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in Riau Province, Indonesia

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Explaining the ‘certification gap’ for different types of oil palm smallholders in Riau province, Indonesia

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Abstract

Indonesia is the world’s largest producer of palm oil and its smallholder oil palm plantations involve more than 2.3 million farmers. The rapid expansion of the oil palm area, and resulting negative environmental and social impacts, has increased sustainability certification for palm oil products. This study investigates whether different types of smallholders face different barriers in complying with certification standards. The study uses survey data from 829 smallholders in Riau, Sumatra. First, an assessment is made of the gap between current management practices and practices required by Roundtable for Sustainable Palm Oil (RSPO) standards for different types of smallholders. Second, the paper explores explanations for the gap between current and required practices. Finally, an investigation is made of the different starting points of different types of smallholders. Results indicate that the diversity between smallholders affects their prospects for certification. This should be considered in the application of RSPO standards.

Keywords: oil palm, certification, RSPO, scheme smallholders, independent smallholders

Author biographical sketches

Sakti Hutabarat is combining a position as assistant professor in the Department of Agribusiness at the University of Riau, Indonesia with PhD research at Wageningen University, the Netherlands. His research interests focus on the oil palm sector in Indonesia, with special attention to the topics of externalities, certification and smallholders.

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1. Introduction

Oil palm cultivation has boomed in tropical areas in recent years. In Indonesia and Malaysia, this expansion has largely happened on forest land and peatland, leading to severe environmental effects such as deforestation, loss in biodiversity, increased greenhouse gas emissions and haze pollution (Anggraini and Grundmann, 2013; Austin et al., 2017, Fitzherbert et al., 2008, Goldstein, 2016, Khatun et al., 2017, Koh and Wilcove, 2007, Koh and Wilcove, 2008, McCarthy and Zen, 2010, Pirker et al., 2016, Prabowo et al., 2017, Setiawan et al., 2016, Sumarga et al., 2016, Varkkey, 2012). These developments have promoted demands for more sustainable oil palm production and, as a result, certification schemes focusing on sustainability have surged (Padfield et al., 2016, Pirker et al., 2016, Richardson, 2015, Ruyschaert and Salles, 2016; Wijaya and Glasbergen, 2016).

In Indonesia, the rise in oil palm cultivation has occurred mainly through the expansion of smallholder production (Euler et al., 2017, Euler et al., 2016). It is therefore worrying that engagement of smallholders in sustainable oil palm production and related certification schemes remains limited (Azhar et al., 2017, Brandi et al., 2015, Martin et al., 2015, Saadun et al., 2018). Several articles have investigated the barriers to certification for smallholders (Glasbergen, 2018, Hutabarat et al., 2018, Rietberg and Slingerland, 2016a, Rietberg and Slingerland, 2016b). These barriers relate to the extent of record keeping, the lack of adequate knowledge and skills, difficulties in getting access to the necessary financial means to improve practices, and uncertainty about the benefits of certification. However, with few exceptions, limited attention has been given so far to the heterogeneity among smallholders and how this may affect the adoption and effect of certification (Hidayat et al., 2015, Jelsma et al., 2017a). Nevertheless, recognizing the heterogeneity among smallholders is important because

differences in starting positions can influence the likelihood of participation in certification schemes but also the potential benefits for smallholders (Euler et al., 2017, Jelsma et al., 2017b, Krishna et al., 2017, Soda et al., 2016).

Indonesian oil palm smallholders can be distinguished as ‘scheme smallholders’ and ‘independent smallholders’. In the late 1960s, the Indonesian government started with the development of oil palm plantations on government owned estates as part of rural development projects (Zen et al., 2006). These programs typically included the establishment of a so-called ‘nucleus estate’, i.e. a large-scale plantation with a central oil palm processing facility or mill, and surrounding ‘scheme smallholders’ from which oil palm was sourced and for whom the nucleus provided and prepared the land, planted seedlings, and carried out maintenance until the trees started to produce fruits. Scheme smallholders have to manage the plantation under the nucleus’ supervision and must sell their oil palm fruits to the nucleus’ mill (Manggabarani, 2009b; Pahan, 2012). Inspired by the increasing income levels of the scheme smallholders, farmers and communities around the nucleus estate gradually also started to grow palm trees (Belcher et al., 2005, Rahadian, 2013) or converted other crops to oil palm trees (Feintrenie et al., 2010, Susanti and Burgers, 2012). These farmers, which cultivated palm trees without the support of nucleus estates or other parties, are known as independent smallholders.

