application, weeding and pruning, and pest control. There are significant differences in the frequency in which these practices are applied. In particular, Thai farmers fertilize, circle weed, and prune significantly less frequently than their Indonesian counterparts (Table 4.3). The total amount of fertilizer they use per hectare is also much lower: Thai farmers reinsert on average only 25.6% of the nutrients needed for oil palm cultivation (Goh & Härdter, 2003) through fertilizers, compared with 62.5% for independent farmers and 86.1% for scheme farmers in Indonesia. This difference may be explained by the pre-financing scheme for inputs that Indonesian farmers benefit from: they request inputs from the mill, which are deducted from the FFB sales at the time of harvest (WWF, 2014). Scheme farmers also typically delegate fertilization to teams managed by the mill, resulting in higher and more timely fertilizer application.When comparing the frequency

of farming practices, Indonesian independent farmers most frequentlyfertilize and weed, but they prune less frequently than the other groups (Table 4.3).

Table 4.3: *Average pre-harvest practices scores of RSPO farmers*

Times/Year	Cross-country comparison			Within Indonesia comparison		
	Thailand	Indonesia	t-test	Independent	Scheme	t-test
Fertilizing	2.67	3.90	7.70***	4.68	3.08	8.95***
Circle weeding	2.10	2.58	1.73*	2.90	2.23	1.87*
Weeding	1.87	1.65	0.14	2.05	1.65	2.42**
Pruning	1.43	1.62	2.11**	1.41	1.86	-4.22***

Note: *** = p<0.01, ** = p<0.05, * = p<0.10

In Thailand the use of herbicides is less common than in Indonesia. Among those who use herbicides,Thai producers use on average less litres per hectare than the independent farmers in Indonesia, whichin turn use less than the scheme farmers. In both countries the most commonly used herbicides are Glyphosate and Paraquat, and their average use is below best management practices of 2-2.5 litres/ha. Yet, there is a risk of overuse, as some independent farmers in Indonesia claimed to use up to 4.5 litres of glyphosate per hectare.

Also in terms of pesticide usage,[15] Thailand has lower frequency among respondents and applied quantity than the independent farmers in Indonesia. Although they manage their fields themselves, the latter make use of "spraying teams" from the neighbouring scheme plantations paying a fixed feethat the cooperative deducts from the sale of FFB. A similar service is in place for the scheme farmersof Musim Mas. It is therefore not surprising, that, when asked details on pesticide use, over 90% responded they did not know (Table 4.4).

Table 4.4: *Respondents using herbicide/pesticide, and applied quantity (litres/hectare)*

Use of:	Thailand	Indonesia independent	Indonesia scheme
Herbicide	20.8%	72.5%	77.0%
Herbicide (lit/ha)	0.73	1.23	1.15
Pesticide	12.9%	15.7%	-
Pesticide (lit/ha)	0.9	3.00	-

Figure 4.2 shows the scores on an awareness index based on responses to four environment-

[15] Pesticide are generally used to mitigate rats, leaf eating caterpillars, rose beetles, rhinoceros beetles among others(Source: survey, 2013).

related subjects (water, planting, pest control and pesticides handling) each ranging from 0 (not aware at all)to 10 (fully aware). It reveals that environmental awareness was weakest among Indonesian scheme farmers.

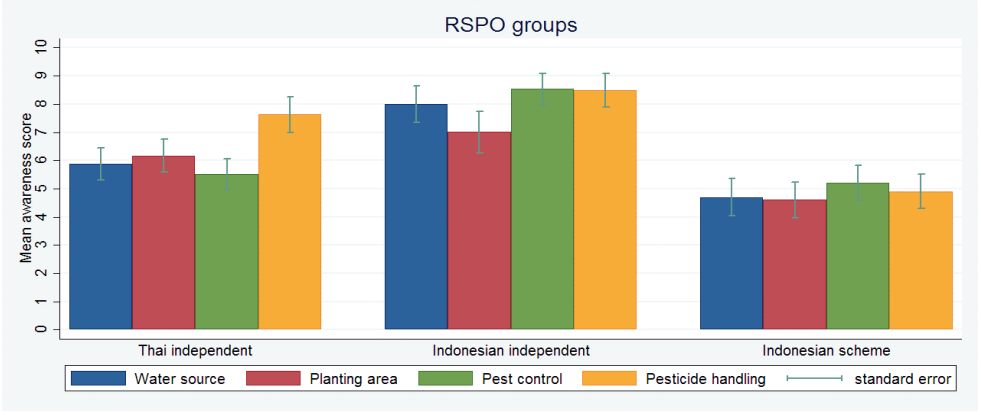

Figure 4.2: *Environmental awareness scores across case studies*

Table 4.5 shows that Indonesian independent farmers are the most likely group to take action with respect to water and land contamination. There is a stark contrast between the greater use of BMPs by Indonesian scheme farmers and their extremely low awareness and capacity to take action.

Table 4.5: Farmers taking actions to prevent environmental contamination

Pollution of:	Thailand	Indonesia independent	Indonesia scheme
Water sources	44.6%	73.5%	9.6%
Planting area	45.5%	55.9%	0.0%

All farmers use so-called “harvesting teams” when harvesting. In Thailand independent producers have two alternatives: they can bring their FFBs directly to ramps or mills, or they can request harvesting teams, usually organized by ramps, to harvest and transport their FFB. In the latter case the costs of harvest and transport services are directly deducted from the FFB sale. As a result, only 18.8% of the farmers in our Thai sample declared that at least one household member is involved in each harvesting. Thai producers have high potential for learning by experience and taking decisions on the harvesting time and on post-harvesting

practices because this determines the quality. This potential is quickly reduced when they use harvesting teams; the task is delegated to the subcontractorand no learning by experience occurs. There is still a potential for learning when producers engage inchecking the fruits that have been collected because harvesting teams often focus on weight only anddo not consider quality to maximize their profits. In Thailand there is no interaction with peers duringharvesting, as each farmer harvests his/her own plantation individually.

In the Indonesian samples harvesting is organized by the cooperative. In the Amanah group the harvest is organized per subgroup of farmers with adjacent plantations. Each subgroup rents a meansof transport to bring their FFBs to the mill (WWF, 2014). This event is also an occasion for interactionamong producers and as respondents mention, this encounter has become central in the farmers' calendar. Harvesting takes place every 10 days and each farmer can decide to participate in the harvestor leave it to the other farmers in their subgroup—on average 40% of them report to participate eachtime. The scheme farmers of Musim Mas have their harvesting teams organized and managed by thecompany while the workers are hired. Nonetheless 28.9% of the scheme farmers claim to always participate, either themselves or with another household member. Table 4.6 shows that non-optimal harvesting practices are not uncommon, with over 50% of the Thai farmers reporting that they very often harvest over-ripe and fallen fruits from their plantations. In Indonesia, both independent and scheme farmers are harvesting less under-ripe fruits, which is possibly linked to the higher vertical integration of their chain: harvesting teams in Thailand are paid per weight collected, and if they do not harvest under-ripe fruits they may not only forego revenue directly, but risk this is being harvestednext time by a competing harvesting team. In Indonesia harvesters do not fear competition from otherharvesting teams and the under-ripe fruits are likely to be ripe the next time. On the other hand, competition between harvesting teams in Thailand ensures that significantly more FFBs are transported within 24 hours. Overall, learning-by-doing is more prevalent in the Thai case as, even when not

harvesting themselves, Thai smallholders are decision-makers throughout the entire production cycle. By triangulating the different data (survey, interviews and RSPO definitions), we can conclude that the Indonesian respondents tend to perform better in terms of harvesting practices (Table 4.6) due to a higher level of control and vertical integration (RSPO, 2019). While convenient from the point of view of the quality of fruits harvested, the drawback of this centralization of activities in the hands of the mill or cooperative is the reduced capacity of Indonesian farmers to learnas they farm, resulting in low awareness scores.

Independent Indonesian farmers visit mills for learning purposes more frequently than Indonesian scheme and Thai farmers. They also receive most frequently visits from mills' staff, around twenty on average per year, whilst Thai farmers receive one visit and Indonesia scheme farmers around ten visits per year. Only very few farmers report receiving useful information on farming practices fromactors downward in the value chain during these visits which they associate rather with control by themill (Table 4.7).

Table 4.6: *Self-declared harvesting and post-harvesting practices across samples*

Harvesting practice:	Thailand	Indonesia independent	Indonesia scheme
Under-ripe fruits	32.7%	1.0%	3.8%
Over-ripe fruits	52.5%	39.2%	28.8%
Fallen fruits	61.4%	54.9%	41.3%
No transport within 24h	6.9%	13.7%	50.0%

Table 4.7: *Visits for learning*

Visits for learning:	Thailand	Indonesia independent	Indonesia scheme
Visits to mills/year	1.54	6.14	1.24
SD* Visits to mills	3.2	11.9	2.3
Visits from mills/year	1.03	21.21	10.18
SD* Visits from mills	2.8	16.15	7.9

Note: * Standard Deviation

When looking at yield, we find no difference between independent and scheme farmers in Indonesia, averaging about 18 tonnes per hectare per year. Governments transpose the responsibility of training farmers to mills but although companies have the expertise, they have

to cover the expenses for the license and they lower the costs of production, even if this means low yield (Sawit-Watch, 2014).

Among Indonesian farmers, almost 90% talked with peers about farming at least once per month. Furthermore, all independent and 90% of scheme smallholders claim to be part of a palm oil organization/association. Slightly more than half of the Thai sample talked to their peers 4 times a year or less. Unlike in Indonesia, in Thailand peer-to-peer interaction occurs during group meetings and internal inspections in preparation for the annual audit for RSPO certification. Only 58% of the Thai palm oil producers who were RSPO-certified "on paper" responded that they were part of a growers' organization/association. This means that they did not see the RSPO group as an actual group, with meetings, joined activities, and shared sustainable farming practices. Some of them perceived their access to RSPO as a bureaucratic requirement necessary to have better marketing andpricing opportunities.

Knowledge transfer from other stakeholders is an integral part in the cases included in this study. In Thailand, the implementation of RSPO-certification has been supported by GIZ, and Prince of Songkhla University, while government extension officers support farmers with Good Agricultural Practices (GAP) training. In Indonesia, members of the Amanah group received several trainings in collaboration with WWF, the certification body Bio-Cert and the Asian Agri mill (WWF, 2014). Also,Musim Mas has supported training on the requirements of the RSPO standard from 2007 and in collaboration with WWF in October 2010 (The Planter, 2012).

In Indonesia, 62% of the independent farmers and 41% of the scheme farmers claimed to have been trained on the RSPO standard with the support of another 'horizontal' actor in the chain. This leavesmany Indonesian RSPO farmers effectively 'untrained', whilst 98% of the Thai sample self-reported having received training. Among those trained, about half of the independent farmers in Indonesia considered the information they received being

understandable and easy to apply (51%). In Thailand,the vast majority of farmers answered that the information was easy to understand and to apply (95%).

Despite the proximity to plantation companies it seems that scheme farmers found it more difficult to absorb the information provided by plantation staff (only 8% found it easy to understand). This could be explained by the use of externally organised trainings in the independent farmers' projects in both countries and the focus on instructions on a narrow spectrum of activities for scheme farmers,because the overall management is controlled by the company itself.

4.5.3. Selling

Price responses can be an important guidance for improving farming practices and produce quality. Since the introduction of private schemes, in Indonesia scheme smallholders are obliged to sell to companies until they have completed the repayment of the land preparation costs (Fairhurst and McLaughlin, 2009; McCarthy and Cramb, 2009). The price is based on: the weight of the FFBs, the quality of the land and the age of the palms (SPKS, 2014). No negotiations are taking place and actualpalm management and farming practices are not taken into account when determining this price. When palm oil prices are high, having a stable relationship with a buyer (the mill), might be positive,but when prices are low this might have a negative effect, especially when the scheme farmer still needs to repay the company.

Independent smallholders deal with mills in a different manner. Mills in Indonesia are legally obligedto have their own plantations (SPKS, 2014) and therefore, during peak season, they may produce more than they can process. Although independent producers can sell to other mills, they are restrictedby their transport capacity. Also, mills prefer to deal with middlemen that organize transportation of FFBs from different producers; this leaves them with less clients to deal with and reduces their (transaction) costs. As a consequence, most small-scale independent

producers prefer to sell to the nearest mill, de facto barring price negotiations. Hence, their situation does not differ much from thescheme smallholders. Farmers reside in close proximity to the mill but despite sharing the same territory interaction is minimal; only the cooperative management interacts directly with the mill. Forfarmers, interaction is limited to the moment of delivering the bunches to the collection points. Hereby, they do not enter in direct contact with the mill but only with the people in charge of transport. The cooperative is responsible for payment to the farmers and the monetary exchange takes place atthe cooperative office for both the Musim Mas scheme and Amanah. Payment is based on the averageamount of FFBs coming from each plot with a certain number of hectares as established in the schemecontract. Interaction with the cooperative becomes therefore vertical, reducing opportunities for learning by experience and by interaction.

Thai producers, on the other hand, face a competitive market; if they have the means they can investin quality through BMP and since they do not have a contract they can sell to mills with a better price.They can even turn to another activity like growing rubber, when the FFB price is too low, giving them more opportunities to develop their own strategy. Alternatively, they can sell to ramps on the basis of price or long-standing relationships. About 53.5% of the certified producers in Thailand claimed to sell to ramps, either directly (27.2%) or through harvesting teams (26.3%), while 44.2% sold directly to the mills. Ramps hold a strategic position in the market, because they offer interlink services to producers (from pre-harvest credit to harvesting teams). This is felt by mills, who often complain about the quality of FFBs that reach them through ramps. Ramps are not RSPO-certified, making it difficult for mills to gather traceability data on certified volumes. For this reason, RSPO-certified producers in Thailand dealing with mills directly seem to have a higher degree of bargainingpower than in Indonesia (Degli Innocenti, Oosterveer, & Mol, 2019).

In Thailand, although the distance between producers and mills is often larger compared with

Indonesia, oil palm producers can still bring their FFBs to the mill of their choice individually if theyhave the means. There is a trade-off between price and transport costs and respondents mention a range of 7 to 30 kilometers, within which they choose their buyer and this may be the reason for smallholders to engage with a ramp. About half of the farmers in our sample actually delivers FFBs personally to the mill while the other half relies on harvesting teams. In the first case producers experience both learning by interaction and by deciding, whilst in the latter case producers do experience learning by deciding as they consider selling to harvesting teams more profitable than seeking for an outlet themselves, but they are not exposed to learning by interaction with the mill.

Overall, transport from plantation to buyer is managed individually in Thailand and collectively in Indonesia, creating different interaction mechanisms, which affect their knowledge on the quality ofthe FFBs they produce. Among the farmers who claim to know the quality of their produce (60% forindependent and 81.7% for scheme farmers), some also specified the quality. Indonesian independentfarmers most often described their FFB as *good quality (38.2%)*, while for the scheme farmers this was specified as: the fruit is harvested at the *right time* (31.7%) and the *correct colour of the fruit* (31.7%). Harvesting is indeed the last activity scheme smallholders conduct before sending their FFBs to the mill.

In Thailand 58.3 % of respondents answered they knew the quality of their product and mentioned the feedback they received from buyers during the sale; some define their percentage of oil content, some claim to have medium quality. These answers reflect two different ways of being exposed to markets. Thai producers receive feedback in terms of oil content (see Section 5.4 on grading) and they get paid accordingly, while Indonesian scheme smallholders do not receive this feedback; they are told when to harvest by the company and their meaning of quality relates to the right timing of harvesting. This limits their capacity to absorb price-related feedback, as improving farming practiceswould not increase their price.

4.5.4. Grading

FFB grading is the practice of determining its quality to base the purchase price on and thereby the acceptability of FFB for processors (Hennessy, 1995). However, agricultural products are more diverse and less standardized than industrial products. Weight, size, shape, colour, taste, cleanliness,odour, maturity, blemishes, moisture content, etc., are among the many parameters of FFB that buyersand sellers have to deal with in a short time while handling sometimes large volumes. Still, this is important for producers' decisions with respect to adopting new practices, because '*market pull factors that shape what is bought and for how much'*, determine smallholders' willingness to invest in sustainable production (Martin et al., 2015, page 54). Grading determines whether their FFB is accepted and what the quality-related rewarding is.

The main determinant of FFB quality is the *Deterioration of Bleachability Index* (DOBI), this is an international market standard to assess the quality of Crude Palm Oil (CPO). DOBI measures the oxidation level of CPO, which describes the absorbance ratio of palm oil dissolved to unsaturated/freefatty acid (FFA). The standard has a range between 1.8 (poor quality) and 3 and beyond (high quality)and the minimum DOBI index required for export is defined by the Codex Alimentarius Commission. While grading, first level processors (crushing mills) or collectors (middlemen), make sure whether harvesting has taken place within 24 hours prior to the sale, by checking the moisture of the FFB stem. Workers at the delivery area of mills or collectors are trained to determine the quality on the basis of visual criteria such as colour, number of fallen seeds from the bunch, texture, ripeness and moist of the stem. Performing lab analysis to get the exact percentage of oil content and FFA is highly time consuming and expensive and therefore cannot be performed at the moment of delivery. This leaves a lot of room for subjectivity, especially with grading large quantities, where only few bunches are visually analysed and a general grade determined. To overcome this, buyers can use previous grading records to determine the CPO content related price for a specific client.

Learning through grading is a particular case of learning by interaction, where a knowledge transfer occurs when the buyer “grades” the quality of the FFB sold by the producer. In fact, FFB quality results from harvesting and post-harvesting practices at the farm and feedback from grading and pricing may lead to changes in harvesting practices. However, local dynamics strongly influence thelink between grading and farming practices. When oil palm producers do not have access to differentbuyers they depend on the judgement of a single buyer. In this situation, smallholders have little bargaining power and become price-takers. When a price is decided upon without thorough quality analysis based on multiple indicators and homogeneous grading or when lack of quality discrimination occurred, producers’ incentives for better practices implementation and related investments are reduced.

In Indonesia interaction occurred through supervision and control from the company or cooperative during harvesting/collection activities without individual smallholders having direct interaction with mills. Interaction is the check whether top-down instructions on harvesting time have been followed.The price is fixed and associated with the assumption that quality is constant based on the age and variety of palm trees for scheme farmers and on previous records for independent smallholders. In Thailand feedback occurs when delivering to collectors or buyers whereby farmers are directly faced with the grading results. This grading creates incentives for producers to decide on how to improve quality (CPO content and FFA) and get a better price. The exchanged information (feedback) with their immediate buyers cannot be easily ignored as Thai farmers have to meet buyers’ standards, especially during peak season when it may be a matter of FFBs being accepted or rejected.Information panels at the mill describing grading and boards with texts like: “*We do not accept un- ripe fruits*”, are vehicles for knowledge transfer to farmers and incentives for reflection on cause- effect relationship and deciding new actions.

However, the increasing number of ramps and mills in Thailand has led to a quality decrease as

moreoutlets are available for producers because mills running under capacity are willing to accept lower quality FFB and sell to processors for whom FFA-levels are not relevant (non-edible oil). Mills that pursue high quality CPO have, instead, to collaborate closely with farmers. For this reason, Thai millsinvolved in the RSPO project are committed to upgrade smallholders by offering them training courses, discounts on fertilizers or fast-delivery ways.

4.6.Discussion

In this research, we have analyzed how the organization of the palm oil supply chain affects opportunities for learning by smallholders. We have studied three different cases and identified challenges and opportunities for social learning based on two factors: 1) the capacity of the smallholders, and 2) the institutional context of the palm oil supply chain. To confirm and conclude our analysis we have also analysed the benefits of RSPO group membership (See Table 4.8).

Table 4.8: *Main benefits from RSPO group*

Benefits	Indonesia – independent	Indonesia – Scheme	Thailand
	%	%	%
Information about sale	71.6	68.3	29.7
Knowledge support	33.3	39.4	51.5
Technical support	4.9	0.0	18.8
Financial facilities	21.6	32.7	5.9
Transport	12.8	31.7	4.0
Other	25.5	3.9	6.9

Note: Numbers in columns do not sum up to 100% as respondents could choose multiple answers.

Our findings show how downstream-upstream knowledge transfers are more dynamic in Thailand than in Indonesia, and within Indonesia more dynamic among independent smallholders than among scheme farmers. Thai farmers are generally aware of farming practices, and self-report to becomplying to at least one of the RSPO principles and criteria in 95% of cases. They have to managetheir plantations themselves from seeds to sale, making

choices along the way and take most decisionsindividually which creates a high potential for learning through experience or single-loop learning. Learning through interaction via peer-to-peer exchange and horizontal networks is limited. There is a high potential for learning by interaction within vertical networks because the presence of multiplebuyers allows farmers to choose where to sell for what price. This is also reflected in the perception of smallholders who identify knowledge support (51.5%) as the main benefit of being part of an RSPO group and not pricing information. Knowledge support is highly sought after by Thaiproducers, because information about farming practices can help increase their productivity, quality and therefore price; knowledge that they do not receive from irregular interactions with their peers. We found that quality grading and price incentives have high potential for learning by interaction andtriple-loop learning; the first one by making leverage on performance in a process of dissonance and co-creation and identification of bad practices or mistakes and the second one by creating a change of values, beliefs or norms behind operational assumptions and actions through economic rewards. The effectiveness of learning by interaction is hindered by the presence of ramps, which blocks farmers' access to knowledge from downstream actors. However, when farmers execute farming practices (agrochemical application, harvesting, post-harvesting) themselves they have the opportunity to monitor ramps' performances and establish their decision-making based thereupon. This goes beyond the idea that intermediaries in certified chains are "*brokers of knowledge, inputs, and resources*" (Deans et al., 2018) and identifies them as a stimuli for learning.

In Indonesia the scheme setting creates a supervised and controlled production system, defined as 'paternalistic' by Barral (2014). This means that smallholders are *de facto* barely engaged in changing farming practices. We found that Musim Mas scheme smallholders have little knowledge of RSPO criteria. They are essentially implementers of instructions which gives a high potential for learning by interaction but a low potential for learning by decision making

(single-loop learning) due to the limited cause-effect reflection and space for dissonance, from which learning is generated through co-creation. Given that all peers follow the same instruction the potential for horizontal learning is minimal. Moreover, the fixed price in schemes where farmers repay their debts is based on an assumed constant quality related to the age of palm trees, which does not stimulate farmers to improvethe quality of their FFB nor triple-loop learning. There is low need for experimenting to address constraints which limits double-loop learning as new actions are taken only to implement the innovative system based on a set of instructions but not addressing the assumptions behind them.

The Amanah group of independent smallholders is more aware of RSPO criteria and has a higher potential for learning by doing and by decision-making (single-loop learning) with respect to the planting and farming phases. 86.3% of the Amanah sample claimed to implement at least one RSPOprinciple compared with only 52.9% for the scheme farmers. Even in this case, however, the presenceof a fixed price reduces the incentives for producing better quality FFB and for improving farming practices (double-loop learning). In terms of selling and grading, their situation is comparable to thatof the scheme farmers as they are also part of an initial scheme with the mill as the only buyer, whichlimits triple-loop learning despite producer and buyer being in the same problematic context. The millwants to purchase certified FFBs which requires congruency between producer and buyer onsustainable practices. Social learning from grading is low, given the fixed OER-related price (based on oil palm age), even though there is a disincentive for delivering below the threshold of quality control. Importantly, the threshold in place is one of minimum quality to be attained. This is in contrast to the case of Thailand, where the threshold to be achieved is ameliorative: the better the quality the higher the price received.

In Indonesia, around 70% of the respondents (both independent and scheme farmers) mentioned information about selling prices as the main benefit of being part of an RSPO group. This

response illustrates a lack of transparency on pricing. In the case of scheme farmers, the Indonesian instruction-based model nullifies the need for technical support and for certain types of knowledge. An instruction-based system creates no particular incentive for improving performance and impedes learning loops by both experience and interaction, despite a high level of assets in the system itself. For independent smallholders, the lack of pricing information can be explained by the absence of direct contact with the mill they are selling to. The cooperative only deals with purchasing and selling FFBs—and is therefore a vertical and not horizontal network. In Thailand the most frequently encountered direct vertical actor is the ramp, while in Indonesia this is the cooperative. Thai farmershave, however, the possibility to monitor ramps' work and to make their own choice, while in Indonesia the cooperative is checking farmer's performances. This is reflected in the perceived powerthat these vertical actors wield on them. In Thailand, only 24% of respondents consider their negotiation power with respect to ramps to be extremely weak. Instead in Indonesia, 39% of the scheme farmers perceive their power with respect to the cooperative as extremely weak and for independent farmers this is even 74%. This lack of perceived power has consequences on the learning opportunities generated through these vertical interactions by reducing co-creation and the process of'learning together to manage together'. We have created a matrix of the opportunities for learning forpalm oil production from planting to grading phases, differentiated by experience and by interaction.

A low or high score is based on the results of the analysis and on the ability of farmers to conduct thelearning cycle (action-reflection-action) in the supply chain they are part of (Table 4.9).

Table 4.9: *Opportunities for Social Learning*

		Planting	Farming	Selling	Grading
Thailand Independent					
Learning by experience	By doing	*High*	*High*	*High*	*High*
	By deciding	*High*	*High*	*High*	*High*
Learning by Interaction	Horizontal	*Low*	*Low*		
	Vertical	*Low*	*Low*	*High*	*High*
Indonesia Independent					
Learning by experience	By doing	*High*	*High*	*Low*	*Low*
	By deciding	*High*	*High*	*Low*	*Low*
Learning by Interaction	Horizontal	*Low*	*High*		
	Vertical	*Low*	*Low*	*Low*	*Low*
Indonesia Scheme					
Learning by experience	By doing	*Low*	*Low*	*Low*	*Low*
	By deciding	*Low*	*Low*	*Low*	*Low*
Learning by Interaction	Horizontal	*Low*	*Low*		
	Vertical	*Low*	*Low*	*Low*	*Low*

These observations have several implications when aiming for increasing sustainability in oil palm cultivation through social learning. Systematically conducted FFB quality assessment could supportthe implementation of BMPs and improve sustainability. This could be a third-loop learning, where learning can be understood as a way to detect and rectify errors. However, if this is not standardized,it may deliver feedback driven by market dynamics rather than by actual quality. Collectors who arekey actors in quality assessment and grading both in Thailand and Indonesia are not really included in strategies promoting sustainability. These collectors represent a risk for lowering product quality while they may also interrupt channels for transferring knowledge between the chain actors.

Involving key chain actors in sustainability programs strengthens vertical integration and information flows that allow knowledge being transferred to the different categories of smallholders. If a standardlike the RSPO wants to increase sustainability through companies,

they may decide to exclude groupsof independent small-scale producers and concentrate on large volumes with a more normative approach. Because, as the Musim Mas management argues, successful implementation of agronomic,environmental and social standards needs the presence of a strong cooperative able to coordinate and administer the implementation of best management practices on all plots. Furthermore, the involvement of a leading company is key to guarantee organization and control and gain the trust of the scheme smallholders, so that they apply the acquired knowledge on their own plots. However, further integration of the smallholders in the chain is required to make sure they receive theappropriate information and practical guidance to help them access the sustainable supply chain. Further investments in knowledge transfers (learning by interaction) on planting material and farmingpractices may be required to fully achieve congruence between mills' demand and producers' supply.Grading and price-discrimination based on the quality of FFBs can be strong incentives to knowledgetransfer and may increase awareness and implementation of RSPO-practices. This would create the conditions for including smallholders in certified supply chains and allow for the knowledge transferand opportunities for social learning necessary for the implementation of sustainability standards.

4.7.Conclusions

Indonesia and Thailand are key actors among palm oil producing countries, increasingly faced with sustainability challenges. Large companies have ample resources and easy access to research to increase productivity and reduce environmental impacts. On the other hand, small-scale producers often lack the knowledge on how to implement more sustainable farming practices. Certification programs like the RSPO may act as a useful link between the two, contributing to knowledge transfers. Whether these result in actual changes in practices, however, depends on the extent to whichknowledge transfers are translated into learning. With this study we contribute to the debate on sociallearning and learning loops, and the specific

discursive settings that might affect the outcomes of aninnovative system initiative like RSPO certification. We provide evidence of how material (tangible goods) and non-material (e.g. information and knowledge) flows are intertwined and how important it is to understand both when studying learning.

Learning can take place on an incidental base (targeted trainings) or more continuously in everyday practices and observations, provided that reflection on the actions and goals occurs. Highly controlled farming systems such as oil palm schemes in Indonesia – with vertical integration, proximity betweensmallholders and mills and long history of production – may achieve more sustainability without necessarily having farmers changing their beliefs and values. This because they focus on learning asan act of imitation, with strict instructions and control, rather than on training and processes of experimenting and co-creation. However, they leverage performance to a certain level only, due to a lack of incentives. Vertical integration, proximity and experience do not automatically translate into learning: as long as knowledge about RSPO and BMPs is transferred to scheme farmers as a set of instructions, it may be hard to expect them to implement sustainability standards by themselves once land is transferred to them or when they quit the scheme.

Independent smallholders in Indonesia and Thailand both have more opportunities to learn by doingcompared to scheme farmers, but differ greatly in the extent to which they are exposed to incentives.In fact, context-related dynamics in chain governance – such as quality incentives, price regulation and grading systems – can determine the extent to which sustained knowledge transfers and actual learning are achieved. These appear to be more effective in Thailand than in Indonesia in triggering individuals' change of assumptions behind actions (action-reflection-new action)—even when activities are delegated to intermediaries. Addressing the key elements in the context in which farmers find information meaningful to the extent of changing their actions is necessary to improve the engagement of smallholders in fostering sustainability, and

identify feasibility and probability of success.

Further research should investigate how upstream chain arrangements can be improved, such that smallholder farmers find the information they are exposed to meaningful, update their beliefs, and implement sustainable practices. Where bottlenecks in learning are found, policy makers should foster the capacity of pre-existing palm oil upstream arrangements to change along with the sustainability initiatives themselves.

Chapter 5

Go Green or Go Home?
Using the Delphi Method to Explore Opportunities and Pitfalls of Policy Scenarios for the Thai Palm Oil Market

Abstract: Recently, Thailand has witnessed a rapid increase in palm oil production. The Thai government plans on further expanding this sector to satisfy the growing domestic demand for food and biofuel. At the same time, however, sustainability programs like Good Agricultural Practices and the Round Table on Sustainable Palm Oil are implemented to mitigate the effects of land conversion into oil palm plantations. The Thai government is therefore faced with the challenge to what extent and in what way sustainable pathways can be included in the expansion of the palm oil sector. In this paper we use the lessons learned from the current palm oil expansion in the North and in the South of Thailand on sustainability challenges, to explore policy scenarios for future palm oil production in Thailand. Using the current situation and the Thai government target as the baseline, we identify the key characteristics, global drivers, and challenges affecting palm oil production and discuss them under four policy scenarios. We apply the Delphi method by interviewing key stakeholders in the Thai palm oil sector, to validate these scenarios and their sustainability challenges, and rank the likelihood for each scenario to be accurately describing the situation in 2050. We found that the most likely scenario is relatively close to the current objective of self-sufficiency with open markets, which at best can lead to 'light green' sustainability practices focused on the domestic market. This is at odds with a 'dark green' scenario in which government policies radically shift towards premium certified niche markets, which is much less likely to happen but would maximize some of the comparative advantages of the Thai palm oil value chain and institutional setting. We conclude by discussing the implications for self-sufficiency and sustainability of alternative scenarios.

(to be submitted)

5.1. Introduction

Palm oil is currently mostly produced in South-East Asia, with Malaysia and Indonesia representing 85% of global production (Cramb & Curry, 2012; Mekhilef, Siga, and Saidur, 2011; Foreign Agricultural Service, 2005; Iskandar, Baharum, Anuar and Othaman, 2018). Thailand occupies third place in the ranking of palm oil producing countries (Indexmundi, 2020a; Mekhilef et al., 2011; Teoh, 2010). Currently, the Thai oil palm area covers 750,000 hectares – mostly in the Southern provinces with their suitable climatic conditions, namely Krabi, Surat Thani and Chumphorn (Office of Agricultural Economics: OAE, 2016) – and the area is steadily increasing. Over the last twenty years, Thai producers have shifted to oil palm cultivation due to attractive prices, lower labour requirements and an interest in diversifying traditional crops (Saswattecha, Hein, Kroeze, & Jawjit, 2016a), but especially due to the rising demand for biodiesel, promoted by the national government (Siriwardhana, Opathella and Jha, 2009; Sanders et al., 2013).The Thai government has, since 2005, introduced energy policies aimed at using the surplus production from oil crops, and especially palm oil, for biofuel production (ADB, 2009; Somnuek, Slingerland and Grünbühel, 2016; Nupueng, Oosterveer and Mol, 2018). In particular, the Thai government supported land use change from rubber trees to oil palm (Saswattecha et al., 2016c) and encouraged biodiesel production and its domestic use by providing loans and tax incentives.

At the same time, these plans for expanding palm oil production have caused sustainability concerns because of the ensuing risk of deforestation and biodiversity loss (Koh and Wilcove, 2009; Sanders et al., 2013), land use change, reduction of ecosystem services, and increased CO_2 and non-CO_2 emissions both in oil palm plantations and palm oil processing mills (Saswattecha et al., 2015a; Saswattecha et al., 2016a: Saswattecha et al., 2016b). Other concerns regard the socio-economic impacts on smallholders resulting from the low and volatile price for FFB (Khatun et al., 2017), and food security challenges resulting from land conversion away

from food crops. For example, between 2000 and 2009, 17,600 hectares of rice fields have been converted to oil palm, and the environmental impacts related to land use change even increased between 2009 and 2012 (Saswattecha et al., 2016c), when the current study was conducted.

The Thai government faces challenges in securing the future of the national palm oil sector with respect to issues such as global competition, free trade agreements, feedstock supply, balancing food versus fuel, price policy, subsidy policy and agricultural sustainability (Nupueng et al., 2018; Chantaraniyom, 2014). In order to keep the CPO stock at 200,000 tonnes, the Thai government regulates the blending rate of biodiesel on the basis of whether the country is in the over-security zone (over-production of palm oil) or the under-security zone (under-production of palm oil). In order to contain the impact of the low FFB price on the producers, the government has a FFB subsidy and a cooking oil price control policy (Nupueng et al., 2018). Consequently, FFB production costs are higher in Thailand than in Malaysia and Indonesia (Chantaraniyom, 2014). Its policies seems to be very ambitious in terms of self-sufficiency of Thai palm oil supply for cooking oil and biodiesel to reduce its fossil fuel dependency. It is not yet clear how the Thai government is going to match its goal of expanding production to secure its self-sufficiency, with its efforts to increase sustainability in palm oil production.

We propose an analysis of the palm oil sector in Thailand and how sustainability and self-sufficiency challenges can be dealt with in the future. Using qualitative data collected among experts from the Thai palm oil sector, we develop four explorative scenarios for sustainable palm oil production in Thailand and outline the role of the Thai government in each of these. Each policy scenario has consequences for the production system, the shaping of the supply chain, national policies, global/regional market relationships. Our research does not intend to select a preferred pathway, but rather to frame the possible consequences and opportunities for each scenario and their probability to provide a data-based support to the debate on how to converge sustainability and palm oil expansion in Thailand.

5.2. Analytical Framework

5.2.1. Theoretical framework

In this study we use explorative scenarios to discuss the future of the Thai palm oil sector. Scenarios are analytical frameworks and operational tools (Stoorvogel and Antle, 2001) developed to allow policy makers to address trade-offs. In this case, between economic development and sustainability, by quantifying competing claims on land use and identifying production systems which are technically feasible, environmentally sound and economically viable (Roetter et al., 2005). The following three analytical tools are available: *predictive*, *explorative*, and *normative* tools (Van Ittersum, M.K., Rabbinge and Van Latensteijn, 1998). Predictive tools clarify how specific drivers will develop and they mostly utilize trend extrapolations and business as usual (BAU) scenarios; predictions of "*what will happen"* if practices and policies do not change and no action is undertaken to deviate from specific trends. Explorative tools address "*what could happen*"; they usually apply qualitative approaches, forecasting, foresight, and strategic scenarios. Normative tools address "*what should happen";* they focus on the outcome to be achieved and how this can be reached, for instance by developing back casting studies. Back casting studies are performed to identify possible challenges when aiming to meet a target (desired situation) (Börjeson et al., 2006). Vision and pathway development can be strengthened when the study also includes learning from the present, identifying existing barriers and incentives, change agents, and improving the future vision to make it more appealing and resilient (Robinson, 2003; Brown and Vergragt, 2008).

We start by developing explorative scenarios based on historical developments and current characteristics of palm oil production in Thailand. Next, we identify global drivers, and challenges that could affect future pathways for sustainable production systems in the country. Finally, the explorative policy scenario endpoints set future states and therefore help, in turn,

to design pathways to overcome possible challenges. The objective of the explorative scenarios is to balance the growth and sustainability ambitions in the Thai palm oil sector. This study aims to provide evidence on whether and under what conditions this balance can be reached by 2050.

5.2.2. Methods

The objective of this study is to feed the debate on the sustainability of the Thai palm oil sector by identifying four different explorative policy scenarios for 2050. We draw these explorative scenarios on the basis of 1) the characteristics and challenges of the current state of the palm oil sector in Thailand, and 2) the global drivers, and 3) the perspectives of key local stakeholders.

We use the term explorative policy scenarios to consider what policy makers set as goals when the current situation does not correspond to their ideal situation. Firstly, we map the historical and current development of the palm oil sector in Thailand. We look at the current supply chain, value chain actors, value chain dynamics, waste and value added. For this first step, we collect secondary as well as primary data about palm oil production in Thailand, Thai palm oil policy and the socio-environmental impacts. We use a literature review, qualitative interviews, questionnaires with local experts (government officials, NGOs, academics, and professionals from the palm oil sector). We also look at the history of palm oil in the country and policy trends. After mapping qualitative and quantitative data, we identify the key characteristics of the Thai palm oil sector: productivity, national supply chain organization and national price determination, and the related challenges. These key characteristics are summarized in an overview with distinct levels: farm, national and international, that provides the basis for building explorative policy scenarios. Secondly, we analyse global drivers that could affect these scenarios: growing global demand for vegetable oil, increasing pressure to address climate change, increasing demand for sustainable palm oil, increasing competition between vegetable

oils and the trend towards regional collaboration within ASEAN. Thirdly, we sketch four explorative policy scenarios, by using the Thai government target for self-sufficiency as our baseline scenario, and integrating key characteristics of the current state, and predictive scenarios of land expansion to achieve the governmental target (Saswattecha, 2016a) next to the global drivers. These policy scenarios are built to understand the gap between the current state and the aimed outcome of converging domestic palm oil demand and sustainability aims, and to discuss through what policy pathways this outcome is achievable.

We apply the Delphi method to validate the scenarios (Bolger, Stranieri, Wright and Yearwood, 2011; Preble, 1983; Schmidt, 1997; Sniezek, 1989). This method provides us with experts' opinions on the depicted scenarios of the future of the palm oil sector in Thailand and rank their likelihood of describing the future state (Delbecq, Van de Ven, & Gustafson, 1975; Landeta, 2006). Firstly, ten experts, also called *panellists* in the Delphi terminology, were identified and accepted to participate in this research. These experts are all located in Thailand and include representatives of the Thai Department of Agriculture, MOAC, Thai Department of Commerce, RSPO-certified producing groups in Surat Thani and Krabi, Palm Oil Labour Union, a mill, a refinery, Prince of Songkhla University, GIZ and RSPO. The interviews took place during the period December 2020-March 2021. Due to the limitations stemming from the Covid-19 pandemic it was not possible to have a larger number of participants. However, we consider our sample sufficiently representative and fitting the purpose of our explorative research to validate the scenarios. Additionally, the pandemic has also determined the number of rounds and the way the interviews were conducted: by phone or internet instead of face-to-face.

Panellists were requested to answer questions to validate our selection of the key characteristics of the Thai palm oil sector and its challenges, the global drivers and the explorative policy scenarios. Based on their answers the scenarios were adjusted and sent back to the panellists for review and approval. This validation constituted the first objective of the second round of

feedback. Next to this, the summary document with the consensus answers from the first round was shared with the panellists and accompanied by a ranking of the scenarios. The ranking ordered the scenarios from 1, the most likely prediction, to 4, the least likely one, and this was also validated in the second round. Finally, the answers, ranking and consensus were included in the scenarios discussed in this chapter.

5.3. Key characteristics of the Thai palm oil sector

5.3.1. A history of palm oil in Thailand

The Thai palm oil industry had a relatively late start compared to Malaysia and Indonesia, where production started around 50 years earlier (Chavalparit, 2006). In 1968, the Thai Department of Public Welfare started implementing the *Self-help*[16] land settlement centre in Satun province, Southern Thailand, covering about 246 ha. At that time, 4000 ha of oil palm plantation had already been developed by a private company, Univanich Palm Oil Public Company Limited (Clendon & Tittinutchanon, 2015). In 1975, oil palm became a commercial crop and got promoted by the Cooperative Promotion Department with estates in Chompon and Krabi provinces. In 2012 the government started promoting oil palm in all nineteen northern provinces—a policy that is currently still effective. In 2015, the Thai oil palm planted area reached 0.75 million ha (mainly in the southern part of Thailand), and the harvested area was 0.68 million ha (OAE, 2016). The range of oil palm growers includes cooperatives, self-help land settlement members, commercial estates, and smallholder farmers.

[16] Self-help land was settled in the Southern region of Thailand in the early 1960s. The government gave land to people to integrate politically sensitive areas. The farmland distributed amounted to some 4 ha per family, for annual or perennial crops: oil palm and rubber were the only ones authorized and financed by loans from the Bank for Agriculture and Agricultural Cooperation (BAAC). Farmers did not obtain definitive titles for the land until they had repaid their start-up loans (Pfeffer & Sutton, 2003).

The total number of oil palm producers In Thailand was 210,000, In 2015 (OAE, 2016). The country has more than 200,000 small-scale oil palm growers, constituting the vast majority of growers. They hold an area between 1.6 to 3.2 ha (Termmahawong, 2014) with an average harvest of 16.5 tons/ha/year; below the national target of 22 tons/ha/year (OAE, 2016). Approximately 90% of the oil palm area in Thailand is located in the southern provinces, Krabi, Surat-Thani and Chumphon (OAE, 2018).

Since 2000, the Thai Ministry of Energy has promoted the use of renewable energy, especially as a consequence of the rapid surge in fossil fuel prices in the first years of the millennium (Morgera, et al., 2009). For this reason, the Thai Government developed different plans. These include the *15-Year Renewable Energy Development Plan* (REDP) 2008–2022, the *10-Year Renewable and Alternative Energy Development* (AEDP) 2012–2021, and the *Oil Palm and Palm Oil Strategy* 2015-2036 (Petchseechoung, 2017). Table 5.1 summarizes the targets set in these plans.

Table 5.1: *Estimation of oil palm yield for biodiesel*

Potential palm oil	**2015**	**2017**	**2019**	**2026**	**2036**
Area of oil palm plantation (Mha)	0.72	0.8	0.9	1.2	1.63
Oil palm production (Mton/year)	14.3	15.4	16.7	21.4	29.5
Palm oil production (Mton/year)	2.6	2.9	3.17	4.3	5.9
Excessed CPO (Mton/year)	1.6	1.9	2.1	2.9	4.2
Estimation of maximum biodiesel (Mliter/day)	5.6	6.5	7.1	10.0	14.0

Source: DEDE (2015). *Mton = metric tons

In 2003 when the government launched its energy security policy, palm oil was identified as the main feedstock for biodiesel production and in order to meet the growing demand for CPO, the government introduced a policy for expanding oil palm plantations. This policy included planting high yielding oil palm varieties on abandoned land and flooded areas in the South and the East; an expansion of the area by 400,000 ha from 2008 to 2012 (80,000/year). Despite this ambitious plan, the expansion in the South was slower than targeted; only 83,400 ha from 2008 to 2010 (Daniel et al., 2010; Dallinger, 2011). Thus, the Government of Thailand adjusted the

plan and started to promote oil palm cultivation in the North and the Northeast, in order to meet its policy goals (Meyer, Prasertsri, & Kunasirirat, 2009).

5.3.2. Productivity

There are three categories of producers in Thailand, according to their land holding size: smallholders, cooperatives, and company estates. The first and largest category, has already been mentioned, and they make widely use of collectors for FFB transportation to mills and to outsource some farming practices, especially harvesting (Degli Innocenti, Oosterveer, & Mol, 2019). The majority of smallholder farmers are independent and not bound to a specific processing mill by contracts or other formal arrangement. They decide themselves on whom to sell their FFB to, based on comparing the purchase price from a pool of market outlets in their area (Dallinger, 2011). The second category, which also includes self-help producers, manages an area of around five hectares. Some farmer cooperatives have even established their own mill with government support (Dallinger et al., 2013). Finally, company estates, the third category, manage areas with a size of fifty hectares and more. They generally have the highest yield among the three groups, due to their larger investment in farm management, research and development.

With an annual production of 12.5 metric tons (Mt) of palm oil Thailand is the third producing country globally after Indonesia and Malaysia, with 126 and 96 Mt, respectively. Thailand has a productivity of 19 ton/ha/y and Malaysia and Indonesia respectively 20.5 and 17.5 ton/ha/y. This lower productivity is due to climate differences, rainfall variability, varieties cultivated and management practices (Corley and Tinker, 2016). For instance, in certain areas in the Northeast of Thailand productivity is as low as six tons/ha/y (OAE, 2017) as additional irrigation is required to produce good quality bunches. The area suitable for oil palm cultivation is concentrated in a small area in southern Thailand (Cramb and Curry, 2012). Furthermore, in Indonesia and Malaysia, respectively 60% and 80% of the plantation area is operated by large

private or state-owned enterprises that own refineries and other downstream operations. Due to its higher production costs, Thailand is not competitive in the international palm oil market (Chayanon, 2015). Therefore, palm oil production here is mainly focusing on meeting domestic demand; the export rate is 3-4% in periods of surplus harvest compared to 90% in the case of Indonesia and Malaysia (OAE, 2017). Thailand even relies on CPO imports (particularly for cooking oil) in periods of undersupply (ADB, 2009).

Public institutions, like the Department of Agriculture (DOA), the Agricultural Research Development Agency (ARDA), the Natural Resources Faculty and the Prince of Songkhla University, are investing in improved oil palm varieties with higher oil content. They also promote good farm management practices, such as the Good Agricultural Practice[17] (GAP) standard for oil palm and facilitate the certification process. The GAP standard provides detailed guidance from production to transportation to the collection centre (ramp) or mill in order to increase production efficiency, quality and safety of FFBs, and reduce environmental and social impact (occupational health and safety of the workers) (ACFS, 2008). GAP certification is not mandatory, it is, however, requested by certain markets (customers, mills, importers), especially for vegetable oil exports; palm oil producers not exposed to such demand might not see the benefits of GAP certification (Delphi interviews, 2021).

At farm level, the Oil Extraction Rate (OER) is often not optimised due to the harvesting of unripe fruits and poor post-harvest practices. Moreover, the FFB price range is set by the Department of Internal Trade (DIT), which sets a general reference FFB price, based on an assumed average OER of 17%, without further consideration of the actual OER of the FFB supplied. The consequence of not setting prices relative to quality is that farmers lack an

[17] Thai government has a policy for GAP; it promotes GAP certification for 148 crops, including palm oil, meaning the government supports farmers with part of the certification costs through extension service. (Source: interviews, 2014).

incentive to develop higher-yielding oil palms and may also harvest before the fruits have had the time to develop the highest possible OER. This reduces the ability of Thai producers to compete on international markets (Petchseechoung, 2017).

5.3.3. Supply chain organization

Thailand's palm oil supply chain includes three main actors: producers, crushing mills and local collectors, called ramps (Degli Innocenti et al., 2019). Individual producers transport their FFBs from production to first processing sites through local collectors who have a key role in collecting small volumes. FFBs have a weight of around thirty kilos and they are voluminous, so they require pick-ups for their transport. This affects the material as well as the information flows that go along with them (Degli Innocenti et al., 2019). Most mills are privately owned and only a few are owned by cooperatives. Overall, smallholders work on their farm and sell their product individually to local collectors (middlemen or ramps) or directly to crushing plants (mills).

Given that palm oil quality is reduced if FFBs are not processed within 24 hours after harvest, crushing factories have to be located nearby oil palm farms. According to the panellists, mills have to be located nearby main roads based on governmental regulations (Delphi interviews, 2021). The product from the crushing mill is called Crude Palm Oil (CPO) and that from the refining mill Refined, Bleached and Deodorized Oil (RBD) (Termmahawong, 2014). In 2017, Thailand had 137 crushing mills with a total capacity of 22-23 Mt of FFBs and 18 refineries. Most crushing mills have been operating for some time already and they benefit from their close connections with the farmers.

Given that the majority of the producers sell to middlemen (ramps), who are widely spread and therefore easy-to reach, FFBs that are not accepted by one ramp are sold to another with lower quality checks. The quality of FFB affects the quality of CPO; this is why harvest and post-

harvest practices are influencing the rest of the supply chain (Termmahawong, 2014; Delphi interviews, 2021). Only good quality oil – with a Fat Fatty Acid (FFA) rate lower than 5% – can be utilised for edible use while the rest can only be processed into biofuel.

5.3.4. Price determination

The FFB price is set based on the oil content of the fruits but there is lack of precision in determining the exact oil content at mill level. Price differences are based on the grade attributed by visual grading considering especially fruit size and weight of bunch. The higher the weight, the higher the price (Termmahawong, 2014). As quality grading can only take place through visual techniques, the oil content is often underestimated to avoid risks of underproduction. The mill lacks specific details affecting the oil content of the FFB delivered by different suppliers such as the variety, age, farming practices, physio-climatic conditions, and post-harvest practices, as well as the time-gap between harvest and delivery at the mill. A proper laboratory analysis is not practical because this would take one week, while farmers prefer to be paid quickly (Delphi interviews, 2021).

Thailand has a long standing policy for protecting the palm oil price to guarantee an affordable price for cooking oil for all Thai consumers. In addition, the government provides low interest loans for purchasing fertilizer or starting a new oil palm plantation (Somnuek et al., 2016). The price is set by the Department of Internal Trade (DIT) with a general FFB price as reference with an OER of 17% (Petchseechoung, 2017). In addition, the Thai government manages imports to protect farmers from sudden price declines[18]. The factors influencing domestic FFB purchase price are: 1. The global market price for CPO, which depends on international demand; 2. The efficiency and consequential production costs of the mill; 3. The harvest and

[18] For instance in February 2015 following the imports of 50,000 T of products (for cooking oil, 42 THB/litre, USD1.4[18]/L), the Ministry of Commerce took an administrative measure, with recommendation prices for FFB at 4.00 THB/kg (USD 134/MT) and CPO at 25.0 THB/kg (USD 834/MT) (Preechajarn, 2016).

post-harvest practices of the suppliers, which affect the palm oil content. While the first factor is out of control for Thailand, the second and third factor are controlled by the mills, middlemen and farmers (Chantaraniyom, 2014).