This paper will investigate the implications of the heterogeneity of smallholders for RSPO certification. Specifically, the objective of this study is to assess the challenges and the prospects that different types of smallholders have to meet RSPO certification. First, an assessment will be made for different types of smallholders of the gap between current agricultural and management practices and the practices that are required under the RSPO standards. For this purpose, the next section will provide details about the RSPO standard, its principles and the criteria that need to be complied with. Section three explains the methodology that is used in the different parts of the analysis. Next, the paper explores the potential barriers that help to explain the gap between current and required agricultural and management

practices. Finally, an investigation is made of the different starting points of different types of smallholders in closing the gap. In this investigation, special attention is paid to explanations for yield differences between smallholder types. The focus on yields provides important insights because good agricultural and management practices have the potential to substantially improve yields of smallholders (Soliman et al., 2016).

2. RSPO Certification

The RSPO standard contains 8 principles, 39 criteria, 139 indicators for companies and mills and 90 indicators for smallholders (RSPO, 2009, RSPO, 2012). RSPO Principles consist of (1) commitment to transparency, (2) compliance with applicable laws and regulations, (3) commitment to long-term economic and financial viability, (4) use of appropriate best practices by growers and millers, (5) environmental responsibility and conservation of natural resources and biodiversity, (6) responsible consideration of employees and of individuals and communities affected by growers and mills, (7) responsible development of new plantings, and (8) commitment to continuous improvement in key areas of activities (RSPO, 2009, RSPO, 2010). Each principle contains a number of criteria. Smallholders must comply with each of the eight principles, but only 35 out of the 39 criteria were applicable to smallholders at the moment of this study. In addition, there are three basic prerequisites for prospective smallholders that want to become certified: (1) their plantations are not located in High Conservation Value Forest, (2) their plantations have no disputes or social conflicts, (3) smallholders have no problems related to labour use (Rahadian, 2013, RSPO, 2012).

RSPO distinguishes between two levels in the RSPO principles and criteria (P&C): the individual smallholder level and the group level – because RSPO certification for smallholders requires smallholders to be organized in groups. Certification of the group standard is expected to assure that sustainability related policies and regulations are implemented by the group administrators and the smallholders. The RSPO standards for agricultural practices are focused

on sustainable oil palm cultivation practices that must be met by all the farmers that are included in the group certification. According to the RSPO Certification Protocol (RSPO, 2010), scheme smallholders should be certified along with the mill with which they are associated, while independent smallholders are to be certified independently of mills through smallholder group certification. The ability of independent farmers to obtain RSPO certification is determined by the ability of farmers' associations to organize their members in applying the principles and criteria demanded by the certification system.

3. Data and Methodology

The study was conducted in two districts in Riau Province, Pelalawan District and Kampar District. The study focused on three different types of smallholders: transmigrant Nucleus Estate smallholders (Perkebunan Inti Rakyat/PIR-TRANS), the Primary Cooperative Credit for Members (Koperasi Kredit Primer Anggota/PIR-KKPA) smallholders, and independent smallholders (Pekebun Kelapa Sawit Swadaya).

The first PIR Projects were established in 1980 with a state-owned company as the nucleus and local farmers as the scheme smallholders, also called "plasma". Farmers received two hectares of land for estate crops and 0.5 hectares for their house and garden. A contract existed between the nucleus and the scheme farmer (Molenaar et al., 2010). The nucleus provided the land for the scheme, implemented land preparation, planted seedlings and carried out plantation maintenance until land was converted to the farmers at the moment that the trees started to produce fruits. Farmers had to manage the plantation under the supervision of the nucleus and were obliged to sell the Fresh Fruit Bunches (FFBs) to the nucleus' mill after the conversion. The repayment of the farmers' debt was deducted from the revenue of each harvest or each month (Manggabarani, 2009, Pahan, 2012). In 1986, the PIR-TRANS scheme commenced involving transmigration farmers from Java Island and private large-scale plantations as the nucleus. In 1996, the PIR-KKPA scheme was launched. Farmers involved in

this scheme were members of the cooperative KKPA. They handed over their land to the cooperative who established and managed the plantation. All costs of investment, maintenance, management and debt repayment were deducted from the farmers' sales revenue (Feintrenie et al., 2010). From 1990 onwards local people have also started to grow oil palm trees without any support from other parties. These smallholders are independent farmers that are free to choose the cultivation system and plant materials, and they can sell to any middleman or mill. There is no contract between independent smallholders and mills or cooperatives.