The key actors determining price policies in the palm oil industry are national government agencies: the Ministry of Industry (MOI) responsible for monitoring national environmental regulations such as water and air pollution, the Ministry of Commerce (MOC) responsible for giving permits of operation to ramps and mills and monitor their tax payment, the Ministry of Agriculture and Cooperatives (MOAC) responsible for oil palm expansion plans, the Ministry of Energy (MOE), and the National Palm Oil Policy Committee (NPOPC). NPOPC is a core pillar in controlling the palm oil market. In combination with setting-up recommendation prices for FFB and CPO for specific timeframes, the NPOPC also supports the national sector with intervention measures, such as allocating funds to the Public Warehouse Organization (PWO) to absorb CPO stocks for set periods (Preechajarn, 2016; Nupueng et al., 2018; Delphi interviews, 2021). The three Ministries (MOC, MOAC and MOE) are members of NPOPC. However, these Ministries have different goals and functions, which is a source of conflict in policy making and implementation. For example, MOC aims to keep the price of cooking oil stable and affordable for Thai consumers, MOAC needs to enhance the price of FFBs which would lead to higher CPO price and cooking oil prices (Nupueng et al., 2018; Sethaputra, 2014). OAE under MOAC, has set out the Oil Palm and Oil Palm Industries Development Strategy 2015-2026 but the implementation of the plan was poor due to the intervention of NPOPC by subsidizing prices. The governament spent over 21 billion THB in subsidizing palm oil[19]. The palm oil price has also been controlled by shifting oversupply to biodiesel production (DEDE, 2009; Nupueng et al.,2018).

[19] See https://www.bangkokpost.com/business/1756804/further-oil-palm-price-support-measures-in-store

There is no single actor having the authority to manage and monitor the whole Thai palm oil sector (Chantaraniyom, 2014), unlike Malaysia, where the Malaysian Palm Oil Association (MPOA) represents oil palm growers and CPO producers, with a long-term growth and development policy for the Malaysian palm oil industry. The Malaysian government through the Malaysian Palm Oil Board (MPOB) ensures that the interests of all parties are considered in policy making, providing the smooth functioning of the production, processing, marketing, and the development of the industry. Table 5.2 summarizes the main differences between the palm oil sector in Thailand and in Malaysia. Panellists stressed the importance to have the same structure for Thailand as Malaysia to overcome the fragmentation of tasks among the different ministries, which is not efficient nor contributes to an integrated policy (Delphi interviews, 2021).

The Thai government has set policies and regulations with respect to import, export, domestic market, production, and consumption for both the palm oil and the biodiesel industry. All imports of palm oil are controlled through NPOPC and the PWO. Palm oil imports are allowed when the CPO stock level is lower than required to protect domestic production, consumer prices and household consumption. Palm oil exports are also controlled to ensure internal consumption needs, which in turn affects consumer prices, given the national comparative disadvantage and consequential higher domestic price compared to the world market price (Chantaraniyom, 2014; Colchester et al., 2011). This government interference has led to market distortions, with the cost of producing refined palm oil in Thailand being some 10% higher than in Indonesia and Malaysia. This limits the ability of Thai products to compete effectively in export markets, so more than 95% of Thai production is consumed domestically.

Table 5.2: *Comparison palm oil sector between Thailand and Malaysia*

Topic	Thailand	Malaysia
Start year	1968	1917
Palm oil exporting	4%	92%
Palm oil domestic	96%	8%
Palm oil mill and refinery	137, 18	352, 46
Main oil palm producer	- Small holder 70%	- Private company 61%
Palm oil policy plan	- Office of Agricultural Economics (OAE) - National Palm Oil Policy Committee (NPOPC)	- Malaysian Palm Oil Board
R&D in new technologies (CT)	Individual institute	- MPOB
Registration and licensing	- Provincial Industrial Office, Department of Industrial Works (DIW)	- MPOB
Trade and marketing promotion	- Ministry of Industry (MoI), - Ministry of Commerce (MoC) - Ministry of Agriculture and Cooperatives (MoAC) - Ministry of Energy (MoE) - National Palm Oil Policy Committee (NPOPC)	- Ministry of International Trade and Industry (MITI) - Malaysian Palm Oil Promotion Council (MPOPC) - Ministry of Plantation Industries and Commodities (MPIC)
Monitoring and Authority Palm oil direction	- Does not exist, occasionally NPOPC for price intervention	- MPOB

Source: Chantaraniyom (2014); Chavalparit (2006); Petchseechoung (2017) (Pacheco et al., 2017)

5.3.5. Summary of characteristics

Table 5.3 summarizes the key characteristics of the current state of the palm oil sector in Thailand, as discussed in the previous three sub-sections. In summary, the Thai palm oil sector is characterised by numerous independent small-scale producers, who struggle to maintain best practices, harvest unripe fruits and implement post-harvest practices poorly thereby reducing OER from an already relatively low yield/ha. Although extension services focus on GAP-certification, ramps and other middlemen reduce quality-related price incentives, exacerbating price distortions related to government policies, focused on boosting biodiesel production. The Thai government's focus clearly lies on self-sufficiency and internal consumption rather than international competitiveness.

Table 5.3: *Key Characteristics of the Current State of Palm il Sector in Thailand*

Levels	***Key Characteristics***		
	Productivity	*Supply Chain Organization*	*Price Determination*
Farm	- Scattered independent producers - Good access to inputs - Low level inputs use related to low FFB price - Low productivity - Low land suitability in the North	- Use of harvesting teams for harvest and delivery to mills - Ramps collect large quantities of FFB from smallholders and deliver to mills (intermediaries)	- Ramps and other intermediaries interested in quantity not in quality FFBs - No transparent farm gate grading system possible - Price based on 17% OER
National	- Training available - Extension Service focus on GAP certification	- Ramps connect producers and mills - Ramps' malpractices - Competition among mills for FFBs - Mills accepting unripe FFBs - Low OER - More oil palm land needed - Lack of an integrated PO policy – many ministries with different roles - Lack of capacity for monitoring sector performances for maximizing CPO quality and quantity	- Government price intervention - Palm oil policy focused on self-sufficiency - Expansion plans aimed at meeting biodiesel targets - Buffer policy: biodiesel production based on meeting domestic cooking oil demand and to mitigate supply fluctuations
International	- Thailand is not competitive worldwide (yield, production costs)	- Policy focusses on self-sufficiency - Little production for export - Dependency from occasional imports to fully meet domestic demand	- International CPO price - Import policy to support domestic consumption of cooking oil - Costs of producing refined palm oil in Thailand around 10% higher than in Indonesia and Malaysia

5.4. Global Drivers

Palm oil is part of the global vegetable oil market where supply and demand change over time. These dynamics are important for the future of the palm oil sector in Thailand. In this section we elaborate on five global drivers: the growing global demand for vegetable oil; the increasing pressure to address climate change; the increasing demand for sustainable palm oil; the increasing competition between different vegetable oils on price, sustainability, security in

supply, and local versus global; and the slowly emerging regional collaboration in Asia through the ASEAN.

5.4.1. Growing global demand for vegetable oil

With an estimated share of 40% of global vegetable oil markets, vegetable oil is one of the most highly traded agricultural commodities (OECD & FAO, 2019). The sector has been very dynamic with an annual growth of 4.1% (compared with 2.1% for all agricultural commodities 1979-1999) and grew even faster than livestock products. This growth resulted from the higher demand for cooking oil as well as input for other food and non-food products (FAO, 2003). The use of vegetable oils for food, non-food and animal-food has shifted from 80:14:6 in 1980 to 75:20:5 in 2012, due to the move away from petroleum-use in the oleochemical industry and the increased production of biodiesel (Ayoub & Abdullah, 2012) to satisfy the increasing need for renewable energy (Murphy, 2014).

The main vegetable oil crops (oil palm, soybeans, rapeseed, and sunflower) are responsible for a substantial portion of the worldwide expansion of cultivated land between the 1970s and 2000. In this period, countries in Europe expanded their oilseed area (25 million ha) by replacing cereal crops, while in developing countries, oil crops were mostly cultivated on new land while land used for other crops increased too. In the period 1974-1999, land expansion for both oilseeds and other crops was around 70% (FAO, 2003). Given the increasing population and the global pressure on substituting fossil fuel with sustainable alternatives (Alam, Hairani, & Singagerda, 2019) by 2028 an increase of 28 MT in the global demand for vegetable oil is forecasted (OECD & FAO, 2019). Although a slowdown in the expansion of the oil palm area is expected, production growth projections for Indonesia and Malaysia are still considerable, namely 4.6 MT and 2.3 MT, respectively. Indonesian biodiesel mandates will put pressure on vegetable oil supplies in the midterm (OECD & FAO, 2019), and Thailand could do the same with its biofuel plan (Nupueng et al., 2018).

It expected that the price of vegetable oils on the global markets will increase for the period up to 2025, with soybean oil witnessing the largest increase and palm oil the smallest (Parisi and Ronzon, 2016). Petroleum price has been going up from around 60 $/barrel until it reached a peak of over 100 $/barrel in 2012. Since then, the price has, with some fluctuations, gone down to as low as 40 $/barrel in 2020, due to Covid-19 (Statista, 2021). Oil seeds have followed similar fluctuating trends. We can expect that prices will go up again. In Thailand specifically, the growing population will affect the consumption of palm oil and the amount of supply needed to satisfy its domestic demand (Delphi interviews, 2021). The pressure from global and local demand can be expected to play a role in increasing palm oil production in Thailand in the future, either through sustainable intensification, or expansion and land conversion.

5.4.2. Increasing competition between different vegetable oils

In recent years the global market share of palm oil has increased further making it the most widely consumed vegetable oil followed by soybean and rapeseed (Alam et al., 2019). This has increased the price competition between the different vegetable oils (Brummer, Korn, Schlubler, & Jaghdani, 2015). In fact, given their similar chemical composition, these vegetable oils can easily be substituted for one another, both for food and non-food purposes (Alam et al., 2019; Amiruddin, Rahman, & Shariff, 2005). This leads to strong competition and price fluctuations on the global market (Fitrianti, Syaukat, Hartoyo, & Fariyanti, 2019; Jayed et al., 2011; Priyati & Tyers, 2016).

In Table 5.4, we compare palm, soybean, and rapeseed oil in terms of economic (price and trade), and sustainability trends. In terms of price, palm oil one is currently the cheapest. In August 2020, the world market price (euro/MT) was 733 for soybean oil, 642 for palm oil, and 779 for rapeseed oil. Between September 2015 and August 2020 the highest price increase has been in palm oil, 20.3% compared with 14.2% for soybean oil and 13.3% for rapeseed oil (Indexmundi, 2020d, 2020b, 2020c). Palm oil seems, in the long run, the most responsive to

changes in global imports and exports compared to the other vegetable oils. This is due to the oligopoly of Indonesia and Malaysia as main exporters and the fact that, apart from Malaysia, importing countries do not have a domestic production of palm oil (Alam et al., 2019; Nazlioglu & Soytas, 2011).

Table 5.4: *Overview of market data: Palm Oil, Soybean Oil and Rapeseed Oil in 2020*

Commodity	Country	Production 1000 MT	Production growth rate in 2020 (%)	Country	Imports 1000MT	Price change (%) 9/2015-8/2020
Palm Oil	Indonesia	43,500	2.4	India	9,200	
	Malaysia	19,300	4.3	China	6,400	
	Thailand	3,100	10.7	EU-27	6,350	
	Colombia	1,670	9.2	Pakistan	3,450	
Total	World	74,598		World	47,491	20.3
Soybean Oil	China	16,755	6.8	India	3,236	
	USA	11,276	1	China	1,200	
	Brazil	8,640	1	Algeria	800	
	Argentina	8,385	5.5	Bangladesh	800	
Total	World	58,701		World	11,122	14.2
Rapeseed Oil	EU-27	9,363	-0.34	USA	1,963	
	China	5,967	0.66	China	1,700	
	Canada	4,350	0	Norway	480	
	India	2,584	-2.86	EU-27	230	
Total	World	27,360		World	5,292	13.3

Source: based on Indexmundi data, 2020

Palm oil production has been growing fast; from representing only 3% of the global vegetable oil production in the second half of the 1930s (Meijaard et al., 2018), to about a third in 2014 (FAOSTAT, 2017). From 4.5 million tonnes of palm oil produced worldwide in 1980 to about 70 million tonnes in 2014 (15 times more) (Meijaard et al., 2018) and 74.598 million tonnes in 2019 (Indexmundi, 2019b).

The four major palm oil producing countries are: Indonesia, Malaysia, Thailand, Colombia. (Indexmundi, 2019b). Although the highest growth rates are in Ecuador (12.8%), Thailand (10.7%), Colombia (9.2%) and Perú (7.9%), Malaysia (4.3%) and Indonesia (2.4%), (Indexmundi, 2019a) remain the world's largest suppliers, with a stable leadership in vegetable oil trade; they export over 70% of their joint production and they together represent almost 60% of world exports (OECD & FAO, 2019). This strong position is based on their higher

productivity compared to other countries, because oil palm can only be grown in the region within ten degrees from the equator, and on their large consumer base (Alam et al., 2019).

In recent years, EU-27 has promoted biodiesel by supporting a land use change policy from cereals to rapeseeds in Europe, making it the largest rapeseed producer worldwide (33%) (Klepacka et al., 2019). The EU-27 export of rapeseed oil decreased from 2,258 1000Mt in 1999 to 20 1000Mt in 2020 (Indexmundi rapeseed exports, 2020). Europe is also the second largest importer of palm oil including for biodiesel. However, as EU's biofuel policy has changed recently (Landeta, 2006; Stattman, Gupta, Partzsch, & Oosterveer, 2018), soybean oil imports for biodiesel are being reduced and palm oil as biodiesel feedstock is being phased out, while demand for rapeseed is increasing (Klepacka, Florkowski, & Revoredo-Giha, 2019). The EU-27 is leading in biodiesel production primarily using rapeseed.

Palm oil could maintain its position in the global vegetable oil market given its competitive price and higher productivity per hectare when compared to other vegetable oils. In terms of sustainability palm oil production has the largest impact in Southeast Asia whereas in Latin America oil palm expansion has mostly happened on non-peat soils, such as pasturelands (Furumo et.al, 2017), were impact is lower (Meijaard et al., 2018). However, other vegetable oil crops also have substantial environmental impacts, for instance soy production diminishes the biodiversity in Brazil and Argentina (Di Giacomo et.al, 2010; Goijman et. Al, 2015) as it threatens birdlife and has replaced high biodiversity cerrado grasslands in Brazil (WWF, 2016). Palm oil represents a better choice compared to rapeseed oil in regard to land use, ozone depletion, acidification, eutrophication and photochemical smog. It has not been, however, determined which vegetable oil performs best concerning global warming, biodiversity and ecotoxicity (Schmidt, 2010). Beyer et al. (2020) found that compared to sunflower and rapeseed, palm oil has the lowest carbon loss per ton oil. By using 6% of the total area of vegetable oil crops, palm oil is responsible for a third of the global vegetable oil production

(FAOSTAT, 2017), while soy production needs 40% of the area to produce 22% of the vegetable oil worldwide (EUPOA, 2016). Thus, substituting oil palm with another vegetable oil means a larger land use change with larger biodiversity impacts (Carrasco et. Al, 2014) and greater deforestation risks.

A critical point for the future of vegetable oils as feedstock for biodiesel production is which land is converted. If forest biotopes are used, GHG emissions will exceed emissions from fossil fuels, with risks for biodiversity and local populations, whilst GHG emissions will reduce if production occurs without land use change or by using grasslands (and not peat land). Palm oil-based feedstock leads to higher reductions of GHG emission than rapeseed and jatropha (Schmidt, 2010; Uusitalo et al., 2014).

Projections consider South America one of the areas with the highest potential for sustainable expansion of crop and livestock production until 2024 (Fairhurst et. Al, 2009; OECD-FAO, 2015) as it could meet the food needed for densely populated areas like Asia, the Middle East and Europe (ADBI, 2017), but only through a multi-stakeholder (government, industry, traders, scientists) collaboration to plan, monitor and guarantee sustainable intensification of farming systems, GHG mitigation and environmental protection (OECD-FAO, 2019).

Thailand does not import rapeseed or soybean oil, therefore there is no domestic competition with palm oil, nor is it affected by international prices for these two crops. The country imports 2000 Mt of CPO to meet its internal demand but this annual import is not increasing (Indexmundi, 2018). Thai imports are limited to crude palm oil only and to periods of low stocks (below 200,000 tonnes). Still, there is a risk for illegal imports of refined palm oil when the latter are cheaper than the legal supplies from the national market (Petchseechoung, 2017; Nupueang et al., 2018). Thailand does not compete with other countries as it is interested to become self-sufficient and does not intend to become an important exporter.

5.4.3. Increasing pressure to address climate change

The top ten crops in the world, including oil palm, rapeseed and soybean, have seen a temperature rise of 0.5-1.2 degrees Celsius in their cultivation areas (IPCC, 2007). Between 2003 and 2013, a general decrease in yields has been observed due to climate change across Europe, Sub-Saharan Africa and Australia and an increase in Latin America, while the development varied in North and Central America and in Asia. In particular, in the steppe region of European Russia and in the grain belt of Western Siberia the yield of rapeseed declined, at least in part due to higher temperatures. In Oceania yields for soybean were lower, while those for rapeseed increased overall. In North and South America yields for oil palm and soybean increased due to climate change. In Asia no specific impacts on oil palm, soy and rapeseed were observed (Ray et al., 2019).

Some governments are taking action. Under the *United Nations Framework Convention on Climate Change* (UNFCCC) Brazil has adopted policies to reduce GHG emissions through the its *Nationally Appropriate Mitigation Actions (NAMAs)* and *Nationally Determined Contribution* (NDC) policies (Rochedo et al., 2018). NAMAs required lowering annual deforestation rates by 80% in the Amazon by 2020 compared with the 1996-2005 average and by 40% in the cerrado zone in comparison with the 1999-2008 average (Brazil NAMA, 2010). This policy has been extended to 2030 (De Oliveira Silva, Barioni, Queiroz Pellegrino and Moran, 2018). Brazil's *Low Carbon Agriculture Plan* includes a range of agricultural techniques and low interest credits for investing in sustainable agriculture (Strassburg et al., 2017, 2014). One of these policies is the Soy Moratorium for Brazilian cerrado grasslands (Arima, Barreto, Araújo, & Soares-Filho, 2014), as well as for wetlands like Pantanal (Meijaard et al., 2018). The Colombian government has promised zero deforestation from oil palm by 2020 (TFA, 2017).

In 2018, Indonesia announced a three-year moratorium on new oil palm licenses to reduce possible negative social, economic and environmental consequences (Mongabay, 2018). The EU is required by its Renewable Energy Directive (RED) to meet 20% of its energy needs by 2020 from renewable sources, whereby biofuel feedstock cannot be sourced from high biodiversity areas, areas with high carbon stocks or drained peatlands (European Parliament, 2009). Moreover, given that oil palm land-based emissions are 1.5 times larger than for soybean (Valin et al., 2015), the EU has decided to phase out palm oil-based biodiesel from its RED policy by 2030 (Pahl-Wostl et al., 2008; Reuters, 2018). Other countries may take similar decisions, such as Norway which in 2017 banned the use of palm oil for biofuels (Erickson-Davis, 2017). Governments can also decide to add conditions for renewable fuels. For instance, palm oil-based biofuels are not qualified as renewable fuel by the US Environmental Protection Agency as they do not meet the minimum requirement in the Renewable Fuel Standard which states that biomass-based diesel must have a GHG lifecycle emissions reduction of 20% (EPA, 2017; Meijaard et al., 2018).

In Thailand, the government is on the one hand aligning with the international requirements (Oo, 2016) and improving the sustainability of Thai agriculture by promoting Thai National GAP certification. On the other hand, this certification is not mandatory as it is a tool mostly needed for export, such as vegetables and fruits (Pongvinyoo, 2015). Thailand is focused on palm oil used for domestic needs with little export, and therefore the country feels less pressure from international import requirements.

5.4.4. Increasing demand for sustainable palm oil

In response to the impacts from palm oil production on ecosystems and forests, the RSPO (Round Table on Sustainable Palm Oil) was created. The RSPO has developed a set of environmental and social criteria as the basis for the production of Certified Sustainable Palm Oil (CSPO) (RSPO, 2013a, 2019a, 2019b). In 2018, approximately 19% of all palm oil

produced globally was certified under the RSPO Standard. The total global CSPO was 13,619,600 Mt of which Thailand produced only 45,667 Mt CSPO (3.35%) (RSPO Secretariat, 2018; Schleifer & Sun, 2018).

Governments need incentives from the demand side in order to invest in sustainable palm oil (Meijaard et al., 2018). Demand for palm oil is currently mostly coming from India, EU, China and Pakistan (Varqa, 2017), besides domestic demand within producing countries. India and China, the first and the third largest importers of palm oil have an elastic demand based on international prices, exchange rates, import tariffs and consumption needs. In China, palm oil is primarily used for non-food purposes and in India mainly for food (Parisi and Ronzon, 2016). Second in the ranking is the EU, where palm oil imports are linked to long-term consumption changes, import prices and population numbers (Alam et al., 2019). Some countries have set targets for CSPO imports by 2020: EU 100%, Malaysia and Indonesia 50% each, India 30% and China 10% (Schleifer & Sun, 2018). Recent initiatives, like the Global Forest Watch platform, reveal the need for more transparency as spatial data can support sustainable sourcing (GFW, 2020).

Voluntary RSPO standard certification started in Thailand in 2009 with a project supported by GIZ which lasted until 2012. This project provided training to farmers on good oil palm practices in accordance with the RSPO criteria (GIZ, 2012). The project specifically addressed smallholder farmers and encouraged partnerships with the crushing mills through shareholding practices, setting a premium price for quality products and providing mentorship for farmers to receive advice and support on critical farming practices. Thailand was the first country to have independent RSPO-certified producers (Thongrak, Kiatpathomchai, and Kaewrak, 2011).

Thailand has a limited risk of deforestation because landowners usually have a legal land title, contrary to other countries where property rights are less clear (Delphi interviews, 2021).

Nevertheless, Thailand requires sustainable palm oil production to reach the target it agreed on in the Paris Agreement (COP 21), which includes the prioritization of the use of alternative energy and a decrease in GHG emissions. However, a clear biodiesel policy confirming these goals is not put in place yet. Although environmental and social sustainability were mentioned in policy documents ensuing the ratification of the Paris Agreement, in practice, the focus remains on controlling the FFB stock and the price (Nuepueng et al., 2018). In addition, few domestic consumers are concerned about palm oil sustainability (Delphi interviews, 2021), hence sustainability is unlikely to be driven by domestic demand.

We can expect that global attention to sustainability issues around palm oil production will only increase in the near future, and therefore pressure from international stakeholders to reduce GHG emissions and ecosystem loss will continue to grow. Some countries, especially in the global north, may further limit imports of palm oil produced under unsustainable practices. However, especially rapidly developing countries, where most demand growth is likely to take place, may continue to focus on cheap imports regardless of climate impacts. In combination with the relative lack of interest in sustainability practices by local consumers, it may be expected that policy makers in Thailand continue to pay less attention to sustainability and to focus on expanding production.

5.4.5. Slowly strengthening of regional collaboration (ASEAN)

In 2015, Thailand became member of the ASEAN Economic Community (AEC), established by the Association of Southeast Asian Nations (ASEAN) founded in 1967. The goal of the AEC is to promote economic, political, social and cultural cooperation across the South-East Asia region, creating a competitive single market and production base, with a free flow of goods, services, labour, investments and capital across the ten members (ASEAN Secretariat, 2015).

The ASEAN has developed a regional standard called ASEAN GAP; a set of requirements to prevent risks associated with production, harvesting and post-harvest handling of fresh fruits and vegetables. The ASEAN GAP is a voluntary standard, meant to facilitate trade of fresh fruits and vegetables between the ASEAN countries, improve viability for farmers, promote a safe food supply chain and protect the environment (ASEAN Secretariat, 2006). Compared to national GAP, the ASEAN GAP is an umbrella standard to which the national GAPs have to be harmonized (ASEAN, 2021). Alignment of national standards with the ASEAN GAP safety requirements has now become mandatory, to facilitate flows of goods and enhance ASEAN competitiveness of agricultural products in the global market (ASEAN Secretariat, 2006).

After joining the AEC, Thailand had to reduce tariffs to facilitate goods and services' circulation within the community. For example, it had to import oil palm coming from other ASEAN countries without import taxes and duties. Consequently, Thai refineries started to purchase CPO from other countries because the import price was lower than the Thai price for palm oil. This policy has affected Thai oil palm industries, especially small oil palm producers, mills, and refineries. Nevertheless, consumers benefited from a competition between palm oil companies through lower prices for household palm oil-based products (Srivirot, 2012; Chantaraniyom, 2014). In addition, the free trade agreement within the AEC increased the concerns of Thai oil palm producers and palm oil processors, due to the comparative disadvantages in Thailand's production and its higher palm oil processing costs compared to Malaysia and Indonesia (Yangdee, 2007). However, as mentioned, the Thai government monitors the biodiesel supply chain and aims to produce sufficient feedstock to keep the national CPO stock at 200,000 tonnes. In the foreseeable future, it is expected that the Thai palm oil supply chain continues to receive government support.

Currently, the AEC does not affect Thai palm oil export because it is a general agreement on agriculture and forestry and not specific for palm oil (ASEAN Secretariat, 2015). As the Delphi

panellists confirmed, Thai palm oil exports are minimal and some of them added that palm oil exports are mostly directed towards non-ASEAN countries. They also agree that EU regulations have more impact on Thailand than the ASEAN ones and that the public debate on sustainable palm oil remains more European than Asian (Delphi interviews, 2021; Weforum, 2019).

5.5. From the Current State to Future Scenarios

The core of this research is on understanding the pathways that Thailand may take to conjugate its stated goals of self-sufficiency and sustainability. Below we start with sketching different policy scenarios taking into account the key characteristics and drivers discussed above. Hereby we focus on the gap between the current situation and the ambitions proposed for 2050.

5.5.1. Sketching the explorative policy scenarios

Based on drivers and challenges of the past and current palm oil Thai sector, we developed four explorative policy scenarios (Future States) with varying degrees of probability and different sustainability consequences: 100% palm oil import, self-sufficiency with open market, self-sufficiency with closed market and niche market export[20]. By using the experts' interview results, we have constructed a ranking of these four scenarios in terms of feasibility. Here, we further elaborate these four explorative policy scenarios separately, starting from the least probable one and ending with the most probable scenario.

5.5.1.1. Scenario I: 100% palm oil import

Under this scenario Thailand stops producing palm oil given the higher production costs compared to other countries. Thailand would then – by 2050 – import all CPO needed to meet

[20] Since these scenarios rely on land use dynamics, our analysis is informed by a set of scenarios developed by Saswattecha et al. (2016) as reference for predicting land requirements to meet Thailand's self-sufficiency target, as well as the assessment made by the Delphi panellists of the likelihood of said scenarios. This analysis can be found in the Appendix of this chapter.

its domestic demand. As the government no longer needs to subsidize the domestic FFB price, Thailand saves money from the palm oil sector and can invest these resources in other sectors. It will depend on international markets for CPO for palm oil imports including the increasing global competition for vegetable oils with respect to availability and price.

Thailand will not need any further investment in certification (GAP and RSPO) nor any additional land conversion, mitigating the environmental impact of palm oil production and processing. Perhaps, some land could even be reconverted to forest, which would be in line with the international pressure to address climate change. Thailand could concentrate its resources on improving the rubber sector in the South and the rice sector in the northeast regions. The country could invest in meeting the global demand for certified sustainable rice or rubber, as Thailand has comparative advantages in these sectors and could become a pioneer of sustainability.

The experts' answers converged towards the view that realizing this scenario is very unlikely. It would go against the current governmental trends focusing on self-sufficiency and a regulatory system reducing imports to the minimum. Land has already been converted in the Southern part of the country where oil palm became (one of) the main sources of income for households. Turning to 100% palm oil imports would therefore lead to strong protests from farmers, with potentially strong political consequences (Delphi interviews, 2021). In addition, land would have to be converted in order to produce other crops than oil palm and the government would have to support a reallocation of the labour force into these other sectors. Nevertheless, it is likely that more palm oil will need to be imported to meet a growing demand for cooking oil, the food and non-food processing industry and biodiesel as a consequence of the increasing population.

Moreover, the influence from global price fluctuations would challenge Thailand's national policy of maintaining the palm oil consumer price low. Global palm oil price may fluctuate due to growing demand for vegetable oils, the competition with other vegetable oils, and the unlikely situation of having only certified palm oil available. Such import dependency would also impact the energy sector as Thailand would need to invest in other types of technologies to address dependencies from both imported fossil fuel and biofuels. There was consensus among the panellists that Thailand would not shift towards importing another vegetable oil such as soybean or rapeseed oil, as there is not enough domestic demand for these because Thai consumers prefer palm oil (Delphi interviews, 2021).

5.5.1.2. Scenario II: self-sufficiency with a closed market

Under this scenario, the Thai government focuses on self-sufficiency and reducing imports as much as possible. To minimize imports, the Thai government could impose tariffs or use other non-financial import barriers. To expand the domestic production substantial, incentives would be needed. Being completely independent in palm oil supply would require substantial increases in production, even more with its growing population. The legal framework should entail a designated national palm oil organization such as the MPOB in Malaysia which has full authority to monitor the whole palm oil system. Such an organization should regulate, monitor, and educate the palm oil sector in an integrated way; it would also play a role in deciding on the balance between biofuels and the other uses of palm oil. To optimize oil production the Thai palm oil sector should be based more on quality which is currently not the case, including good farming, harvesting and post-harvesting practices, transparent grading systems and good processing equipment (Delphi interviews, 2021).

The legal framework, including the creation of a Thai Palm Oil Association (TPOA), should be implemented by 2050 and the government should support cooperatives and other kind of groups

to intensify palm oil production. Extension efforts should focus on intensification and land use management as land for oil palm expansion is limited in Thailand.

Export is not interesting under this scenario as the comparative CPO production costs are lower in other countries. The panel experts agree that through its focus on the domestic market Thailand will not be much affected by changes in global CPO supply, prices, and regulations, nor by increasing competition among vegetable oils or the increasing demand for sustainable palm oil. However, the ASEAN may affect this scenario if it prevents the Thai government to limit the import of palm oil from other ASEAN countries. Unless the ASEAN countries make binding agreements for national standards, international sustainability certification, such as RSPO, will not be needed, and GAP certification only if domestic consumers request it.

However, this scenario is less likely to happen because it means Thailand has to produce 5 million tons of palm oil to meet its domestic demand for cooking oil and biodiesel. To meet the biodiesel target of B10 alone, Thailand should achieve a total of 9.432 million ton FFB, representing 85.60% of total FFB production in 2015 and would require an increase in the planted area of about 0.506 million hectares or 73.90% compared with 2015 (Nupueng et.al, 2018). This looks quite unlikely given the past trends of conversion and the priority for self-sufficiency in cooking oil. When the area is to be increased, especially rubber will be affected severely, in particular in the Northeast where most producers are producing this cash crop next to their diversified production for auto-consumption. Climate change could also affect the availability of suitable land in Thailand.

Dependency on the domestic supply would put Thailand in a vulnerable position, especially in case of climatic incidents like droughts and floods leading to a shortage of palm oil. In these circumstances the cooking oil sector would be prioritized (like in the current situation) with consequential impact for the other sectors (e.g., biofuels and cosmetics), that would have to be

managed on the basis of a flexible supply and developing production lines with different ingredients' ratios. This would require mechanisms for overcoming the current issues of overcapacity in biofuel plants and the related costs. Panellists mentioned how biofuel plants are currently working inefficiently because they have to operate in a lot of uncertainty whereby sustainable biofuels is priority number two (Delphi interviews, 2021; Nupueng et.al, 2018).

Delphi panellists further pointed out that the Thai government currently does not have the capacity to monitor and enforce its regulation for achieving sustainable intensification of oil palm cultivation, good harvesting, post-harvesting practices and processing practices. In particular, because oil palm is mostly cultivated by individual farmers who are not easy to organize, the necessary training and monitoring required to the achieve this scenario is challenging (Delphi interviews, 2021).

5.5.1.3. Policy scenario III: niche market export

In this scenario Thailand would focus on an open market and export small quantities to sustainable niche markets, such as RSPO-certified supply chains with a premium price. Increasing demand for sustainable palm oil would positively affect this scenario, while a growing pressure to address climate change could affect it both positively (increased market opportunities) and negatively (more stringent definition of sustainable palm oil). Even if the global demand for palm oil would increase, however, Thai exports would remain limited because of the higher cost of CPO compared with other exporters. The objective for Thailand would therefore not be to become a competitor in terms of quantity, but rather an exporter of premium quality palm oil. Thailand could import cheaper palm oil from Indonesia and Malaysia for local consumption and sell certified palm oil at premium price. Certified sustainable palm oil export would stimulate quality palm oil production; from higher quality FFB to better oil extraction technologies. An adequate legal framework as well as an organization to fully monitor the performance of the palm oil supply chain would need to be created and

strengthened. Also, in this case, cooperatives and other group initiatives would receive government support. International certification for sustainable palm oil would be required but only for companies selling to interested buyers. Public and private investments could accelerate this process, already in the earliest stages of the development. Price gains from sustainable palm oil could be reinvested in sustainable production and capacity for monitoring the legal framework, which is currently not always affordable.

This scenario has some probability considering the market for certified palm oil in the EU, building on previous experiences from some Thai companies contracting EU buyers for RSPO-certified palm oil. The Thai government has invested in GAP-certification, but exporting companies are not necessarily interested in this possibility, because they either opt for internationally recognized standards such as RSPO or for no certification at all. Currently, GAP-certified FFBs are mixed with non-GAP-certified FFBs at the crushing mills, which makes GAP-certification less interesting for farmers, unless their buyers (mills) aim for certified supply. Some companies are interested in niche markets because this offers them recognition, support from institutions like GIZ, and better pricing. Some mills consider their reputation to which RSPO certification contributes positively (Interviews, 2014). However, when looking at media and retailers' websites, we found no particular program involving big brands in palm oil sustainability, except for Shell that had a project in collaboration with Patum Vegetable Oil in 2015 and 2016. No further projects have been implemented by Shell or any other company. Also, the government focus is more on price and quantity than on sustainability (Delphi interviews, 2021).

In this scenario, land conversion would be lower than in scenario II as the demand would be lower in terms of quantity, while local demand could also be covered by increasing imports. At the same time, the increased value added from certified sustainable palm oil produced domestically would cover the financial imbalance resulting from these imports. Increasing

competition among vegetable oils as well as the future of ASEAN do not seem to affect this scenario as it takes an open-market oriented approach to premium palm oil production (Delphi interviews, 2021).

While it could be argued that countries with lower costs would profit more from producing certified palm oil, panelists agree that the conditions for producing certified palm oil in Thailand are better in terms of comparatively clearer land titles, as well as little deforestation risk, making the opportunity cost of producing certified palm oil lower. Given that Thailand has higher production costs for non-certified palm oil, but a relatively better position to transition towards certification (translated into lower costs of transition), it can be argued that Thailand has a comparative advantage in certified palm oil. This would, however, require converting the investments the Thai government currently makes into the palm oil sector. Price subsidies for consumption and investments in biofuels would need to be replaced with investing in sustainability standards and training and monitoring in all parts of the value chain. According to the experts, this radical departure from current policies is perhaps the main reason why this scenario is not very likely to happen.

5.5.1.4. Policy scenario IV: self-sufficiency with an open market

Under this scenario, Thailand will focus on meeting domestic demand and exporting some palm oil to countries that do not require certification. Hereby, Thailand does not necessarily need GAP-certification. Neither does it need to foster RSPO or other international certification schemes unless for companies that have a contract with buyers interested in certified palm oil.

The world's growing demand for palm oil will not affect Thailand much given its limited exports, but its growing domestic demand would affect this scenario as its supply would need to increase. Continued climate change, for instance through droughts or floods, will probably

reduce the availability of suitable land for oil palm cultivation and therefore increase the amount of imports needed to meet national demand.

Expansion of palm oil production would be needed to meet the demand for both cooking oil and biodiesel, also given the policy target for biodiesel (B10). Conversion of land used for producing staple foods like rice should remain minimal to avoid putting the country in a vulnerable position. This is, however, different for rubber. Although global demand probably continues to increase with Thailand being the largest producer worldwide and exports 90% of rubber production[21] (Indexmundi, 2019c), the Delphi panellists would accept converting this area into oil palm as the global rubber price has gone down over the years.

Also, with limited imports Thailand would not need to produce five million tons of palm oil per year and therefore would expand the production area with less than the expected 800,000 ha (Saswattecha et al., 2016a). However, at its current rate land conversion is not going fast enough to allow for self-sufficiency. The main reason is that available land in Thailand is limited, and that 80% of oil palm production is in the South, because the North is less suitable for oil palm cultivation. In 2012, the majority of oil palm area (96%) overlapped with pre-existing plantations from before 2009. New oil palm area in 2012 came especially from rubber plantations conversion (28%), unused land (17%) and orchards (17%) (net changes) and only a small portion of forest land (3.5%) (Saswattecha et al., 2016c). These trends would probably continue under this scenario. It seems more feasible to cover the gap in domestic demand through imports and increased productivity than by expanding oil palm plantations.

Cooperatives and other farmer groups would be supported by the government to intensify palm oil production, as groups are easier to monitor than individual farmers. Additionally, group structures facilitate the access farmers have to cheaper inputs (e.g., discounts for fertilizer) by

[21] http://www.thaitexgroup.com/main_page/index_our_company.php

purchasing in bulk. This could lead to a restructuration and reregulation of the supply chain, including the possible exclusion of ramps and mills that cannot meet the new requirements (Delphi interviews, 2021). A higher rate of oil extraction would reduce the amount of FFB needed and therefore the land expansion required. Mitigation practices would cost approximately 250 million USD, in particular for mitigating Empty Fruit Bunch (EFB) combustion (excessive steam and heat from palm oil mills) (Saswattecha et al., 2016a). An additional standard could be imposed on the mills and refineries to achieve a higher FFB oil extraction rate and better oil recovery from decanter cake (Saswattecha et al., 2016b; Sharpley, 2015).

Also, in this scenario, the legal framework has to be further developed and a TPOA created. The TPOA would decide on the distribution between biofuel and the other palm oil sectors based on available supply and potential import, although the imported amount should not change drastically because this would otherwise lead to shocks in the Thai palm oil sector.

This scenario is the most likely to happen as it is most similar to the current situation and trends: Thailand is not under pressure to export, which it currently does only in case of oversupply (around 3-4%) and Thailand is already importing to secure domestic demand relying on imports from countries that have lower palm oil production costs like Malaysia and Indonesia.

Compared to scenario II, less expansion of plantations would be needed. Moreover, imports would relieve Thai government from the need to achieve a solid monitoring system by 2050. Unless the supply chain adopts a "shared responsibility approach", whereby standards are pulled by downstream actors in the chain, it is unlikely that the government manages to redesign the whole sector in an integrated way and have the capacity to monitor FFB quality at farm gate, OER at mills and ramps' practices (Delphi interviews, 2021).

Increasing demand for sustainable palm oil will not come from domestic consumers as their awareness on the topic is low, neither from the global level. Thailand is currently exporting a limited amount to countries that are not demanding certified palm oil like China and India. In the EU the demand for Thai certified palm oil may reduce, as it is phasing out palm oil (Delphi interviews, 2021).

In this scenario, there would be no need for an international certification scheme like the RSPO. The GAP standard could support sustainable intensification and food safety for the domestic demand, and used for export within ASEAN. Thailand will not have to deviate from ASEAN policies as they have no specific rules on palm oil and Thai CPO is mostly exported outside the ASEAN members. Respondents see EU measures affecting Thailand more than ASEAN and, for the future, they expect this to remain the same (Delphi Interviews, 2021).

5.5.2. Summary of explorative policy scenarios

With the help of a panel of experts, and using the Delphi method to identify a consensus, we sketched four explorative policy scenarios for the Thai palm oil sector with widely diverging sustainability impacts. The applicability of these scenarios is in varying ways substantially affected by the global drivers we discussed in this paper. Table 5.5 presents a summary of the global drivers that are likely to play a role under these four explorative policy scenarios. For example, ASEAN cooperation is not likely to affect Thai policies unless these increase trade barriers as in the case of scenario II. Similarly, increasing competition among different vegetable oils is likely to matter most under scenario I, because Thailand would be more exposed to international price fluctuations. Only in scenario I palm oil would not constitute a growing threat and pressure with regards to climate change. Increasing demand for sustainable palm oil would instead mostly affect those scenarios with a greater degree of attention for certified palm oil—especially scenario III, and to a lesser extent scenario IV. Finally, the growing demand for vegetable oils is expected to affect all four scenarios, albeit in diverse

ways. Under scenario I, this may increase the vulnerability of Thailand to international prices, as global demand soars. Under scenario II global demand would not matter as export would be curtailed. However, if domestic demand follows international trends, growing demand would still put additional pressure on the government to secure self-sufficiency. Scenarios III and IV would also be affected, with diverging implications for sustainability: while increasing international demand could foster a greater niche market in scenario III, it could create sufficient demand for non-certified palm oil in scenario IV.

Table 5.5: *Global drivers affecting the Explorative Policy Scenarios*

Global Drivers	**Explorative Policy Scenarios**			
	I	**II**	**III**	**IV**
Growing global demand for vegetable oil	YES	YES	YES	YES
Increasing pressure to address climate change	NO	YES	YES	YES
Increasing demand for sustainable palm oil	NO	NO	YES	YES
Increasing competition between different vegetable oils on price, sustainability, security in supply, local versus global	YES	NO	NO	NO
Slowly strengthening of regional collaboration (ASEAN)	NO	YES	NO	NO

Note: this table summarizes which global drivers are key to each of the four explorative policy scenarios identified by the panel experts. Scenario I is 100% palm oil import; Scenario II is self-sufficiency with closed markets; Scenario III is niche market export; Scenario IV is self-sufficiency with an open market.

The ranking exercise clearly identified scenarios I and II as the least likely. This would entail a radical shift from current policies (scenario I) and a deviation from international trade agreements ratified by Thailand (scenario II). Also, scenario II would put a pressure on land expansion in Thailand, with the most negative sustainability consequences compared with the other scenarios.

The most virtuous scenario in terms of sustainability would be scenario III, with most production being certified and aiming for the international price premium. This would also limit the pressure on land use and land conversion, as the focus would shift from expanding the production area to more sustainable intensification. At the same time, under this scenario, imports would have to grow, as most domestic production would be oriented towards export. All this constitutes a substantial departure from the current Thai policy, scenario III less likely

to happen compared to scenario IV. This scenario was indeed identified through the Delphi method as the most likely one. It is in essence a continuation of current policies, maintaining subsidies and a focus on biofuels, with increasing pressure on land taken up by replacing less attractive cultures such as rubber.

5.6. Discussion and conclusions

Thailand's policy for self-sufficiency in palm oil has resulted in expansion plans. Policy directions, however, have not been clear in how this goal should be reached, nor how this may affect the sustainability of palm oil production. To this end, this paper investigated the history and current state of the palm oil sector in Thailand and developed four explorative policy scenarios.

By using the present (current situation) and the national target as reference points, we have identified the key characteristics and challenges that the Thai policy should take into account when designing sustainability scenarios that combine self-sufficiency with sustainability. Our research did not choose a preferred pathway. Instead, we ranked the four possible explorative policy scenarios based on likelihood to become reality in 2050 given the situation today, as assessed by consensus reached among the panelists that participated in this study.

Overall, given Thailand's disadvantages in palm oil production compared to Malaysia and Indonesia, we identified different elements a national policy should include. Through the Delphi panel of experts some of our assumptions were confirmed while others were not. Our first assumption that good access to inputs was lacking was not confirmed; the experts stressed that good varieties, inputs, and training are available, and that the problem is rather the implementation. Thai oil palm is commoditized, and its cultivation is not based on quality, which affects the whole sector including the amount of oil produced. The second assumption,

the legal framework, appeared to be the most important challenge due to the lack of capacity within the Thai government and institutions to closely monitor the performance of all the actors upstream in the chain, namely farmers, harvesting teams, ramps, and mills. Panellists pointed out that there are many obstacles to reach a quality palm oil system: farmers are often not the ones operating the land, and they invest only when prices are high, harvesting teams are interested in collecting quantity (for the retribution) and not quality, ramps need to minimize their transaction costs by delaying delivery of FFBs to the mills and the latter have to accept sometimes unripe FFBs (despite national regulations) due to the high competition among the mills. Finally, a transparent grading system is not possible due to the need to pay farmers quickly. Mills should improve their extraction rate by investing in better machinery and reduce emissions. The government should set up a land use plan with expected environmental and socio-economic impacts and actions for mitigating those. A stringent regulatory system on product quality would trigger the exclusion of actors in the chain that downgrade the product and increase waste and support intensification at all stages within the value chain thereby reducing the need for land expansion. Specific practices from each actor in the chain, including emissions standards should be implemented.

Additionally, despite oil palm cultivation being mostly in the hands of individual farmers, setting up cooperatives or groups for selling of FFBs would shorten the chain and maximize government support by channelling investments from public and private sectors. This would be more efficient than training each and every producer through the extension services and guarantee lower prices for inputs.

Moreover, the Thai government has to decide whether continuously subsidizing palm oil used for daily consumption is desired compared to a long-term investment in increasing productivity, choosing the policy scenario optimising the trade-off between domestic production and import. Panellists pointed out that scenario III is not the least likely one among the four. However, they

agreed that it would constitute a radical shift from the way Thailand currently spends its resources to sustain palm oil production—away from price subsidies and biofuels and towards sustainable intensification.

The government needs to understand the impacts on other sectors, which will be affected especially in case of policy scenario II, which involves a conversion of cropland mostly from rubber, with important socio-economic consequences for Thai rubber farmers, especially in the North of the country.

Finally, our assumption of the global driver "strengthening of ASEAN" was not confirmed by the panellists, which pointed out that ASEAN does not have a specific regional palm oil policy. However, over time ASEAN may still limit some of the most stringent import-substitution and subsidization practices, especially if ASEAN countries agree to an ever-closer union styled on the EU-27.

The most likely explorative policy scenario (IV) was identified to be closely related to the status quo objective of self-sufficiency. While this scenario clearly has properties that make it more attuned with sustainable practices compared with scenarios I and II, it is unclear to what extent self-sufficiency can be achieved while at the same time maintaining an increased attention to sustainability. At best, this scenario would see only a 'light green' approach to sustainability, prioritizing national standards such as GAP, which combines environmental concerns with a need to intensify production, over international ones such as RSPO. In fact, under this scenario the incentives would mostly be driven by the scarcity of land in Thailand, with little to no pressure from international demand for certified palm oil.

At the same time, it can be argued that under scenario IV Thailand would be forgoing some of the benefits for value addition and ecosystem management that a niche-market export route could offer. As previously discussed, such benefits come at a price, e.g., the cost of certification,

but also that of setting up a system of traceability. This said, some of the characteristics of the Thai palm oil sector, including relatively secure land titling, a higher average income and access to finance for its producers, including smallholders, and not least the reduced risk of deforestation, puts it at an advantage compared with countries such as Indonesia, in pursuing aggressively 'dark green' policies. This, in combination with relatively lower productivity and higher costs of production, make Thailand a less than optimal competitor on the commoditized non-certified palm oil market, which forms a strong case for engaging policy makers into a debate around the policy changes required to drive Thailand closer to scenario III.

Policies would need to depart radically from the current approach of price subsidization for urban consumers, and the national attention towards developing a biofuel industry—focusing instead on incentives for value addition driven by sustainability practices. Since certified sustainable palm oil yields a price premium primarily on international markets, rather than local ones, a shift towards sustainability would also require replacing the current goal of self-sufficiency with one of full integration with international markets—where most of the national production would be exported, while national consumption would be largely replaced by non-certified, cheaper, alternatives.

Policy changes always bear risks and costs. The extent to which such policy changes are desirable at the national level in Thailand therefore involves trade-offs, and assessing this is beyond the scope of this research. It is clear, however, that the likelihood of such changes should currently be considered low, irrespective of the potential benefits for the Thai palm oil sector. At the same time, at the global level, such a shift in terms of sustainability seems to be in high demand. This sets the stage for international actors in the global palm oil value chain to advocate more strongly to this end, and to facilitate the 'internalization' of global sustainability externalities into the Thai palm oil sector. This could be achieved in the form of public-private partnerships between Thailand and countries/firms that have strong interests in increasing the

sustainability of global palm oil chains. Thailand cannot be expected to champion such shift on its own; international investments and initiatives may ultimately play a decisive role in enabling a darker shade of green than the one the Thai palm oil sector is currently on track to achieve.

Appendix of Chapter 5

Scenarios predicting land requirements to meet Thailand's self-sufficiency target

We used the scenarios developed by Saswattecha et al. (2016a) as reference to understand the land conversion needed to reach self-sufficiency. The Business as Usual (BAU) is the scenario where without any intervention the production area will be doubled between 2012 and 2050 to produce five million tons of palm oil. BAU does not include a palm oil zoning policy and therefore, although conversion will start with rubber, followed by orchard, grassland, and scrubland, by 2050, 40,000 hectares will be deforested. Within this scenario, the target of 3.9 mil tons of palm oil (AEDP) will be reached by 2036.

In the Current Policy (CP) scenario, the assumption is that land-use is managed and therefore conversion to oil palm only occurs on existing arable land. Based on the suitability of the land, 80% of the new oil palm area in 2050 (or 11,2000 ha), in this scenario, is coming from cropland, especially from rubber plantations. The remaining 20% comes from the conversion of arable land not currently used as cropland, such as grassland, scrubland or abandoned land. Forests remain well protected. With the Strong Growth (GRT) scenario, it is assumed that Land Use Management (LUM) is the same as in the CP scenario but with larger areas of land-use change from cropland (90%) of which the majority from rubber plantations (60%). Finally, the Green Development (GRN) scenario is the one where the expansion (80,0000 ha) will mainly (80%) come from non-cropland with high suitability for oil palm production.

For the scenarios CP, GRT and GRN the target of 3.9 mil tons will be reached before 2036. Practices like harvesting ripe fruits and mulching Empty Fruit Bunches (EFB) are expected to lead to a productivity of 25 tons/year. In order to reach 27-37 tons/year, however, additional improvements are needed like improved land management, breeding programs, irrigation management, planting density management (Saswattecha et al., 2016a) and good processing practices at mill level. Self-sufficiency of palm oil supply is a target for all the scenarios,

whether it would be reached by 2050 (BAU) or before 2036 (CP, GRT and GRN). Imports should be reduced along with progressive meeting of the target. However, imports may be higher in BAU as here the target will be reached later than in the other scenarios. Exports will probably not increase until the target of self-sufficiency is achieved. When the target is reached exports, increase is more likely in the BAU and GRN scenarios, but less in the CP and GRT scenarios.

Impact on other sectors is expected to be higher for the scenarios CP and GRT because of the land conversion and the priority given to oil palm for suitable land, compared to the BAU scenario where new land/forest is cleared and the GRN scenario, where conversion comes mostly (80%) from non-cropland. The productivity of other crops on less suitable land may likely reduce. In the GRT scenario conversion to palm oil will be very high (60% from rubber and 30% from other crops), so it could lead to the need for importing rubber and even for importing basic food crops like rice (Saswattecha et al., 2016).

Table 5.6 presents the outcomes of the first Delphi interview round, where experts were asked to qualitatively identify the most likely land use scenarios for Thailand. Respondents were allowed to choose for more than one scenario and eight of them did choose for two scenarios. According to the panellists, BAU is not likely to occur at all. CP got four votes, followed by GRN (six votes) and GRT (eight votes). In other words, the panellists seem to propend for scenarios with continued expansion, mostly through conversion of cropland and of non-cropland highly suitable for oil palm cultivation. From the answers given, a broad consensus is emerging on the following three points: 1. Thailand has a limited amount of land for oil palm expansion, 2. To increase the production and reach the government targets, intensification is the most promising option, and 3. Targets require land expansion to be combined with good harvesting and post-harvesting practises. The interviews shower further consensus on the following factors affecting Thai CPO production: the harvest of unripe fruits is due to the use

of harvesting teams, which are paid per kilo harvested and not on quality; FFB are being delivered to the mills beyond the 24h time frame because ramps wait for trucks to be filled; and the competition between the mills, especially during the low season, leads to accepting unripe/low quality FFB, with low OER. The experts also all mentioned that the government does not have the means to monitor these bad practices and enforce rules such as prohibiting the purchase of unripe FFB, to guarantee a minimum OER (Delphi Interview, 2021).

Table 5.6: *Preferred land use predictive scenarios, as expressed by panelists*

Resp.	BAU	CP	GRN	GRT
#1				✓
#2		✓	✓	
#3			✓	✓
#4		✓		✓
#5		✓	✓	
#6			✓	✓
#7			✓	✓
#8		✓		✓
#9				✓
#10			✓	✓
Total	0	4	6	8

Note: land use predictive scenarios taken from Saswattecha et al. (2016)

Chapter 6

General discussion and synthesis

6.1. Introduction

Sustainability initiatives in Global Value Chains (GVCs) have the potential to mitigate some of the most pressing environmental stresses (Golgeci, 2021). In practice, however, in most sectors sustainability practices remain limited in scope and impact (Thorlackson et al. 2018). The palm oil value chain is a perfect example of such global value chains facing intense pressure to increase the sustainability of production practices and the material flows from upstream to downstream. It is in this context that initiatives such as the Round Table for Sustainable Palm Oil (RSPO) have been created, bringing together actors from all parts of the value chain with the intention to contribute to the 'greening' of production and supply practices. However, so far, these efforts – backed by some of the largest Multinational Enterprises (MNEs) purchasing palm oil at the global scale – did not yield the intended impact and scale. Why this is the case remains poorly understood, however. This thesis therefore investigates the bottlenecks that may hamper the adoption and effectiveness of sustainability practices in palm oil supply chains. The study takes a GVC approach to zoom-in on the upstream part of the palm oil value chain. Although the thesis focuses on RSPO initiatives in Thailand and Indonesia, the larger aim is to draw lessons that can also be applied in other value chains and other sustainability initiatives. By focusing on the upstream part of a global value chain, the goal is not only to identify local dynamics that may hinder the process of greening at the local level, but also to investigate how

such bottlenecks end up affecting the global-local nexus and influence the success of global sustainability initiatives by preventing up- and downstream information and material flows.

This thesis aims to contribute to the existing body of scientific knowledge on sustainability standards by bringing new evidence on the extent to which the RSPO certification program is affected by particular bottlenecks. Hereby, the focus is on whether information and material flows are successfully integrated vertically in the sustainably certified palm oil value chain. In this concluding chapter, I will recapitulate the main contributions from each chapter to the overall goal of this thesis, before coming to a final statement and reflect on the broader relevance of this conclusion.

6.2. Main empirical findings

In this section, I use the conclusions from chapters 2 to 5 in order to formulate the answers to the different research questions that have guided this thesis.

Research question 1 is mainly dealt with in Chapter 2: *Has the global RSPO standard contributed to the vertical integration of the palm oil chain upstream in Thailand, allowing for material as well as informational flows downstream the certified chain, and to which extent are local dynamics taken into account in the RSPO framework?*

Global governance instruments such as certification for sustainable value chain (SVC) can create a direct link between the global and the local level, for instance by connecting local farmers to the international market outlet, through sustainable production practices. Such practices are requested by the chain downstream and implemented by the upstream, overcoming the need for national/local level policy and active government engagement.

Chapter 2 reveals that this approach may nevertheless lead to bottlenecks if essential local actors are excluded from the SVC. These missing links hamper the vertical integration of the material and information flows necessary for the success of the standard and they reduce the

capacity of the initiative to increase in scale. For instance, the necessity to streamline production flows of certified chains in Thailand by bypassing ramps, does not fit the ramps' significant role in the palm oil value chain. Ramps collect important quantities of FFBs that would otherwise not reach the processing mills in time. Ramps are easily accessible for producers in ways that mills are not and currently there is not yet an RSPO infrastructure that offers the same services. In the context of the RSPO project in Thailand the stakeholders decided to involve only the (few) ramps that were also producers. This decision was made strategically to ensure that sufficient volumes and traceability data would be available and this demonstrates the need for including this key value chain actor. At the same time, this study found that ramps could be more prominently included in the local SVC framework to increase its impact. Including ramps as a fundamental pin and not as a necessary exception, would ensure the success and growth of the RSPO sustainability standard. This could be done through training the existing ramps on the RSPO principles, but also through the creation of curricula leading to 'RSPO-certified' ramps. These approaches would increase the capacity of ramps to handle RSPO certified volumes separately and perform quality checks of the certified and the non-certified palm oil.

The second research question was: *Can sustainability outcomes (including smallholders' behavior towards sustainability practices) be affected by the Indonesian upstream supply chain structure and dynamics?*

Chapter 3 shows the impact institutional arrangements have on the uptake of environmental sustainability practices. Particularly important in the context of Indonesia is the monopsonist type of contract between producers and buyers. The proximity between the chain actors that this arrangement creates, brings the advantage of a shorter value chain, facilitates traceability for sustainable products, contributes to a vertical integration of the material flows and eases smallholders' access to inputs and output markets. The arrangement, however, also leads to

disadvantages. The monopsonic relationship between the producers and the buyers, the scheme-type of the arrangements and the lack of transparency in the price making process, reduce smallholders' bargaining power and create a form of dependency in terms of fixed channels for sale and access to inputs. This may lead to a lower motivation for the adoption of good agricultural practices and engaging in continuous improvement, because this will not be translated into a better price.

Given this setting, even a higher transparency in the process of price determination would not solve the situation as smallholders are not in the position to refuse the price offered by the mill. For the situation to improve, the price determination process needs to change and price discrimination needs to be created. Currently monopsonist buyers calculate the price based on the age of palm trees and multiply this by a fixed coefficient called K-index. This calculation is independent from the actual performance during farming and the harvesting practices and does therefore not include quality differences. Although the K-coefficient is, on paper, determined by agreements between the government and the actors in the sector, different actors' positions and power imbalances in the chain make the agreement process not fully just, fair, and transparent. In contexts where producers are not only price takers, but where buyers also have the power to impose additional costs such as maintenance fees (e.g., of scheme infrastructures), producers are not encouraged to improve their performance. The differences in the share flowing to producers was found not to be connected to the RSPO certification, but rather to the higher international price for palm oil. Buyers calculate additional costs and use the K-index in order to adapt to international palm oil prices and make sure they remain profitable, which leaves no room for negotiations and allows producers to only benefit when global prices are high.

Research question three is: *Does RSPO certification fosters upstream learning to improve farming practices in Thailand and Indonesia?*

Chapter 4 mainly dealt with answering this question and it shows how learning depends on institutional arrangements which can be a bottleneck for effective learning. Chapter 4 takes the unique approach of analyzing knowledge transfer and the potential for learning across the whole production phase from seeds to sale, thereby going beyond the conventional approach of studying the retention of information in the context of training courses. This approach allows to reveal that knowledge transfer and learning are influenced by local dynamics and context. Downstream-to-upstream knowledge transfer was found to be more dynamic in Thailand than in Indonesia, and within Indonesia it was more dynamic among independent smallholders compared to scheme farmers. Thai producers who manage their own plantations from seeds to sale adopt a learning by doing approach and thereby face more learning loops. In Indonesia, despite the higher productivity compared to Thailand and the proximity between producers and buyers, our study confirmed the 'paternalistic' setting described by Barral (2014) where the scheme arrangements create a supervised and controlled production system (Barral, 2014). This system is established to make sure FFBs are delivered to the mills in the right quality, quantity, and in a timely manner. In essence, Indonesian smallholders are the implementers of instructions and thus have a low potential for learning by experimenting, for dealing with constraints, and for failing and improving routines and performances (single-loop learning) (Pahl-Wostl, 2009; Tabara and Pahl-Wostl, 2007). They have limited space for reflections on cause-effect and for dissonance (Wals, 2011) during their interactions with the mill staff. In this case, learning is an act of imitation rather than one of co-creation (Tran et al., 2018).

Given that all peer farmers follow the same instructions mandated by the local mill, the potential for horizontal learning among Indonesian scheme farmers is minimal. Nevertheless,

independent smallholders were found to be more aware of the RSPO criteria than their scheme colleagues, as the former conduct planting and farming activities independently. This context enables them to put in practice learning by-doing and learning by decision-making (single-loop learning). However, being bounded to the same monopsonist relationship with their buyer as the scheme smallholders, there are few incentives for independent smallholders to produce better quality FFB and to improve farming practices. Thus, in this situation there are only some options for double-loop learning, i.e., transforming, innovating and creating forms of institutional interaction, whereby not only new actions are taken but whereby also the assumptions behind those are changed (Sol et al., 2013).

Knowledge transfers along the chain from downstream to upstream (information flows) are found to be affected in cases of disruption of vertical integration when the farmer is replaced by other actors in certain production activities. Examples for such disrupted integration are the case of the middlemen in Thailand (e.g., harvesting and transportation teams) and of the mills (buyers) in Indonesia (e.g., agrochemical application teams). In these situations, the potential for learning among producers is reduced as farmers are not in control of all farming activities. Thai producers have, however, – unlike their Indonesian peers – the responsibility to supervise and take decisions on harvesting teams' performances, which makes them still in control of the production system. Indonesian independent smallholders also experience a gap in the production process by having the cooperative taking over the management of pest control. Therefore, they do not have to experiment to overcome a constraint nor go through a learning cycle (action-reflection-action) (Kolb, 1984). The cooperative checks the producers' performances and is therefore part of a vertical rather than of a horizontal network.

Interactions, power dynamics and incentives are important elements in the shift from knowledge transfer to learning. Thai producers face many opportunities for learning by

interaction within vertical networks because the presence of multiple buyers allows farmers to choose where to sell their produce and for what price. In particular, quality grading and price incentives have a high potential for learning by interacting and triple-loop learning (which involves changes of the values, beliefs or norms that are behind operational assumptions and actions) (Argyris, 2003; Pahl-Wostl et al., 2011). Grading provides a feedback on bad practices and product mistakes, and provided that this is connected with economic rewards (the price is related to product quality), this can create a change in farmers' values, beliefs, or norms behind assumptions about their farming operations. In itself, proximity between actors, interactions and many assets do not make a system apt for learning, if the system is instruction based. The monopsonist framework in Indonesia is characterized by fixed prices (linked to parameters such as a fixed OER-related price, only dependent on the age of the palm tree). In addition, as the FFB profits are connected to maintenance payments from producers to the mills, farmers are not stimulated to improve the quality of their FFB nor to engage in triple-loop learning. Indonesian independent smallholders, similar to their scheme colleagues, have a monopsonist relationship with their buyer, but as the cooperative conducts the selling and grading activities, triple-loop learning is limited although both the producer and the buyer operate in the same problematic context.

Chapter 5 provides the main results for answering research question four: *Can Thailand converge the national self-sufficiency plan for palm oil and its sustainability ambitions for oil palm production?*

Chapter 5 illustrates how some of the bottlenecks explained in Chapters 2, 3 and 4 are not only relevant for global sustainable chain initiatives but also for national governments' policies. While governments may sometimes be ambitious, the feasibility of their policies is not always fully anticipated as important bottlenecks along the implementation pathway have not been

identified. By using the case of Thailand, the study presented in this Chapter, shows how national governments do not always fully align with the comparative advantages and disadvantages of domestic crop production, in this case palm oil. Aiming for self-sufficiency for both cooking oil and biofuel, Thailand has created a highly regulated and subsidized national palm oil supply system and has ignored a real palm oil trade policy. The country does not seem to have assessed different market options and their respective advantages and disadvantages.

Characterized by lower productivity and higher production costs per hectare compared with neighboring producing countries like Indonesia and Malaysia, Thailand cannot compete on the international market in terms of price and quantity. In addition, bottlenecks such as the strong role of intermediaries (ramps) and the lack of government capacity to enforce quality assessment for all actors in the chain upstream (farmers, harvesting teams, ramps, and mills), affect the oil content of FFBs and therefore the available quantity of palm oil. On the other hand, Thailand does not face a serious problem of deforestation and offers a free market environment where producers can be more responsive to price and quality related incentives, when compared with Indonesia. Moreover, palm oil producers in Thailand tend to be wealthier, better educated and owning slightly larger land holdings than farmers in neighboring palm oil producing countries. Based on these advantages and disadvantages, and the fact that global demand for sustainable palm oil seems to increase, Thailand could choose to focus on niche market production rather than on mass production. In that case, Thailand would take advantage of the higher/premium prices offered on the market for sustainably certified palm oil. Four different future scenarios of the Thai palm oil sector were presented to a number of experts. The results show that scenario IV, which is based on open markets and in line with current government plans of self-sufficiency, is considered the most plausible given the current situation. This scenario can, however, at best only lead to '*light green*' practices. The experts identified scenario III (which includes '*dark green*' practices) as the second most plausible

option, although they agreed that it would be a thorough shift away from how Thailand currently spends its financial resources. It would entail shifting from the current price subsidies and biofuels prescriptions towards investing in sustainable intensification and offering incentives for value addition driven by sustainability practices, in combination with a solid regulatory system to assess the quality of FFB and palm oil. This scenario could be facilitated by a radical shift towards premium certified niche markets to increase profits while importing non-certified palm oil at low cost from neighboring countries. Downstream stakeholders could facilitate changes in the national palm oil policy through lobbying, training, and advocacy, thereby trying to overcome policy bottlenecks towards sustainable SVCs. Even though this shift seems to be supported by the growing demand for sustainable palm oil at the global level, its implementation looks unlikely given the current trends in Thai government palm oil policy.

These four research questions combined are contributing to answer the overall research question of this thesis: "*What is the role of local dynamics and context when implementing a global sustainability initiative in palm oil and how can potential obstacles be addressed?*"

The different Chapters have demonstrated that local dynamics and specific contexts can diminish the impact of global sustainability initiatives. Local dynamics and contexts may create bottlenecks that are not included in the standardized and simplified designs of global sustainability standards that are supposed to be universally applicable worldwide. Local contexts are characterized by specific dimensions of space and time that shape a commodity sector and determine its key features. Examples from this thesis, are the way in which chain actors are geographically distributed, how they interact with each other, what type of contractual agreements are in place, what the profile is of the involved producers (e.g. with low or high levels of education, possessing means of transport, additional income, etc.), what the national policy is as well as the level of upgrading of the local sector. The level of

embeddedness of these upstream key features in the value chain determines whether there is a disruption of the vertical integration of material and information flows during the implementation of a sustainability initiative. In case of disruption, the uptake of new practices and the consequential success of the initiative may be compromised or limited.

To allow for the uptake of new practices, global sustainability initiatives need to acknowledge the embedded dynamics and actors first, and to subsequently transform identified bottlenecks and obstacles into opportunities for success. Such global initiatives can be more successful when engaging in public-private partnerships and advocating for institutional arrangements that reduce the bottlenecks and increase the benefits for the ultimate implementers. These local implementers need to be included in global sustainability initiatives because they have a key role in improving the vertical integration.

6.3. Reflections on the scientific contribution of this thesis

This thesis has contributed to three scientific debates and a methodological approach. These contributions are further discussed in this section.

First, global sustainability initiatives are faced with the challenge how to accommodate local differences while at the same time remaining a globally recognizable standard that is effectively contributing to more sustainability. Many standards and sustainability initiatives are based on one global model to be implemented in many countries. This thesis builds on the RSPO as a case to assess the applicability of global initiatives in different contexts and to understand the bottlenecks that arise from their implementation in local contexts. The results confirm that a simple translation of global normative frameworks into a local context without adaptation or inclusion of local actors (Nadvi 2004, 2008; Horner and Nadvi 2017; Peña 2014) and national institutional structures, reduces the uptake of new practices supported by these global frameworks (Braun 2006; Delmas 2002) and limits the positive impact of the initiative. Such

an approach also limits the possibility for expanding the same framework to more implementers beyond just a cluster of niche markets or scattered projects, while that is needed to create a sustainable world. This thesis shows that contextualization is critical for the success of global standards (Fransen 2012; Ponte and Cheyns 2013). It also provides indications for the claim that if the implementation of global standards is designed with a clear vision of the end goal, it can adapt to local contexts and overcome important bottlenecks, and thus have more impact.

Standardized approaches are easier to implement as they require less resources from the organizers and are easily accountable worldwide. In addition, they do not need to be concerned about so-called "double standards" (i.e., a lighter or stronger version of the requirements in different contexts). Also, consumers understand a standardized model more easily and trust it better, without needing to check for each country whether their expectations are met. In line with other scholars, this thesis shows that the inflexibility of global sustainability standards might, however, decouple the globally defined normative framework and expected outcomes in the local practices (Bromley and Powell, 2012; Bromley et al., 2012). By first understanding local bottlenecks and then adapting to local contexts, standards' setters and organizers are able to provide a better absorption of their normative framework into the upstream chain structure. If they tackle missing links and bottlenecks, they can improve the vertical integration and increase the success of the initiative thereby contributing to achieving a higher impact. They can do this, for instance, through the inclusion of key local actors, both in the design as well as in the implementation of the initiative by conducting the global framework adaptation process in loco (Strambach and Surmeier, 2018).

Furthermore, standardization facilitates comparing data from different countries (green transparency). The use of similar indicators for measuring the outcomes of a standard helps to even compare a broad range of initiatives. Similar kinds of data potentially allow for a better

assessment of where these initiatives are overlapping and where better synergies and collaboration opportunities can be found to achieve a higher level of impact. Currently, however, transparency is standardized and conceptualized as the performance of a sustainability initiative as a whole (indicators are often developed as the macro-outcomes of sustainability initiatives such as the number of hectares or volumes certified). However, this does not provide evidence on the benefits the actual implementers receive. While by the same token the presence of such benefits is crucial because this affects to a large extent whether the initiative will be sustainable and long standing. This thesis reinforces the need for studying local upstream dynamics to assess whether the outcomes of standards are sufficient to pursue sustainability and offer benefits to smallholders, the ultimate implementers.

Thus, by taking the GVC framework and zooming in on the upstream part, this thesis contributes to better understanding the role of local dynamics to the success and impact of the sustainability initiatives. Moreover, it puts at the center of attention the relationship between the downstream sustainability objectives and the upstream production practices – the global-local nexus. By focusing on bottlenecks in this relationship, this thesis made clear that to achieve greater sustainability it is not necessary to overhaul and radically transform upstream value chains. Instead, it is necessary to understand the causes of these bottlenecks and tackle them by finding feasible solutions for them.

The second contribution this thesis makes is to the scientific debate on the role of public-private collaboration in the global-local nexus. Private global standards play a vital role in upgrading a product, based on downstream requirements (Nelson & Tallontire, 2014). These standards usually aim to improve farmers' income (Rossi, 2013), enhance organizational capabilities (Ruben et al., 2011) and achieve better environmental quality (Virah-Sawmy, 2019). Pre-existing local asymmetries in information flows and in chain power due to the presence of a

dominant market partner may, however, result in unexpected and unbalanced outcomes of global private initiatives (Fuchs et al., 2011) particularly influence the social well-being of the implementers (Vicol et al., 2019).

Despite the strength of the downstream-driven sustainability requirements within the RSPO, this thesis found, however, no evidence that the global-local nexus is a comparatively more advantageous approach to reach vertical integration of materials and information flows in global value chains. This thesis showed that global initiatives do not supply the basic local infrastructures and normative arrangements needed for a global initiative to succeed. The growing influence from actors such as international organizations, industry sectors, farmers' organizations, and labor unions, on the content and implementation of the standards contributed to rebalance the existing chain power distribution that was disadvantageous for producers (Coe et al., 2015). Price setting, legal frameworks, and appropriate infrastructures for crop quality assessment are all, however, part of a regulatory framework that requires the engagement of the national state. Thanks to the rise of various hybrid governance arrangements that involve national, transnational, and non-governmental organizations (e.g., standards schemes and multi-stakeholder initiatives), the importance of public-private governance is increasingly being recognized. Public governance has a role in influencing global sustainable production through national policies and engagement with private and civil society actors at different scales, in order to match regulatory systems with local actors' interests and incentives (Alford, 2016; Glin et al., 2015; McCarty et al., 2012). However, this thesis also showed that global standards do not have the awareness nor the authority to change chain agreements that may be at the disadvantage of the ultimate implementers. For instance in the case of captive value chain governance, as illustrated in Chapter 3, where a group of smallholders is dependent on one or a few buyers to purchase their output (Gereffi and Lee, 2012), and where the product has to comply with complex (sustainability) requirements (Gibbon et al., 2008) under circumstances

of linkages (between buyer and suppliers) governed by the buyer (Ponte and Sturgeon, 2014). This affects the motivation of the farmers to implement sustainability practices. This thesis showed that the Indonesian palm oil contractual agreements between producers and first processors (mills) were simply translating the RSPO framework into a monopsonic relationship which did not automatically add benefits to smallholders. Therefore, this thesis confirms the need to further explore the non-economic functions of the state, like the selection, mediation, and coordination of local capabilities, financial resources, and societal goals (Lombardozzi, 2020). Hereby the state may need to make different choices and build additional capacity to deliberately connect economic upgrading with social and environmental sustainability objectives (Wardell et al., 2021). Further research should address the question whether states want to engage in such activity and under which conditions.

The third contribution this thesis makes relates to the role of social learning in the promotion of global standards. Upgrading an agricultural product through the implementation of private standards creates opportunities for enhancing organizational capabilities through guidance and supervision (Ruben et al., 2011). Various studies have shown a positive effect of RSPO and other voluntary standards on improved crop production and farm management practices (Oosterveer et al., 2014; Ruysschaert et al., 2019; Piao et. al., 2019). This thesis challenges the capacity of global standards framework to shift from a mere instruction-based approach to an instrument in a social learning process. According to Lipparini, Lorenzoni and Ferriani (2014) GVC networks that benefit most from knowledge transfer among partners are those where the latter share a common identity and language. This thesis reveals that common identity and language are not enough and that chain position, negotiation power and the conditions under which knowledge is transferred are fundamental for creating real benefit.

In a social learning process, knowledge is absorbed by the implementer, who reflects on it and acts on the basis of the newly acquired knowledge (Kolb, 1984). Social learning is extremely relevant when a global standard cannot be adapted to the local context.

Standards organizations do not have the capacity to reach the entire population of farmers at the appropriate speed and scale that our planet needs. Therefore, local actors play a critical role here. They have to be involved in the process of standard implementation, a process that needs to go beyond distributing a set of instructions that farmers are requested to follow. This thesis showed that the Thai model of learning (cf. Chapter 4) can be considered an example for scaling learning processes among implementers and be applied to other countries. It was particularly insightful to find that the intermediaries (ramps) became also brokers of knowledge and not only of the material flows between producers and mills. Deans defines intermediaries in certified chains as "brokers of knowledge, inputs, and resources" (Deans et al., 2018), but this thesis goes one step further by identifying intermediaries as a stimulus for learning by palm oil producers. Farmers tend to rely on embedded local networks to obtain external resources and information, especially on how to reduce or spread risks. The literature highlights that locally embedded actors such as local service providers and intermediaries are increasingly taking on the role of improving vertical and horizontal coordination (Bolwig et al., 2011; Poulton et al., 2010). This includes acting as an intermediary for knowledge transfer (Ramirez et al., 2018) and facilitating smallholders in the uptake of new and innovative practices (Zuckerman et al., 2006). Intermediaries like ramps are in the perfect position for connecting downstream requirements with producers' knowledge and for providing feedback during the activities of selling and grading. In doing so, such intermediaries stimulate the learning process among farmers, which is necessary to change beliefs and values. This thesis also showed that learning should not only be associated with activities of knowledge transfer like training but also to other practices, such as interactions related to selling and grading. These activities

proved to be effective because there are economic incentives attached to them. 'Inclusive governance' of smallholders (German et al., 2020) starts with the inclusion of embedded local actors like intermediaries who can supply inclusive services and facilities that other actors such as the mills cannot offer. Furthermore, acknowledging the role of such intermediaries in learning loops would allow for reducing the number of farmers excluded from lucrative markets because they do not fulfil compliance standards. This thesis also revealed, however, that this Thai model of social learning within the value chain cannot simply be transferred one-to-one to other countries and that often a change in the local chain structure is needed. In the case of Indonesia for instance, the monopsonist structure, the dominance the of instruction-based system and the lack of price incentives do not create the correct setting for social learning and an *action-reflection-action* loop.

Finally, the applied research methods warrant a further reflection. Throughout this thesis, the combination of quantitative and qualitative data collection offered a comprehensive picture of the situation on the ground in Thailand and Indonesia. By managing the data collection, I got to spend several months in the field in both Indonesia and Thailand, which gave me a close look at the concrete context and the actors within it. Through interviews, focus groups and personal observations, I was able to better understand the respondents' answers to the survey questions and thereby to better interpret the data. This allowed me to get to know the chain structure, the key actors and their relationships, their geospatial distribution, etc. These are all elements that influence the material and information flows in the palm oil value chain. Complementing quantitative and qualitative data has also been possible by allowing to return to the field after the initial data analysis and to investigate follow-up questions. This approach has increased the confidence in answering the research questions. The first data collection and findings from Chapters 2 and 4 provided a solid basis for conducting the Delphi Method analysis later in Chapter 5. In this way, I could assess the key characteristics and

challenges that the Thai policy should take into account when designing sustainability scenarios. Subsequently, I could depict four explorative scenarios with key representatives from the Thai entities with a role in the national palm oil policy. The explorative scenarios allowed for building a pathway for reaching sustainability goals in each of the four cases. This process raised questions on whether certain steps along the pathway were plausible for the Thai government or not and under which conditions. The Delphi method was, however, more time consuming than the other methods such as workshops and focus groups, as respondents needed to be contacted and followed up individually. This method was useful during the time of the Covid pandemic when travel was not possible. Without Covid, however, additional rounds might have been added through face-to-face meetings with the respondents.

The samples and case studies included in this thesis varied in terms of numbers, characteristics of respondents (scheme Indonesia, independent producers in Thailand and Indonesia, certified and non-certified) and locations (the largest production areas in both countries). Working with two countries has been challenging in terms of data collection, ensuring comparability of the data (units, language and context differences sometimes required a slightly different formulation of the question). It has been, however, academically enriching and extremely valuable to compare these two countries, to be able to draw solid conclusions and to translate findings into recommendations that could also be applicable to other countries and contexts.

In terms of internal and external validity, the methodology and the study methods are replicable in further research on this topic to confirm the findings part of this work. In terms of internal validity, the use of several methodologies, both qualitative and quantitative, triangulating findings across them, should bring quite some hope that the findings of this thesis would replicate within the same study population. By using a comparative methodology with

two countries as subjects of analysis, this thesis has some external validity within other production areas in these countries as the type of chain and institutional settings will be similar under the same national policies, norms, and market structures. In addition, the methods used (both quantitative and qualitative) have provided solid evidence that is re-confirmed throughout all the chapters of this thesis. This research study has highlighted many bottlenecks applicable to the implementation of the RSPO certification program in many other producing countries. The challenges derived from the specificity of this crop will always shape the upstream chain structure and related market relationships and bring similar challenges in any other palm oil producing country and this is why in-depth analysis of the upstream chain with mixed methods, and the use of treatment and control groups, provide this validity. For instance, the lack of transportation for farmers to bring their FFBs to mills and the consequential need for middlemen (or any similar institution) that provides this service is present in other countries as well (Furumo et. al, 2020) and this is an example around which market relationships take shape without RSPO being in control of. Finally, the two countries provide two different national models of the palm oil sector; one based on free-market and the other one based on more national intervention and scheme structures that can be met in other countries as well.

The findings of this thesis are relevant and valuable for many other global value chains of tropical crops. At the same time, each country and market has their own specificities, bottlenecks and challenges that would require further research to be fully understood. This being said, there are some clear lessons learned from the specific cases studies in this thesis: that the implementation of any other international standard without contextualization will face similar challenges in fully implementing its goals, unless it does an effort to understand local institutions, infrastructures, monitoring systems and policies in a way that the research methods from this thesis have highlighted.

6.4. Policy recommendations

The findings and analyses presented in this thesis provide the basis for the formulation of a series of policy recommendations for both Thailand and Indonesia as well as for the RSPO.

a) Thailand

The first recommendation is to strengthen the inclusion of key chain actors in sustainability certification programs, such as the RSPO. Their involvement would strengthen the vertical integration and facilitate information flows and thereby allow reaching the various categories of smallholders. Thus, although the ramps in Thailand are disrupting conventional vertical integration, it is recommended to seek their inclusion instead of exclusion because they can provide the traceability information required for certification. In this sense, the involvement of ramps would be a first step in encouraging initiatives such as the RSPO to put more effort in including actors 'middle in the upstream' into their framework and approach. It is only by including them and targeting knowledge transfers and incentives to them that certification schemes, such as the RSPO, can expect large groups of farmers to experience the full value of sustainable practices.

The second recommendation is to seek a stronger engagement from the Thai government in shaping the implementation of the RSPO and of global private sustainability initiatives in general. Such public-private partnership would create the support needed to mitigate dynamics hampering vertical integration. Policy makers should implement a stringent regulatory system to upgrade the national palm oil sector. Regulations should address product quality, maximize oil extraction, reduce waste and emissions from mills and support sustainable intensification within the value chain to reduce the need for land expansion. In this way, actors who downgrade the product quality and increase waste would be excluded from the value chain, because they do not comply with the downstream requirements.

The third recommendation is to set up cooperatives or farmer groups for FFB sale. This would 1) shorten the chain; 2) maximize the impact of public and private investment, and 3) guarantee lower prices for inputs.

b) Indonesia

The first recommendation is to enhance the engagement of the Indonesian government in supporting fair and sustainable institutional agreements in the palm oil sector. Currently, the focus is on promoting the quantity of produced and exported palm oil through mill plantation and mill scheme production whereby there may be a trade-off between quantity and sustainability aims. So far, the role of smallholders with respect to the RSPO requirements has received little attention. As shown in this thesis, the instruction-based system organized around optimizing the supply efficiency reduces the role of smallholders to simple executers without much opportunity for learning. The Indonesian government should consider the consequences of this approach and its long-term consequences. Considering the future role of smallholders in practicing sustainability and avoiding further deforestation should be a core element in the government's palm oil policy.

The second recommendation is that the Indonesian government should improve the regulatory system of the palm oil sector, in particular the contractual agreements in the schemes and the price making processes (cf. Chapter 3). The government should bring more transparency in this process and make sure Indonesian oil palm producers have correct knowledge about the topic and are included in the process. Lack of transparency and asymmetry of information may lead to bottlenecks in the implementation as they reduce the incentives for the uptake of new practices and continuous improvement. The government should in particular monitor the net income position of scheme producers and independent smallholders by strengthening their bargaining position. Finally, the government should also address the weak

collection infrastructure that puts smallholders in a position of dependence vis-à-vis local traders.

c) RSPO

The first recommendation for the RSPO is to consider the importance of contextualization within the process of standardization when aiming for increased impact. This would require accepting a certain degree of flexibility and adaptation of RSPO standards to local contexts to deal with specific bottlenecks that hamper the successful expansion of the program. The RSPO could establish local teams of RSPO staff, consultants, and experts to help defining country strategy plans that tackle the specific local context bottlenecks.

The second recommendation is that the RSPO and more in general, transparency and certification initiatives (standards and certification bodies, the International Organization for Standardization (ISO), etc.) should give more attention to the context in which its program and the related supportive tools like training and incentives are implemented. The organization should consider whether its program makes it effective or creates bottlenecks for scaling up and meeting its societal goals. Leading companies can guarantee a good organization and control for the implementation of a sustainability standard, gain the trust of implementers, and make sure these implementers apply the acquired knowledge through appropriate supervision. However, supervision and instruction-based approaches are not the best option if the aim is to change the behavior of implementers and scale up fast. It is recommendable for RSPO to collaborate with policy makers to foster the capacity of pre-existing upstream palm oil value chain arrangements to change along with the sustainability initiatives themselves. Further investments in knowledge transfers are necessary to identify the type of interactions promoting (third loop) learning. This would create the conditions for including smallholders in certified

supply chains and allow for creating the knowledge transfer and opportunities for social learning necessary for the implementation of sustainability standards.

The third recommendation is that the RSPO should engage in lobbying and advocacy to support national policies towards sustainable palm oil production. In the case of Thailand, the RSPO should support national palm oil policy makers, in the realization that the current national policy might not fully align with the potential of the Thai sustainable GVC and help steering it towards alternative directions. For instance, by steering this national policy towards creating a niche in the profitable certified sustainable palm oil market and balance this with import of cheaper palm oil from neighboring producing countries. In the case of Indonesia, the RSPO should play an advocacy role in terms of the pricing and agreements between producers and mills and in local power dynamics to make sure smallholders are benefiting from their program.

6.5. Suggestions for future research

Based on the findings from this thesis and the scientific reflections presented above in this Chapter, a research agenda is proposed here.

Overall, I recommend detailed research on the local context in which the upstream value chain (of a sustainable certification program) structure functions and where relations between market actors develop. This research would allow to uncover bottlenecks and black boxes that determine the failures and successes of a sustainable supply chain initiative. Additional research should focus on comparing the upstream RSPO-certified chains in different countries to see whether similar or different bottlenecks are hampering the vertical integration of material and information flows.

Second, future research could investigate under which upstream chain arrangement implementers of sustainability schemes learn at their best. Research could explore 1) when the implementers find the information they are exposed to meaningful, 2) when they update their

beliefs, and 3) when they decide to implement sustainability guidelines, such as those from the RSPO, in their everyday farming practices.

Third, pay more attention to the study of implementers' benefits when assessing global sustainability initiatives like the RSPO. Many standards report and are compared based on indicators about environmental sustainability concerning the program as a whole (such as volumes of certified sustainable product and number of certified hectares). It would be valuable to assess such initiatives also based on indicators about the social and economic benefits implementers have received and what behavioral change has occurred during the uptake of new practices. This research could build on Jason et. al. (2023) who analyzed 29 sustainability initiatives and found discrepancies between the number of indicators used for environmental, social, and economic sustainability, with a considerable prioritization of environmental sustainability.

Finally, future studies could investigate the implementation of the RSPO standard by learning from positive examples. I would suggest going beyond impact studies and to study correlations between implementers' satisfaction in terms of benefits and develop a set of parameters describing the specific context (chain structure, institutional arrangements, contractual agreements, etc.) in cases of successful and impactful implementation of sustainability standards. This would allow to determine the optimal form of standard governance and to understand whether there has been a change in the behavior for implementation to guarantee the long-term durability of the program.

6.6. A final statement

With this thesis, I had the double objective to describe and identify local upstream dynamics in the palm oil value chain and to investigate their impacts on the functioning and potential longevity of sustainability initiatives for palm oil as a global commodity In doing so, I found

that local dynamics are often more complex than the theories of change applied by these initiatives suggest. The approach that "*one size fits all*" is not sufficient to achieve the expected outcomes. My conclusion is that a better understanding of the local, context-specific dynamics, bottlenecks, and specificities, may help global initiatives to tailor their own requirements and modus operandi to the local contexts and thereby increasing their speed of adoption and sustainability impacts.

Local mechanisms for agricultural upgrading have acquired a central place in this thesis research. Upgrading hereby has been understood as a value associated with the sustainability of the product itself. This upgrading has found place in this thesis in relation to a range of sustainability aspects.

First, the value of a product may be reduced by a missing link or a black box in the upstream value chain that contributes to downgrading the product and hampering the vertical integration of material and information flows. Consequently, the commodity is no longer recognized as being sustainable. Final standard implementers are often part of complex networks of relationships that are not considered by global standard organizations, as they rely on one single standardized model for all countries. When black boxes are identified and included in certification programs, they allow for vertical and horizontal linkages with implementers. Hereby, implementers are no longer just territorial and relationally embedded actors, but rather key actors that can enhance the vertical integration, affect the outcome of agriculture upgrading and help achieving sustainable governance.

Second, lack of engagement from national governments in global sustainability governance initiatives diminishes the value of a global commodity because there is no underlying infrastructure. This thesis shows that the upgrading of global commodities requires the establishment of a coherent regulatory and governance system that is supported by the

national government. As local agricultural upgrading is influenced by global, national, and local forces, it is fundamental to consider the roles of national actors in the context of global-local linkages and the promotion of public-private partnerships for sustainability.

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Appendices

Appendix 1: Survey instruments Thailand

Thailand – Palm Oil Survey

FILL OUT THE LINES WITH !!! INFRONT OF THEM BEFORE TALKING TO THE RESPONDENT

		Name	ID	Date		
!!!	District		└─┴─┴─┘			
!!!	Village		└─┴─┴─┘			
	House number					
	Respondent		└─┴─┘			
	Phone number					
!!!	Enumerator		└─┴─┘	D D	M M	Y Y Y Y
	Field supervisor		└─┴─┘	D D	M M	Y Y Y Y
	Data clerk 1		└─┴─┘	D D	M M	Y Y Y Y
	Data clerk 2		└─┴─┘	D D	M M	Y Y Y Y

Module 0 Introduction

NO.	QUESTIONS AND FILTERS	ANSWER		CODING CATEGORIES	SKIP
001	Hello. My name is ____________________ and I am working with Walailak University. Together with Wageningen University from the Netherlands, we are conducting a survey about palm oil. It will help us evaluate the progress of the palm oil sector. We would very much appreciate your participation in this survey. The survey will take less than one hour to complete. Participation in this survey is voluntary, and if we should come to any question you don't want to answer, just let me know and I will go to the next question; or you can stop the interview at any time. However, we hope that you will participate in this survey since your views are important. At this time, do you want to ask me anything about the survey? May I begin the interview now? Signature of interviewer: ________________ Date: ________________				
002	DOES THE RESPONDENT AGREE TO BE INTERVIEWED?	└─┘		1. yes 2. no	→ 003 → END
003	RECORD THE TIME	H H	M M		

[This page is to be kept separate. In the survey below only ID codes are used.]

!!!	District	!!!	Village	!!!	Respondent
	⌊_⌊_⌊_⌋		⌊_⌊_⌊_⌋		⌊_⌊_⌋

Module 1 Personal Information

NO.	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES	SKIP
101	IS THE RESPONDENT MALE OR FEMALE?	⌊_⌋	1. Male 2. Female	
102	What were the month and year of your birth?	MM YYYY	RECORD THE DATE IF THE RESPONDENT DOESN'T KNOW ENTER 99 / 9999	
103	How old were you at your last birthday? COMPARE WITH 102 IF CONSISTENT. IF NOT, PROBE UNTIL CONSISTENT	⌊_⌊_⌋ years	ENTER AGE IN COMPLETED YEARS	
104	What is your marital status? PROBE FOR THE RESPONDENT'S MARITAL STATUS	⌊_⌋	1. Married 3. Engaged 5. Single 2. Widow 4. Divorced	
105	Have you ever been to school?	⌊_⌋	1. yes 2. no	→ 106 → 108
106	What is the highest level of education you attended?	⌊_⌋	1. Prathom 2. Mattayom 3. Tertiary Education 4. Other, specify _____	
107	What is the highest level you got a certificate from?	⌊_⌋		
108	How many kids do you have over 15 years old?	⌊_⌊_⌋ Nº	RECORD NUMBER	
109	How many kids do you have under 15 years old?	⌊_⌊_⌋ Nº	RECORD NUMBER	
110	How many people is your household composed by? PROBE: PEOPLE LIVING IN THE SAME DWELLING WHO EAT TOGETHER AND ACKNOWLEDGE THE AUTHORITY OF A THE HEAD OF HOUSEHOLD	⌊_⌊_⌋ Nº	RECORD NUMBER	
111	Who is your household head?	⌊_⌋	1. Myself 4. My father 2. My husband 5. My mother 3. My wife 6. Other, specify: _____	
112	What is your religion?	⌊_⌊_⌋	7. Buddhist 9. Muslim 8. Christian 10. Other, specify: _____	
113	Which of the following items does your household own? a. mobile phone? b. radio? c. tv? d. fridge? e. car? f. bicycle? g. motorbike?	⌊_⌋ ⌊_⌋ ⌊_⌋ ⌊_⌋ ⌊_⌋ ⌊_⌋ ⌊_⌋	1. yes 2. no	
114	How many Kg of rice does your household consumes/eat per month?	⌊_⌋	RECORD NUMBER	
115	How much phone credit do you usually spend per week (7 days)?	⌊_⌊_⌊_⌊_⌋	REPORT EXPENDITURE IN BAHT (0000 IF NO CELLPHONE)	
116	Do you have another source of income from non-agricultural activities?	⌊_⌋	1. Yes, specify monthly income : ⌊_⌊_⌊_⌊_⌋ BAHT 2. No	

Module 2 Agricultural Production

NO	201	202	203	204	205	206
PLOT	Agricultural product START FROM THE BIGGEST PLOTS UNDER ONE CROP AND CONTINUE WITH SMALLER	Land area (Rai)	Type of property	Number of harvests per year	Total production in last harvest (KG)	Selling price (Baht/KG)
1	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
2	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
3	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
4	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
5	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
6	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
7	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
8	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
11	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
12	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
All other	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
	1. Palm oil 2. Rice 3. Rubber 4. Fruit trees 5. Livestock 6. Other, specify_____	RECORD THE HECTARES OF EACH PLOT WITH THIS CROP	1. Chanod 2. Nor Sor 3 3. Nor Sor 3 Gor 4. Sor Por Gor4-01 5. Por Bor Tor 5 6. No title 7. Other, specify _____	RECORD THE TOTAL NUMBER OF HARVERSTS FOR EACH PLOT. RECORD 00 IF NO HARVEST	RECORD THE TOTAL PRODUCTION IN KG FOR EACH PLOT. RECORD 00000 IF NO PRODUCTION	RECORD THE AVERAGE ESTIMATED SELLING PRICE IN BAHT PER KG

!!!	District	!!!	Village	!!!	Respondent
	⌊_⌊_⌊_⌋		⌊_⌊_⌊_⌋		⌊_⌊_⌋

Module 3 Certification

NO.	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES	SKIP
301	Are you farming palm oil within a scheme or independently?	⌊_⌋	1. Scheme 3.Other,specify 2. Independent _____	
302	Have you ever heard about RSPO certifications? PROBE FOR VERY MINIMUM KNOWLEDGE	⌊_⌋	1. yes 2. no	→ 303 → 310
303	Are you certified RSPO?	⌊_⌋	1. yes 2. no	→ 304 → 306
304	Since when are you RSPO certified?	⌊_⌊_⌊_⌊_⌋	RECORD YEAR IN EUROPEAN CALENDAR (CONVERT)	
305	When did you start following RSPO principles & criteria?	⌊_⌊_⌊_⌊_⌋	RECORD YEAR IN EUROPEAN CALENDAR (CONVERT)	
306	Did you follow or are you currently following a training to get RSPO certification?	⌊_⌋	1. yes, by the RSPO farmers' leader 2. yes, by the mill 3. yes, by government 4. yes by, specify _____ 5. no	
307	In your opinion, will you be RSPO certified after 5 years from now?	⌊_⌋	1. yes 2. no	
308	How important do you think these reasons may be for your decision to be RSPO certified in 5 years from now? a. RSPO can improve quality of environment b. RSPO can increase production efficiency c. RSPO gives new knowledge d. Payment support from NGO/government/or others e. Access to market	⌊_⌋ ⌊_⌋ ⌊_⌋ ⌊_⌋ ⌊_⌋	1. Not important 2. Slightly important 3. Fairly important 4. Very important 5. Fundamental	
309	How important do you think these reasons may be for your decision to not be RSPO certified in 5 years from now? a. Severity of change in farm management required by RSPO b. Lengthy of application forms c. Poor communication between promoters and farmers d. Absence of external support e. Increased costs of production	⌊_⌋ ⌊_⌋ ⌊_⌋ ⌊_⌋ ⌊_⌋	1. Not important 2. Slightly important 3. Fairly important 4. Very important 5. Fundamental	
310	Do you have other palm oil certifications?	⌊_⌋	1. Yes, GAP 2. Yes, other, specify:_____ 3. no	→ 401 → 401 → 311
311	Are you in the process of obtaining other certifications?	⌊_⌋	1. Yes, GAP 2. Yes, other, specify:_____ 3. no	

Module 4 Integration Roster

NO	401	402	403	404	405	406	407	408
Stakeholder Name	How many of the following stakeholders are in your network? PROBE FOR CORRECT NUMBER	How many times per year are you selling your FFB produce to these stakeholders?	Which type of CONTRACT do you have when you sell?	Do you sell certified or non-certified to these stakeholders?	How often do you have active contact with these stakeholders?	For what main reasons do you contact these stakeholders for? REPORT MAXIMUM TWO MAIN REASONS	For what main reasons are these stakeholders contacting you? REPORT MAXIMUM TWO MAIN REASONS	How do you typically keep contact with these stakeholders
Mills	⌊_⌊_⌋	⌊_⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋
Cooperatives	⌊_⌊_⌋	⌊_⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋
Middlemen/ramps	⌊_⌊_⌋	⌊_⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋
Foreign companies	⌊_⌊_⌋	⌊_⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋
Harvest hired workers	⌊_⌊_⌋	⌊_⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋
Government representatives	⌊_⌊_⌋				⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋
Certification bodies	⌊_⌊_⌋				⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋
NGOs	⌊_⌊_⌋				⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋
Research Institutes	⌊_⌊_⌋				⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋
Financial institutions	⌊_⌊_⌋				⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋
Other, specify: _____	⌊_⌊_⌋	⌊_⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋
Other, specify: _____	⌊_⌊_⌋	⌊_⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋ ⌊_⌋	⌊_⌋
	SPECIFY THE NUMBER OF STAKEHOLDERS IN EACH CATHEGORY IF NONE RECORD 00 AND MOVE TO NEXT STAKEHOLDER	RECORD NUMBER OF TIMES PER YEAR	1. Spot selling Pre-harvest: 2. One harvest 3. One year 4. Multiannual	1. Certified 2. Non-certified 3. Both	1. Once per week 2. Once every 2 weeks 3. Once per month 4. Once every 2 moths 5. Once every 6 months 6. Once per year 7. Never	1. Product price 2. Product quantity 3. Product quality 4. Sustainable practices 5. Contract 6. Harvesting 7. Transport 8. Training 9. Nothing 10. Other, specify: _____	1. Product price 2. Product quantity 3. Product quality 4. Sustainable practices 5. Contract 6. Harvesting 7. Transport 8. Training 9. Nothing 10. Other, specify: _____	1. Formal meeting 2. Informal meeting 3. Phone 4. Computer 5. Written letter 6. Focus group 7. Other, specify: _____

6/14

!!!	District	!!!	Village	!!!	Respondent
	⌊_⌊_⌊_⌋		⌊_⌊_⌊_⌋		⌊_⌊_⌋

Module 5 Trust and Power Roster

NO	501	502	503	504	505	506	507
Stakeholder Name	In general, are you able to contact [*Stakeholder Name*] when you want?	When you have problems relating to your palm oil production how much can you rely on help by [*Stakeholder Name*]?	On a scale from 1 (no trust) to 5 (full trust) how much would you say you can trust [*Stakeholder Name*]?	On a scale from 1 (no trust) to 5 (full trust) how much would you say [*Stakeholder Name*] trust you?	How much are you economically dependent on the decisions and choices of [*Stakeholder Name*]?	Rank the stakeholders from most powerful and influential in your decisions regarding palm oil production to the least powerful	How do you judge your negotiation power in the palm oil sector with respect to [Stakeholder Name]?
Mills	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋
Cooperatives	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋
Middlemen/ramps	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋
Foreign companies	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋
Harvest hired workers	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋
Government representatives	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋
Certification bodies	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋
NGOs	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	
Research Institutes	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	
Financial Institutions	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋
Other, specify: _____	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋
Other, specify: _____	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋
	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never	1. No trust 2. Little trust 3. Fair trust 4. A lot of trust 5. Full trust	1. No trust 2. Little trust 3. Fair trust 4. A lot of trust 5. Full trust	1. Completely 2. A lot 3. Little 4. Not at all	START WITH THE MOST POWERFUL (1) AND GO ON WITH THE REST (2, 3,..., 9). RANK 0 IF NO POWER	1. Extremely weak 2. Little weak 3. Not weak nor strong 4. Little strong 5. Very strong

Module 6 Palm Oil Production, BMP and Knowledge

NO.	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES	SKIP
601	For how many years have you been harvesting your palm trees?	⌊_⌋⌊_⌋ years ⌊_⌋⌊_⌋ months	RECORD NUMBER OF YEARS AND MONTHS	
602	What are the main palm breeds you are growing on your land? DO NOT PROMT THE RESPONDENT ONLY REPORT THE ANSWER	1st: SPECIFY: _____ 2nd: SPECIFY: _____		
603	What is the name of a good oil palm variety?	1st: SPECIFY: _____		
604	When buying seedlings what do you look at? RANK THE OPTIONS ON THE RIGHT (maximum 3, minimum 1)	1. ⌊_⌋ 2. ⌊_⌋ 3. ⌊_⌋	A. quality B. well accepted/with licence C. government support D. suitable for your land E. suggested by a friend F. cheap price G. nearest nursery H. other, specify: _____	
605	Is your land suitable for oil palm production?	⌊_⌋	1. Yes 2. No 3. I do not know	
606	When was the last time you sold some of your own palm FFB?	M M | Y Y Y Y	RECORD THE DATE	
607	What was the price (BAHT/KG) that you sold your own palm FFB for that last time?	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋	RECORD THE PRICE IN BAHT	
608	Do you know the quality level at which you sold your own palm FFB that last time?	⌊_⌋	1. Yes, specify: _____ 2. No	
609	Do you know or can you estimate the current price of that quality level of FFB at this moment? RECORD THE PRICE IN BAHT	⌊_⌋	1.Yes, specify: ⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋ BAHT 2. No	
610	What do you think about the FFB price at the current moment?	⌊_⌋	1. Very unfavourable price 3. Slightly favourable price 2. Slightly unfavourable price 4. Very favourable price	
611	What are the main channels through which you get information over the current price of palm FFB when you decide to sell your own produce? RANK THE OPTIONS ON THE RIGHT (maximum 3, minimum 1)	1. ⌊_⌋ 2. ⌊_⌋ 3. ⌊_⌋	A. Mill B. Middlemen/traders C. Other palm oil smallholders D. Palm oil plantations E. Extension workers F. Radio/TV/Newspapers G. Other, specify: _____	
612	When you need to obtain credit to invest in your oil palm plantations, which are the borrowers you can go to? Order them in order of preference, excluding the ones that would not provide you with credit for this. RECORD A MAXIMUM OF 4 PREFERRED CREDIT SOURCES PROBE THE RESPONDENT FOR THE ORDER OF PREFERENCE	1. ⌊_⌋ 2. ⌊_⌋ 3. ⌊_⌋ 4. ⌊_⌋	A. Official banks B. Microfinance institutions C. Cooperative D. NGOs E. Mills F. Informal moneylenders G. Friends and family H. Other, specify: _____	

!!!	District	!!!	Village	!!!	Respondent
	⌊_⌊_⌊_⌋		⌊_⌊_⌊_⌋		⌊_⌊_⌋

NO	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES	SKIP
613	CROSS-CECK Q302: DOES THE RESPONDENT KNOW RSPO?	⌊_⌋	1. Yes 2. No	→ 614 → 617
614	Are you currently growing palm oil using at least one of the RSPO principles and criteria?	⌊_⌋	1. Yes 2. No	→ 615 → 617
615	Could you name some of the RSPO regulations? DO NOT PROMT THE RESPONDENT CIRCLE ALL THAT APPLY	A. Transparency of land rights documents B. Production record documents C. Fertilizing practices D. Pesticide application practices E. Zero burning F. Water availability & quality maintenance	G. Waste management H. Labour rights & minimum wage I. Occupational health & insurance J. Communication with stakeholders K. Other, specify:_____	
616	In your opinion, which RSPO criteria are the most difficult to apply and why? DO NOT PROMT THE RESPONDENT CIRCLE ALL THAT APPLY	A. Transparency of land rights documents B. Production record documents C. Fertilizing practices D. Pesticide application practices E. Zero burning F. Water availability & quality maintenance	G. Waste management H. Labour rights & minimum wage I. Occupational health & insurance J. Communication with stakeholders K. Other, specify:_____	
617	How many times per year do you do the following activities related to oil palm? a. harvesting b. circle weeding c. weeding d. pruning e. fertilizing	⌊_⌊_⌋ times ⌊_⌊_⌋ people ⌊_⌊_⌋ days ⌊_⌊_⌋ times ⌊_⌊_⌋ people ⌊_⌊_⌋ days ⌊_⌊_⌋ times ⌊_⌊_⌋ people ⌊_⌊_⌋ days ⌊_⌊_⌋ times ⌊_⌊_⌋ people ⌊_⌊_⌋ days ⌊_⌊_⌋ times ⌊_⌊_⌋ people ⌊_⌊_⌋ days	RECORD THE ESTIMATED NUMBER OF TIMES PER YEAR, PEOPLE AND DAYS	
618	What are the characteristics of the bunch when you decide to harvest? CIRCLE THE ANSWERS OF THE RESPONDENT DO NOT PROBE ANSWER!!!	A. Colour change of the bunch B. Texture of the bunch	C. Moisture of the bunch D. 2-3 fallen fruits per bunch E. 10 fallen fruits per bunch F. Other, specify:_____	
619	Do you harvest your palm oil yourself within your household?	⌊_⌋	1. Always 2. Sometimes 3. Never	→ 622 → 622 → 620
620	When you do not harvest by yourself, do you monitor the workers harvesting your palm FFB?	⌊_⌋	1. Yes 2. Sometimes 3. No	→ 622 → 622 → 621
621	Do you have an idea about how the workers are harvesting?	⌊_⌋	1. Yes 2. No	→ 622 → 623
622	How often do you/others pick bunches from your oil palm fields that are: a. not perfectly mature yet? b. over-matured? c. loose fruits laying on the field?	⌊_⌋ ⌊_⌋ ⌊_⌋	1. Always 2. Very often 3. Rarely 4. Never	
623	Does your FFB reach the mill in 24 hours?	⌊_⌋	1. Always 2. Very often 3. Rarely, because: _____ 4. Never because: _____ 5. Don't know / Don't care	

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NO	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES	
624	Who is in charge of the transport of your palm oil?	⌊__⌋	1. You personally 2. Harvest workers 3. Middlemen	4. Miller 5. Cooperative 6. Other, specify: _____
625	To which mill do you/others usually transport your harvest to?	SPECIFY MILL: _____		
626	How far is this mill from your plantations?	⌊__⌋⌊__⌋⌊__⌋	ENTER THE NUMBERS OF KM	
627	How many times per year do you visit the mill estate to watch and learn how to improve oil palm production?	⌊__⌋⌊__⌋	ENTER NUMBERS OF TIMES/YEAR	
628	Do you also work in the mill estate?	⌊__⌋	1. Yes 2. No	
629	Do you take any specific step or practice to prevent the risk of having a water source for your plantation which is contaminated and/or polluted?	Open response: _____		
	PROBE THE RESPONDENT AND VALUE THE AWARENESS LEVEL	⌊__⌋	1. Very aware 2. Little aware	3. Not aware
630	Do you take any specific step or practice to prevent the risk of having a planting area which is contaminated and/or polluted?	Open response: _____		
	PROBE THE RESPONDENT AND VALUE THE AWARENESS LEVEL	⌊__⌋	1. Very aware 2. Little aware	3. Not aware
631	Do you take any specific step or practice to prevent the risk of your plantations attacked by one of pests (e.g. rats, leaf eating caterpillars, rose beetles, rhinoceros beetles, other pests)?	Open response: _____		
	PROBE THE RESPONDENT AND VALUE THE AWARENESS LEVEL	⌊__⌋	1. Very aware 2. Little aware	3. Not aware
632	Do you know how to manage pesticides in a way that they do not pose a health threat for yourself and for the oil palm plantation?	Open response: _____		
	PROBE THE RESPONDENT AND VALUE THE AWARENESS LEVEL	⌊__⌋	1. Very aware 2. Little aware	3. Not aware
633	Which fertilizer do you use?	⌊__⌋	1. Chemical 2. Organic	3. Both 4. None
634	How many bags of 50 kg fertilizer do you typically use per year on your palm oil land?	⌊__⌋⌊__⌋⌊__⌋⌊__⌋⌊__⌋ BOXES	RECORD THE ESTIMATED BOXES PER 1 YEAR BLACK OUT THE WRONG UNIT OF MEASURE	
635	How many KG/LT of pesticide do you use per year on your OP plantation/s?	⌊__⌋⌊__⌋⌊__⌋⌊__⌋⌊__⌋ KG/LT	RECORD THE ESTIMATED AMOUNT OF KG/LT PER YEAR BLANK OUT THE WRONG UNIT OF MEASURE	
636	How many KG/LT of herbicide do you use per year on your OP plantation/s?	⌊__⌋⌊__⌋⌊__⌋⌊__⌋⌊__⌋ KG/LT	RECORD THE ESTIMATED AMOUNT OF KG/LT PER YEAR BLANK OUT THE WRONG UNIT OF MEASURE	
637	How many palm trees do you have in your plantation/s?	⌊__⌋⌊__⌋⌊__⌋⌊__⌋⌊__⌋ N°	RECORD THE AMOUNT OF PALM TREES	

!!!	District	!!!	Village	!!!	Respondent
	⌊_⌊_⌊_⌋		⌊_⌊_⌊_⌋		⌊_⌊_⌋

638	When do you usually start replanting?	⌊_⌋	1. 3 years before the old palms become 25 years old 2. After the old palm trees do not have fruits anymore 3. Other, specify: _____	
639	What are the most important investments a farmer should do to obtain high quality FFB? DO NOT PROMT THE RESPONDENT CIRCLE ALL THAT APPLY	A. Improved technologies B. Better land	C. High quality labour D. Quality palm breeds	E. Better transport F. Other, specify:
640	What is the daily salary for a person working in your OP plantation/s?	⌊_⌊_⌊_⌊_⌋	RECORD THE AMOUNT IN BAHT PER PERSON PER DAY	

Module 7 Upgrading

NO	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES	SKIP
701	Do you know what a global value chain is? PROBE: A GLOBAL VALUE CHAIN IS THE DIFFERENT PROCESSES IN DIFFERENT PARTS OF THE WORLD THAT EACH ADD VALUE TO THE GOODS OR SERVICES BEING PRODUCED	⌊__⌋	1. Yes 2. No	
702	Do you know who is buying the CPO after the mill processes it?	⌊__⌋	1. Yes, specify:_____ 2. No	
703	What is, more or less, the price the mill sells this Palm Oil?	⌊__⌋⌊__⌋⌊__⌋⌊__⌋,⌊__⌋	RECORD THE PRICE IN BAHT RECORD 9999,9 IF NOT KNOWN	
704	Do you know if the mill you are selling your FFB to sells RSPO palm oil: a. Identity preserved b. segregated c. mass balance d. book & claim	⌊__⌋ ⌊__⌋ ⌊__⌋ ⌊__⌋	1.Yes 2.No 3.I do not know	
705	Do you know which countries are the most demanding for palm oil from Indonesia?	⌊__⌋	1. Yes, specify:_____ 2. No	
706	Can you name some final products for which palm oil is used? DO NOT PROMT THE RESPONDENT CIRCLE ALL THAT APPLY		A. Cooking Oil B. Cosmetics C. Soap D. Plastic E. Biodiesel F. Margarines G. Animal Feeds H. Sweets I. Washing powders J. Baked foods K. Cereals L. Other:_____	
707	Are you part of a palm oil growers' organization or association?	⌊__⌋	1. Yes, specify name:_____ 2. No	→ 708 → 712
708	How long have you been a member?	⌊__⌋⌊__⌋	RECORD THE TIME IN YEARS ROUNDING DOWN 00 IF LESS THAN ONE YEAR	
709	What is your position in the group?	⌊__⌋	1. Chair 2. Simple group member 3. Treasurer 4. President 5. Secretary 6. Other, specify:_____	→ 711 → 710 → 710 → 710 → 710 → 710
710	Do you trust the chair of the group?	⌊__⌋	1. No trust 2. Little trust 3. Fair trust 4. A lot of trust 5. Full trust	
711	Name the main benefit you obtain from the group CIRCLE ALL THE ANSWERS OF THE RESPONDENT DO NOT PROBE THE ANSWER!!!		A. Information about the sale B. Knowledge support C. Technical support D. Financial facilities E. Transport facilities F. Other, specify _____	
712	How many times per year do you receive : a. an external control by the Mill? b. an internal control by the head of the farmers' group?	⌊__⌋ ⌊__⌋	RECORD THE NUMBER OF TIMES PER YEAR	

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!!!	District	!!!	Village	!!!	Respondent
	⌊_⌊_⌊_⌋		⌊_⌊_⌊_⌋		⌊_⌊_⌋

NO	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES		SKIP
713	How do you deal with palm oil price fluctuations? CIRCLE THE ANSWERS OF THE RESPONDENT DO NOT PROBE THE RESPONDENT	A. By selling at different times through the year B. By pre-harvest price agreements C. By harvesting less when price is low D. By helping each other among farmers	E. By harvesting more when price is high F. By having other side crops G. By borrowing money H. By using savings	I. By selling to different buyers at different times J. By having side jobs/salary K. By selling assets in bad times L. Other, specify:_____	
714	Can you name the two most important stakeholders supporting you concerning the following issues: a. Input access? b. Input use? c. Credit access? d. Production technologies access? e. Production technologies use? f. Transport services?	⌊_⌊_⌋ ⌊_⌊_⌋ ⌊_⌊_⌋ ⌊_⌊_⌋ ⌊_⌊_⌋ ⌊_⌊_⌋	1. Mills 2. Middleman 3. Group of farmers 4. International Buyers/Traders 5. Local Buyers/Traders 6. NGOs	7. Government 8. Research Institutes 9. Other fellow farmers 10. Other, specify: _____	
715	In which form do you receive information about : a. Input access? b. Input use? c. Credit access? d. Production technologies access? e. Production technologies use? f. Transport services?	⌊_⌊_⌋ ⌊_⌊_⌋ ⌊_⌊_⌋ ⌊_⌊_⌋ ⌊_⌊_⌋ ⌊_⌊_⌋	1. Explanatory pamphlets/videos 2. Training 3. Informal discussions 4. Extension workers 5. Other, specify: _____ 6. Never get information about this		
716	In general, would you say this information easy to a. understand? b. apply in practice?	⌊_⌋ ⌊_⌋	1. Always 2. Most of the time 3. Sometimes 4. Rarely 5. Never		
717	What are the main difficulties to apply this information in practice?	Open response:_____ _____			
718	How often on average do you talk with other farmers like you about how to improve the quality of your palm oil?	⌊_⌋	1. Almost every day/more than once per week 2. Once per week 3. Once every 2 weeks 4. Once per month 5. Once every 2 moths	6. Once every 6 months 7. Once per year 8. Less than once per year 9. Never	
719	How often on average do you visit the plantations of another farmer like you to try to improve the quality of your palm oil?	⌊_⌋			

801	RECORD THE TIME	H H	M M		

Comments and Observations

TO BE FILLED IN AFTER COMPLETING INTERVIEW

INTERVIEWER'S COMMENTS ABOUT RESPONDENT:

_____
_____
_____
_____

INTERVIEWER'S COMMENTS ON SPECIFIC QUESTIONS:

_____
_____
_____
_____

ANY OTHER INTERVIEWER'S COMMENTS:

_____
_____
_____
_____
_____

FIELD SUPERVISOR'S COMMENTS: Field supervisor's name: _____ Date: _____

_____
_____
_____

Appendix 2: Survey instruments Indonesia

Indonesia – Palm Oil Survey

FILL OUT THE LINES WITH !!! INFRONT OF THEM BEFORE TALKING TO THE RESPONDENT

		Name	ID	Date		
!!!	District		└─┴─┴─┴─┘			
!!!	Village		└─┴─┴─┴─┘			
	Respondent		└─┴─┘			
	Phone number					
!!!	Enumerator		└─┴─┘	D D	M M	Y Y Y Y
	Field supervisor		└─┴─┘	D D	M M	Y Y Y Y
	Data clerk 1		└─┴─┘	D D	M M	Y Y Y Y
	Data clerk 2		└─┴─┘	D D	M M	Y Y Y Y

Module 0 Introduction

NO.	QUESTIONS AND FILTERS	ANSWER		CODING CATEGORIES	SKIP
001	Hello. My name is ______________________ and I am working with Riau University. Together with Wageningen University from the Netherlands, we are conducting a survey about palm oil. It will help us evaluate the progress of the palm oil sector. We would very much appreciate your participation in this survey. The survey will take less than one hour to complete. Participation in this survey is voluntary, and if we should come to any question you don't want to answer, just let me know and I will go to the next question; or you can stop the interview at any time. However, we hope that you will participate in this survey since your views are important. At this time, do you want to ask me anything about the survey? May I begin the interview now? Signature of interviewer: ______________ Date: ______________				
002	DOES THE RESPONDENT AGREE TO BE INTERVIEWED?	└─┘		1. yes 2. no	→ 003 → END
003	RECORD THE TIME	H H	M M		

[This page is to be kept separate. In the survey below only ID codes are used.]

!!!	District	!!!	Village	!!!	Respondent
	⌊_⌊_⌊_⌋		⌊_⌊_⌊_⌋		⌊_⌊_⌋

Module 1 Personal Information

NO.	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES	SKIP
101	IS THE RESPONDENT MALE OR FEMALE?	⌊_⌋	1. Male 2. Female	
102	What were the month and year of your birth?	MM YYYY	RECORD THE DATE IF THE RESPONDENT DOESN'T KNOW ENTER 99 / 9999	
103	How old were you at your last birthday? COMPARE WITH 102 IF CONSISTENT. IF NOT, PROBE UNTIL CONSISTENT	⌊_⌊_⌋ years	ENTER AGE IN COMPLETED YEARS	
104	What is your marital status? PROBE FOR THE RESPONDENT'S MARITAL STATUS	⌊_⌋	1. Married 4. Single 2. Widow 3. Divorced	
105	Have you ever been to school?	⌊_⌋	1. yes 2. no	→ 106 → 108
106	What is the highest level of education you attended?	⌊_⌋	1. SD6 (____years) 5. S2(____years) 2. SMP3(____years) 6. S3(____years) 3. SMA3(____years) 7. Other, specify 4. S1(____years)	
107	What is the highest level you got a certificate from?	⌊_⌋		
108	How many kids do you have over 15 years old?	⌊_⌊_⌋ Nº	RECORD NUMBER	
109	How many kids do you have under 15 years old?	⌊_⌊_⌋ Nº	RECORD NUMBER	
110	How many people is your household composed by? PROBE: PEOPLE LIVING IN THE SAME DWELLING WHO EAT TOGETHER AND ACKNOWLEDGE THE AUTHORITY OF A THE HEAD OF HOUSEHOLD	⌊_⌊_⌋ Nº	RECORD NUMBER	
111	Who is your household head?	⌊_⌋	1. Myself 4. My father 2. My husband 5. My mother 3. My wife 6. Other, specify:_____	
112	What is your religion?	⌊_⌊_⌋	7. Buddhist 9. Muslim 8. Christian 10. Other, specify:_____	
113	Which of the following items does your household own?			
	a. mobile phone?	⌊_⌋	1. yes 2. no	
	b. radio?	⌊_⌋		
	c. tv?	⌊_⌋		
	d. fridge?	⌊_⌋		
	e. car?	⌊_⌋		
	f. bicycle?	⌊_⌋		
	g. motorbike?	⌊_⌋		
114	How many Kg of rice does your household consumes/eat per month? PROBE ONE HANDFUL IS ONE FULL HAND	⌊_⌋	RECORD NUMBER	
115	How much phone credit do you usually spend per week (7 days)?	⌊_⌊_⌊_⌊_⌋	REPORT EXPENDITURE IN RUPIA (0000 IF NO CELLPHONE)	

Module 2 Agricultural Production

NO	201	202	203	204	205	206
PLOT	Agricultural product START FROM THE BIGGEST PLOTS UNDER ONE CROP AND CONTINUE WITH SMALLER	Land area (Hectares)	Type of property	Number of harvests per year	Total production in last harvest (KG)	Selling price (Rupiah/KG)
1	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
2	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
3	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
4	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
5	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
6	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
7	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
8	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
11	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
12	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
All other	⌊_⌋	⌊_⌋⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋	⌊_⌋⌊_⌋⌊_⌋⌊_⌋,⌊_⌋
	1. Palm oil 2. Rubber 3. Rice 4. Fruit trees 5. Livestock _____ 6. Other, specify_____	RECORD THE HECTARES OF EACH PLOT WITH THIS CROP	1. Hak Milik 2. HGU 3. SKGR 4. Letter head district 5. Letter head village 6. Tanah adat/ulayat 7. No title 8. Other, specify _____	RECORD THE TOTAL NUMBER OF HARVERSTS FOR EACH PLOT. RECORD 00 IF NO HARVEST	RECORD THE TOTAL PRODUCTION IN KG FOR EACH PLOT. RECORD 00000 IF NO PRODUCTION	RECORD THE AVERAGE ESTIMATED SELLING PRICE IN RUPIA PER KG

!!!	District	!!!	Village	!!!	Respondent
	⌊_⌊_⌊_⌋		⌊_⌊_⌊_⌋		⌊_⌊_⌋

Module 3 Certification

NO.	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES	SKIP
301	Are you farming palm oil within a scheme or independently?	⌊_⌋⌊_⌋	1. NES 3.Independent 2. KKPA 4. Other,specify: _____	
302	Have you ever heard about RSPO certifications? PROBE FOR VERY MINIMUM KNOWLEDGE	⌊_⌋	1. yes 2. no	→ 303 → 310
303	Are you certified RSPO?	⌊_⌋	1. yes 2. no	→ 304 → 306
304	Since when are you RSPO certified?	⌊_⌊_⌊_⌊_⌋	RECORD YEAR IN EUROPEAN CALENDAR (CONVERT)	
305	When did you start following RSPO principles & criteria?	⌊_⌊_⌊_⌊_⌋	RECORD YEAR IN EUROPEAN CALENDAR (CONVERT)	
306	Did you follow or are you currently following a training to get RSPO certification?	⌊_⌋	1. yes, by the RSPO farmers' leader 2. yes, by the mill 3. yes, by government 4. yes by, specify _____ 5. no	
307	In your opinion, will you be RSPO certified after 5 years from now?	⌊_⌋	1. yes 2. no	
308	How important do you think these reasons may be for your decision to be RSPO certified in 5 years from now?		1. Not important 2. Slightly important 3. Fairly important 4. Very important 5. Fundamental	
	a. RSPO can improve quality of environment	⌊_⌋		
	b. RSPO can increase production efficiency	⌊_⌋		
	c. RSPO gives new knowledge	⌊_⌋		
	d. Payment support from NGO/government/or others	⌊_⌋		
	e. Access to market	⌊_⌋		
309	How important do you think these reasons may be for your decision to not be RSPO certified in 5 years from now?		1. Not important 2. Slightly important 3. Fairly important 4. Very important 5. Fundamental	
	a. Severity of change in farm management required by RSPO	⌊_⌋		
	b. Lengthy application forms	⌊_⌋		
	c. Poor communication between promoters and farmers	⌊_⌋		
	d. Absence of external support	⌊_⌋		
	e. Increased costs of production	⌊_⌋		
310	Do you have other palm oil certifications?	⌊_⌋	1. Yes, ISPO 2. Yes, other, specify:_____ 3. no	→ 401 → 401 → 311
311	Are you in the process of obtaining other certifications?	⌊_⌋	1. Yes, ISPO 2. Yes, other, specify:_____ 3. no	

Module 4 Integration Roster

NO	401	402	403	404	405	406	407	408
Stakeholder Name	How many of the following stakeholders are in your network? PROBE FOR CORRECT NUMBER	How many times per year are you selling your FFB produce to these stakeholders?	Which type of CONTRACT do you have when you sell?	Do you sell certified or non-certified to these stakeholders?	How often do you have active contact with these stakeholders?	For what main reasons do you contact these stakeholders for? REPORT MAXIMUM TWO MAIN REASONS	For what main reasons are these stakeholders contacting you? REPORT MAXIMUM TWO MAIN REASONS	How do you typically keep contact with these stakeholders
Mills	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋
Cooperatives	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋
Local trader 1 (Collector/agent)	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋
Local trader 2 (Wholesaler)	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋
Harvest hired workers	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋
Government representatives	⌊_⌋⌊_⌋				⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋
Certification bodies	⌊_⌋⌊_⌋				⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋
NGOs	⌊_⌋⌊_⌋				⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋
Research Institutes	⌊_⌋⌊_⌋				⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋
Financial institutions	⌊_⌋⌊_⌋				⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋
Other, specify: _____	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋
Other, specify: _____	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋⌊_⌋	⌊_⌋
	SPECIFY THE NUMBER OF STAKEHOLDERS IN EACH CATHEGORY IF NONE RECORD 00 AND MOVE TO NEXT STAKEHOLDER	RECORD NUMBER OF TIMES PER YEAR	1. Spot selling Pre-harvest: 2. One harvest 3. One year 4. Multiannual	1. Certified 2. Non-certified 3. Both	1. Once per week 2. Once every 2 weeks 3. Once per month 4. Once every 2 moths 5. Once every 6 months 6. Once per year 7. Never	1. Product price 2. Product quantity 3. Sustainable practices 4. Product quality 5. Contract 6. Harvesting 7. Transport 8. Training 9. Nothing 10. Other, specify: _____	1. Product price 2. Product quantity 3. Sustainable practices 4. Product quality 5. Contract 6. Harvesting 7. Transport 8. Training 9. Nothing 10. Other, specify: _____	1. Formal meeting 2. Informal meeting 3. Phone 4. Computer 5. Written letter 6. Focus group 7. Other, specify: _____

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!!!	District	!!!	Village	!!!	Respondent
	⌊_⌊_⌊		⌊_⌊_⌊		⌊_⌊

Module 5 Trust and Power Roster

NO	501	502	503	504	505	506	507
Stakeholder Name	In general, are you able to contact [*Stakeholder Name*] when you want?	When you have problems relating to your palm oil production how much can you rely on help by [*Stakeholder Name*]?	On a scale from 1 (no trust) to 5 (full trust) how much would you say you can trust [*Stakeholder Name*]?	On a scale from 1 (no trust) to 5 (full trust) how much would you say [*Stakeholder Name*] trust you?	How much are you economically dependent on the decisions and choices of [*Stakeholder Name*]?	Rank the stakeholders from most powerful and influential in your decisions regarding palm oil production to the least powerful	How do you judge your negotiation power in the palm oil sector with respect to [Stakeholder Name]?
Mills	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊
Cooperatives	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊
Local trader 1 (collector/agent)	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊
Local trader 2 (Wholesaler)	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊
Harvest hired workers	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊
Government representatives	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊
Certification bodies	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	
NGOs	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	
Research Institutes	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	
Financial Institutions	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	
Other, specify: _____	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	
Other, specify: _____	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	⌊_⌊	
	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never	1. Always 2. Often 3. Sometimes 4. Rarely 5. Never	1. No trust 2. Little trust 3. Fair trust 4. A lot of trust 5. Full trust	1. No trust 2. Little trust 3. Fair trust 4. A lot of trust 5. Full trust	1. Completely 2. A lot 3. Little 4. Not at all	START WITH THE MOST POWERFUL (1) AND GO ON WITH THE REST (2, 3,..., 9). RANK 0 IF NO POWER	1. Extremely weak 2. Little weak 3. Not weak nor strong 4. Little strong 5. Very strong

Module 6 Palm Oil Production, BMP and Knowledge

NO.	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES	SKIP
601	For how many years have you been harvesting your palm trees?	⌊_⌊_⌋ years ⌊_⌊_⌋ months	RECORD NUMBER OF YEARS ROUNDING DOWN	
602	What are the main palm breeds you are growing on your land? DO NOT PROMT THE RESPONDENT ONLY REPORT THE ANSWER	1st: SPECIFY: _____ 2nd: SPECIFY: _____		
603	What is the name of a good oil palm variety?	1st: SPECIFY: _____		
604	When buying seedlings what do you look at? RANK THE OPTIONS ON THE RIGHT (maximum 3, minimum 1)	1. ⌊_⌋ 2. ⌊_⌋ 3. ⌊_⌋	A. quality B. well accepted/with licence C. government support D. suitable for your land E. suggested by a friend F. cheap price G. nearest nursery H. other, specify: _____	
605	Is your land suitable for oil palm production?	⌊_⌋	1. Yes 2. No 3. I do not know	
606	When was the last time you sold some of your own (FFB) palm oil (PO)?	M M Y Y Y Y	RECORD THE DATE	
607	What was the price (RUPIAH/KG) that you sold your own (FFB) PO for that last time?	⌊_⌊_⌊_⌊_⌋,⌊_⌋	RECORD THE PRICE IN RUPIA	
608	Do you know the quality level at which you sold your own (FFB) PO that last time?	⌊_⌋	1. Yes, specify: _____ 2. No	
609	Do you know or can you estimate the current price of that quality level of (FFB) PO at this moment? RECORD THE PRICE IN RUPIAH	⌊_⌋	1.Yes, specify: ⌊_⌊_⌊_⌊_⌋,⌊_⌋ RUPIAH 2. No	
610	What do you think about the FFB price at the current moment?	⌊_⌋	1. Very unfavorable price 2. Slightly unfavorable price 3. Slightly favorable price 4. Very favorable price	
611	What are the main channels through which you get information over the current price of (FFB) oil palm when you decide to sell your own produce? RANK THE OPTIONS ON THE RIGHT (maximum 3, minimum 1)	1. ⌊_⌋ 2. ⌊_⌋ 3. ⌊_⌋	A. Mill B. Cooperatives C. Middlemen/traders D. Other palm oil smallholders E. Palm oil plantations F. Extension workers G. Radio/TV/Newspapers H. Other, specify: _____	
612	When you need to obtain credit to invest in your oil palm plantations, which are the borrowers you can go to? Order them in order of preference, excluding the ones that would not provide you with credit for this. RECORD A MAXIMUM OF 4 PREFERRED CREDIT SOURCES PROBE THE RESPONDENT FOR THE ORDER OF PREFERENCE	1. ⌊_⌋ 2. ⌊_⌋ 3. ⌊_⌋ 4. ⌊_⌋	A. Official banks B. Microfinance institutions C. Cooperative D. NGOs E. Mills F. Informal moneylenders G. Friends and family H. Other, specify _____	
613	CROSS-CECK Q302: DOES THE RESPONDENT KNOW RSPO?	⌊_⌋	1. Yes 2. No	→ 614 → 616

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!!!	District	!!!	Village	!!!	Respondent
	⌊_⌊_⌊_⌋		⌊_⌊_⌊_⌋		⌊_⌊_⌋

NO.	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES	SKIP
614	Are you currently growing palm oil using at least one of the RSPO principles and criteria?	⌊_⌋	1. Yes 2. No	→ 615 → 616
615	In your opinion, which RSPO criteria are the most difficult to apply and why? DO NOT PROMT THE RESPONDENT CIRCLE ALL THAT APPLY		A. Transparency of land rights documents B. Production record documents C. Fertilizing practices D. Pesticide application practices E. Zero burning F. Water availability & quality maintenance G. Waste management H. Labour rights & minimum wage I. Occupational health & insurance J. Communication with stakeholders K. other, specify:_____	
616	How many times per year do you do the following activities related to oil palm? a. harvesting b. circle weeding c. weeding d. pruning e. fertilizing	⌊_⌋times ⌊_⌋workers ⌊_⌋days ⌊_⌋times ⌊_⌋workers ⌊_⌋days ⌊_⌋times ⌊_⌋workers ⌊_⌋days ⌊_⌋times ⌊_⌋workers ⌊_⌋days ⌊_⌋times ⌊_⌋workers ⌊_⌋days	RECORD THE ESTIMATED NUMBER OF TIMES PER YEAR, NUMBER OF WORKERS AND DAYS	
617	What are the characteristics of the bunch when you decide to harvest? CIRCLE THE ANSWERS OF THE RESPONDENT DO NOT PROBE ANSWER!!!		A. Colour change of the bunch B. Texture of the bunch C. Moisture of the bunch D. 2-3 fallen fruits per bunch E. 10 fallen fruits per bunch F. Other, specify:_____	
618	Do you harvest your palm oil yourself within your household?	⌊_⌋	1. Always 2. Sometimes 3. Never	→ 621 → 621 → 619
619	When you do not harvest by yourself, do you monitor the workers harvesting your palm FFB?	⌊_⌋	1. Yes 2. Sometimes 3. No	→ 621 → 621 → 620
620	Do you have an idea about how the workers are harvesting?	⌊_⌋	1. Yes 2. No	→ 621 → 623
621	How often do you/others pick bunches from your oil palm fields that are: a. not perfectly mature yet? b. over-matured? c. loose fruits laying on the field?	⌊_⌋ ⌊_⌋ ⌊_⌋	1. Always 2. Very often 3. Rarely 4. Never	
622	Does your FFB reach the mill in 24 hours?	⌊_⌋	1. Always 2. Very often 3. Rarely, because: _____ 4. Never because: _____ 5. Don't know / Don't care	
623	Who is in charge of the transport of your palm oil?	⌊_⌋	1. You personally 2. Harvest workers 3. Middlemen 4. Miller 5. Cooperative 6. Other, specify: _____	

NO.	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES	SKIP
624	To which mill do you/others usually transport your harvest to?	SPECIFY MILL:_____		
625	How far is this mill from your plantations?	⌊_⌋⌊_⌋⌊_⌋	ENTER THE NUMBERS OF KM	
626	How many times per year do you visit the mill estate to watch and learn how to improve oil palm production?	⌊_⌋⌊_⌋	ENTER NUMBERS OF TIMES/YEAR	
627	Do you also work in the mill estate?	⌊_⌋	1. Yes 2. No	
628	Do you take any specific step or practice to prevent the risk of having a water source for your plantation which is contaminated and/or polluted?	Open response:_____		
	PROBE THE RESPONDENT AND VALUE THE AWARENESS LEVEL	⌊_⌋	1. Very aware 3. Not aware 2. Little aware	
629	Do you take any specific step or practice to prevent the risk of having a planting area which is contaminated and/or polluted?	Open response:_____		
	PROBE THE RESPONDENT AND VALUE THE AWARENESS LEVEL	⌊_⌋	1. Very aware 3. Not aware 2. Little aware	
630	Do you take any specific step or practice to prevent the risk of your plantations attacked by one of pests (e.g. rats, leaf eating caterpillars, rose beetles, rhinoceros beetles, other pests)?	Open response:_____		
	PROBE THE RESPONDENT AND VALUE THE AWARENESS LEVEL	⌊_⌋	1. Very aware 3. Not aware 2. Little aware	
631	Do you know how to manage pesticides in a way that they do not pose a health threat for yourself and for the oil palm plantation?	Open response:_____		
	PROBE THE RESPONDENT AND VALUE THE AWARENESS LEVEL	⌊_⌋	1. Very aware 3. Not aware 2. Little aware	
632	Which fertilizer do you use?	⌊_⌋	1. Chemical 3. Both 2. Organic 4. None	
633	What are the most important investments a farmer should do to obtain high quality FFB palm oil? DO NOT PROMT THE RESPONDENT CIRCLE ALL THAT APPLY	A. Improved technologies B. Better land	C. High quality labour D. Quality palm breeds	E. Better transport F. Other, specify:_____

!!!	District	!!!	Village	!!!	Respondent
	⌊_⌊_⌊_⌋		⌊_⌊_⌊_⌋		⌊_⌊_⌋

Module 7 Upgrading

NO	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES	SKIP
701	Do you know what a global value chain is? PROBE: A GLOBAL VALUE CHAIN IS THE DIFFERENT PROCESSES IN DIFFERENT PARTS OF THE WORLD THAT EACH ADD VALUE TO THE GOODS OR SERVICES BEING PRODUCED	⌊_⌋	1. Yes 2. No	
702	Do you know who is buying your Palm Oil after the mill processes it?	⌊_⌋	1. Yes, specify:_____ 2. No	
703	What is, more or less, the price the mill sells this Palm Oil?	⌊_⌊_⌊_⌊_⌋,⌊_⌋	RECORD THE PRICE IN BAHT RECORD 9999,9 IF NOT KNOWN	
704	Do you know if the mill you are selling your FFB to sells RSPO palm oil: a. Identity preserved b. segregated c. mass balance d. book & claim	⌊_⌋ ⌊_⌋ ⌊_⌋ ⌊_⌋	1.Yes 2.No 3.I do not know	
705	Do you know which countries are the most demanding for palm oil from Indonesia?	⌊_⌋	1. Yes, specify:_____ 2. No	
706	Can you name some final products for which palm oil is used? DO NOT PROMT THE RESPONDENT CIRCLE ALL THAT APPLY	A. Cooking Oil B. Cosmetics C. Soap D. Plastic E. Biodiesel F. Margarines G. Animal Feeds H. Sweets I. Washing powders J. Baked foods K. Cereals L. Other:_____		
707	Are you part of a palm oil growers' organization or association?	⌊_⌋	1. Yes, specify name:_____ 2. No	→ 708 → 712
708	How long have you been a member?	⌊_⌊_⌋	RECORD THE TIME IN YEARS ROUNDING DOWN 00 IF LESS THAN ONE YEAR	
709	What is your position in the group?	⌊_⌋	1. Chair 2. Simple group member 3. Treasurer 4. President 5. Secretary 6. Other, specify:_____	→ 711 → 710 → 710 → 710 → 710 → 710
710	Do you trust the chair of the group?	⌊_⌋	1. No trust 2. Little trust 3. Fair trust 4. A lot of trust 5. Full trust	
711	Name the main benefit you obtain from the group CIRCLE ALL THE ANSWERS OF THE RESPONDENT DO NOT PROBE THE ANSWER!!!	A. Information about the sale B. Knowledge support C. Technical support D. Financial facilities E. Transport facilities F. Other, specify_____		

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NO	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES		SKIP
712	How many times per year do you receive a control: a. by the mill? b. by the leader of your farmers' group?	⌊__⌋ ⌊__⌋	RECORD NUMBER OF TIMES PER YEAR		
713	How do you protect from palm oil price fluctuations? CIRCLE THE ANSWERS OF THE RESPONDENT DO NOT PROBE THE RESPONDENT	A. By selling at different times through the year B. By pre-harvest price agreements C. By harvesting less when price is low D. By helping each other among farmers E. By harvesting more when price is high F. By having other side crops G. By borrowing money H. By using savings I. By selling to different buyers at different times J. By having side jobs/salary K. By selling assets in bad times L. Other, specify:_____			
714	Can you name the two most important stakeholders supporting you concerning the following issues: a. Input access? b. Input use? c. Credit access? d. Production technologies access? e. Production technologies use? f. Transport services?	⌊__⌋⌊__⌋ ⌊__⌋⌊__⌋ ⌊__⌋⌊__⌋ ⌊__⌋⌊__⌋ ⌊__⌋⌊__⌋ ⌊__⌋⌊__⌋	1. Mills 2. Cooperative 3. Middleman 4. International Buyers/Traders 5. Local Buyers/Traders	6. Government 7. NGOs 8. Research Institutes 9. Other fellow farmers 10. Other, specify: _____	
715	In which form do you receive information about : a. Input access? b. Input use? c. Credit access? d. Production technologies access? e. Production technologies use? f. Transport services?	⌊__⌋⌊__⌋ ⌊__⌋⌊__⌋ ⌊__⌋⌊__⌋ ⌊__⌋⌊__⌋ ⌊__⌋⌊__⌋ ⌊__⌋⌊__⌋	1. Explanatory pamphlets/videos 2. Training 3. Informal discussions 4. Extension workers 5. Other, specify: _____ 6. Never get information about this		
716	In general, would you say this information easy to a. understand? b. apply in practice?	⌊__⌋ ⌊__⌋	1. Always 2. Most of the time 3. Sometimes 4. Rarely 5. Never		
717	What are the main difficulties to apply this information in practice?	Open response:_____			
718	How often on average do you talk with other farmers like you about how to improve the quality of your palm oil?	⌊__⌋	1. Almost every day/more than once per week 2. Once per week 3. Once every 2 weeks 4. Once per month 5. Once every 2 moths	6. Once every 6 months 7. Once per year 8. Less than once per year 9. Never	
719	How often on average do you visit the plantations of another farmer like you to try to improve the quality of your palm oil?	⌊__⌋			

!!!	District	!!!	Village	!!!	Respondent
	⌊_⌊_⌊_⌋		⌊_⌊_⌊_⌋		⌊_⌊_⌋

Module 8 Additional Information

NO.	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES	SKIP
801	Do you have another source of income from non-agricultural activities?	⌊_⌋	1. Yes, specify job : _____ 2. No	→ 802 → 803
802	What is your monthly income from this job?	⌊_⌊_⌊_⌋.⌊_⌋	RECORD THE AMOUNT OF RUPIAH / MONTH	
803	Did you follow short courses/informal education (e.g. workshop, training, extension…..)	⌊_⌋	1. Yes, specify : _____ 2. No	
804	How long have you been living in this village?	⌊_⌊_⌋	RECORD THE NUMBER OF YEARS	
805	Where did you live before? (name of the village, district, regency, province)	SPECIFY: _____		
806	What was the land use of your land before oil palm?	⌊_⌋	1. Rubber 2. Rice 3. Bush 4. Forest 5. Swampy land 6. Other, specify: _____	
807	How many Kg of the following type of fertilizer do you apply on your oil palm plantation/s? a. Urea (nitrogen) b. TSP (phosphorus) c. KCL/MOP (potassium) d. Kieserit e. Calcium Borate f. Other, specify: _____	⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋	RECORD THE AMOUNT OF KG PER HECTARE PER YEAR	
808	How many Kg of herbicide do you applying on your oil palm plantation/s? a. specify type: _____ b. specify type: _____	⌊_⌊_⌊_⌋ ⌊_⌊_⌊_⌋	RECORD THE AMOUNT OF KG PER HECTARE PER YEAR	
809	How much pesticide do apply on your oil palm plantation/s? a. specify type: _____ b. specify type: _____	⌊_⌊_⌊_⌋KG/LT ⌊_⌊_⌊_⌋KG/LT	RECORD THE AMOUNT OF KG OR LITER PER HECTARE PER YEAR BLANK OUT THE WRONG MEASURE KG/LT	
810	How many trees do you have per hectare?	⌊_⌊_⌊_⌋	RECORD THE NUMBER PER HECTARE	
811	Do you know what is the daily wage for workers in this area?	⌊_⌊_⌊_⌊_⌋	RECORD THE AMOUNT OF RUPIAH PER PERSON	
812	When do you usually start replanting?	⌊_⌋	1. 3 years before the old palms become 25 years old 2. After the old palm trees do not have fruits anymore 3. Other, specify: _____	
813	Do you prepare money for replanting expenditure?	⌊_⌋	1. Yes 2. No	
814	Where do you get the financial resources for replanting?	⌊_⌋	1. Saving 2. Borrowing money 3. Other, specify: _____	
815	What is the main problem you face when replanting?	⌊_⌋	1. Financial resources 2. Access to planting input 3. Income decrease 4. I am too old to plan 5. FFB price 6. Other, specify: _____	

816	What are, in your opinion, the most suitable methods of replanting for your land?	⌊⌋	1. Replanting all palm trees 2. Under-planting (intervalling) 3. Organized by the farmers' group on all lands 4. Other, specify: _____	
817	Could you name some of the RSPO regulations?	Open response: _____ _____ _____		
818	Do you own a prior informed consent with the company?	⌊⌋	1.Yes 2.No 3.I do not know	

901	RECORD THE TIME	H H	M M		

!!!	District	!!!	Village	!!!	Respondent
	⌊_⌊_⌊_⌋		⌊_⌊_⌊_⌋		⌊_⌊_⌋

Comments and Observations

TO BE FILLED IN AFTER COMPLETING INTERVIEW

INTERVIEWER'S COMMENTS ABOUT RESPONDENT:

_____
_____
_____
_____

INTERVIEWER'S COMMENTS ON SPECIFIC QUESTIONS:

_____
_____
_____
_____

ANY OTHER INTERVIEWER'S COMMENTS:

_____
_____
_____
_____
_____

FIELD SUPERVISOR'S COMMENTS: Field supervisor's name: _____ Date: _____

_____
_____
_____

Summary

This thesis investigates the upstream local context of the palm oil value chain in Thailand and Indonesia, and how its dynamics affect both material and information flows downstream to the global (sustainable) palm oil value chain. Its analysis is based on three case studies of smallholder farmers certified under the Round Table on Sustainable Palm Oil (RSPO), either as individual farmers or as cooperatives, or within a 'scheme'—a typical Indonesian institution.

Certification of sustainable palm oil as organised through the RSPO is based on a simplified understanding of the global palm oil value chain—according to which instructions about production practices can be directly translated from the palm oil mill to the primary producer. The reality of palm oil provision is much more complex than this as is shown both in the case of Thailand and Indonesia, and this complexity means that not always the original intentions of the RSPO are met, and even when they are, they may not be sustained over time, when downstream support is winded down.

The complexity of upstream dynamics can take the form of a 'forgotten actor'. This is the case in Chapter 2 where, on the basis of a qualitative field study in Southern Thailand, this chapter shows that intermediary actors not considered within the RSPO chain, such as the 'ramps' that take care of the bulking of oil palm fruit bunches before reselling them to mills, can play a key role in the organisation of the chain itself, and thus be a determining factor in the ability of sustainability certification to upscale and remain traceable. In the conclusions, I argue that standards such as RSPO have to walk a fine balance between offering standardized rules that apply globally, and tailoring those rules to the local context, avoiding treating the latter as a 'black box' but rather understanding the role of local actors. These can represent a

bottleneck when ignored, but at the same time can form the basis of rapid adoption and implementation of a standard if their role is duly recognized and internalized by sustainable chains.

Also, this complexity can take the form of 'market and power dynamics'. This is the case in Chapter 3, where, based on a survey among Indonesian smallholders, this thesis shows these power and dependency dynamics shape the way producers absorb and embed sustainability practices. The chapter unveils the complex price determination mechanism in Indonesia, analyses how the market structure of RSPO-certified smallholder-based supply chains in Indonesia affects transparency and information about farm gate prices, and how this in turn is reflected in the smallholders' compliance with sustainability standards. In the conclusion I argue that efforts towards greener supply chains should not focus only on training on sustainable production practices, but also include the upstream supply chain dynamics where price and production flows, as well as the ensuing incentives, are determined.

Local dynamics, and how these shape the capacity of producers to 'learn', can also be understood comparatively. This is the case of Chapter 4 in which, taking a comparative approach between Thailand and Indonesia, I show that the current structure of the value chain is not always well-suited for upstream learning beyond mere knowledge transfers. In particular, farmers in Indonesia suffer from the delegation of practices to the mill and cooperative, limiting the extent to which farmers absorb new knowledge on farming practices. In Thailand instead, price incentives based on quality are more developed, and only hindered by the presence of intermediary collectors, as already discussed in Chapter 2. This makes that Thai farmers are systematically more aware of farming and environmental practices, and RSPO principles and criteria. Their relatively higher independence in farming decision-making, however, results in weaker peer-to-peer interactions and higher deviations from best

management practices, with consequences both for productivity and quality. In the conclusions I highlights the major bottlenecks in upstream learning within RSPO-certified palm oil value chains in Indonesia and Thailand, and once again stress how addressing such bottlenecks is a precondition to improving smallholders' sustainable farming practices in the long term.

Finally, local policy makers ultimately hold the key to future developments in national palm oil value chains. As such, understanding the directions that national policy might take is fundamental in assessing the opportunities and challenges that sustainability standards will face. In Chapter 5 I sketch such policy scenarios for Thailand, using the so-called Delphi Method. In this method various stakeholders are asked to describe their opinions on a certain topic separately from each other, and through several iterations that include finding a common ground, with other stakeholders' opinions, eventually reach a consensus. Currently, Thai policymakers are faced with the challenge of determining to what extent and in what way sustainable pathways can be included in their ambitious plan for expanding the palm oil sector. I find that the most likely policy scenario in the medium future is one relatively close to the current stated objective of 'self-sufficiency with open markets', which at best can lead to 'light green' sustainability practices focused on the domestic market. This is at odds with a 'dark green' scenario in which government policies radically shift towards premium certified niche markets. This latter scenario is much less likely to happen, but would maximize some of the comparative advantages of the Thai palm oil value chain and institutional setting at the global scale (e.g. relatively more literate, wealthier farmers, that however cannot compete in terms of absolute productivity due to adverse climatic conditions). In other words, policymakers in the local context might miss out on opportunities for both high value-added growth as well as increased sustainability, unless global actors contribute in clearly identifying such opportunities. This once again highlights how the global sustainable palm oil chain is

influenced by local dynamics, but also showcases the important role that global stakeholders can take in shaping those same dynamics. Hence, the local-global nexus mentioned in the title.

In fact, this thesis analyses the local context of palm oil chains but does so understanding that the real core of the action shaping global chains happens at the interaction between local and global—be it in terms of including 'forgotten actors' or rather in shaping national policies through incentives, forward guidance, and advocacy. Local contexts will always shape global outcomes; understanding them is the first step for global actors to induce sustained, impactful and sustainable change in the local context towards better practices.

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This PhD has been an important part of my life in many ways and, as all relevant gates in the lifespan of an individual, it came with a rollercoaster of events and emotions. I cannot imagine going through such a rollercoaster without the key people that allowed me to never give up and supported my stubbornness of pursuing this PhD pathway. My first big thank you goes to my life partner Francesco, who has been supporting me both from a personal and an academic perspective. He tolerated my limited amount of time for vacations and relaxing time because my weekends were already booked for working on this PhD and waited patiently to start our family. He was very supportive since the start when we got the news that I would not receive any economic benefits for this four-year research work. Being an academic himself, he has also been a thought partner for debating and challenging my research, and I cannot imagine doing this PhD under these conditions without him.

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fight of my father. He has helped me coping with the fact that I was far away in such a critical moment.

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Elena Degli Innocenti

Wageningen School of Social Sciences (WASS)

Completed Training and Supervision Plan

Name of the learning activity	Department/Institute	Year	ECTS*
A) Project related competences			
Environmental Policy: Analysis & Evaluation, ENP34306	WUR	2013	6.0
Environmental Quality and Governance, ENP35806	WUR	2013	6.0
Quantitative Analysis of Land Use Systems (QUALUS), RSO30306	WUR	2013	6.0
Writing research proposal	WUR	2012	4.0
B) General research related competences			
WASS Introduction course	WASS	2012	1.0
Action Oriented Research	CDI	2012	0.5
Techniques for Writing and Presenting a Scientific Paper	WGS	2016	1.2
Tackling Transparency – the Methodological Challenges of Research on Disclosing Sustainability	ENP, WASS and SENSE	2016	2.2
"*Breaching the Black Box: the Role of Ramps in Thai Sustainable Palm Oil Certification"*	WASS PhD day	2016	1.0
C) Career related competences/personal development			
"*Breaching the Black Box: the Role of Ramps in Thai Sustainable Palm Oil Certification"*	SUSPENSE Annual Meeting 2014, Pekambaru, Indonesia	2014	1.0
"*Investing field works among palm oil growers in the South of Thailand and the mechanism of RSPO and comparing 'missing links' in Indonesia and Thailand"*	AIT University, Bangkok	2014	1.0
"*Breaching the Black Box: the Role of Ramps in Thai Sustainable Palm Oil Certification"*	RT 14 Conference 2014, Bangkok	2014	1.0
"*Opportunities and bottlenecks for upstream learning within RSPO certified palm oil value chains: A comparative analysis between Indonesia and Thailand"*	SUSPENSE Annual Meeting 2015, Krabi, Thailand	2015	1.0
"*The Sustainability of Sustainable Palm Oil Production for Independent Smallholders; the Role of Transparency and Price Incentives in RSPO-Certified Palm Oil Production in Indonesia"*	SUSPENSE Annual Meeting 2016, Wageningen, Netherlands	2016	1.0
"The Paradox of Plasma Schemes: Institutional Arrangements and Sustainability in the Indonesian Palm Oil Value Chain"	International Conference "Disclosing Sustainability - The Transformative Power of Transparency"	2016	1.0
Sustainable Pathways in Agriculture in South East Asia: beyond Certification symposium and Methodologies: Crossing boundaries in research workshop	Maastricht University	2017	1.2
Reviewing RSPO Training Material session named "Detailed guide for conducting the group training"	RSPO	2018	1.0
Total			**36.1**

*One credit according to ECTS is on average equivalent to 28 hours of study load

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