Primary data was gathered through a survey among different types of smallholders using structured questionnaires. The survey used two sampling methods, random sampling for scheme smallholders (PIR-TRANS and PIR-KKPA), and snowball sampling for independent smallholders. For each type of smallholder, both RSPO-certified and non-certified smallholders have been included in the sample (Table 1). Additional primary information was gathered using semi-structured questionnaires with smallholders and other stakeholders (such as middlemen, cooperatives, agricultural extension services, banks, microfinance providers and government agencies), group discussions, field visits and a validation workshop with the key actors in the sector. Secondary quantitative data were derived from the records held by companies, cooperatives, government agencies and non-government actors and include yields, prices, and other quantitative data.

INSERT TABLE 1 HERE

A scaling method involving the eight principles and 35 criteria of the RSPO standard is used to analyse the gap between smallholders' current practices and RSPO standard practices. Compliance with each of the criteria was scored between 1 (lowest level) and 5 (highest level). The analysis was conducted for each criterion and each principle separately, and all criteria together (Appendix 1 provides details about the method).

The study also assesses farmers' access to various resources such as, access to information, inputs, markets, financial resources, and infrastructure. Responses to the questionnaire were scaled from 1 (low) to 2 (medium) and 3 (high). "Low" means that farmers do not have access to the resource, "high" indicates that there are no obstacles in accessing the resource and "medium" indicates that resources can be accessed partly (see Appendix 2).

Finally, the determinants of yield differences between smallholders are analysed using Ordinary Least Squares regression models. The dependent variable is calculated as the annual yield per hectare. The independent variables include plant-technical factors (e.g. quality of planting material and tree age); variables of managerial practices relating to fertilizer use and harvesting; farmer characteristics; and whether or not the farm has been RSPO certified. A variable of special attention addresses the smallholder type. One model examines yield differences between scheme and non-scheme smallholders; a second model tests for differences among farmer groups of independent smallholders. Details on the variables that are used in the analysis can be found in Appendix 3.

4. Results and Analysis

4.1 Smallholders current practices compared to the RSPO Principles & Criteria (P&C)

PIR-TRANS smallholders on average have the highest score of compliance with the RSPO standard, followed by the PIR-KKPA and independent smallholders (Figure 1). Certified smallholders have the highest level of compliance with the RSPO standard for each type of smallholder. In general, RSPO-certified smallholders comply with around 70% of the standards. Independent smallholders have the largest gap between current practices and RSPO standards compared to other smallholder types.

INSERT FIGURE 1 HERE

Figure 2 shows the level of compliance of different types of smallholders for each of the eight RSPO principles. Certified smallholders in each type have the highest compliance with each of the principles in the RSPO standard. Non-certified PIR-TRANS and PIR-KKPA smallholders have high scores for principles 2 and 3, the principles that relate to compliance with applicable laws and regulations and commitment to long-term economic and financial viability, respectively. PIR-TRANS and PIR-KKPA smallholders usually comply with laws and regulations as they are organized by a cooperative and/or supervised by a nucleus company. Moreover, they are provided with the necessary documents through the cooperative office and they received a legal land ownership certificate at the moment that they participated in the PIR or KKPA program. On the other hand, PIR-TRANS and PIR-KKPA smallholders have relatively low scores on principles 6 (responsible consideration of employees and of individuals and communities affected by growers and mills), 7 (responsible development of new plantings), and 8 (commitment to continuous improvement in key areas of activities).

INSERT FIGURE 2 HERE

Non-certified independent smallholders on average have low scores for every RSPO principle. Firstly, they cannot comply with RSPO standards applied to farmer groups (Principles 1, 2, 3, 6, 7 and 8). Independent farmers are not associated to any cooperative or nucleus estate. However, RSPO standards were constructed with a vision of group-based certification. Therefore, independent smallholders need to establish an organization or association to become certified. Secondly, their compliance to the standard of agricultural practices (Principles 4 and 5) is also low due to a lack of access to agricultural inputs. In the next section, we elaborate further on the potential barriers to compliance for different smallholder types. We do this by comparing the characteristics of the different smallholder types.

4.2 Heterogeneity of smallholders – different characteristics, different challenges

Farmer characteristics

The average age of farmers (n=829) was 46 ± 10 years old while average formal education was 8 ± 3 years or equivalent elementary school. While there are differences in the average age (42 to 49 years old) and level of education (6 to 9 years) of smallholders between different smallholder types, the average age and education level of certified farmers does not seem more or less favourable than that of non-certified farmers.

Plantation performance

PIR-TRANS smallholders have the oldest oil palm plantations. The plantations have been cultivated between 15 and 27 years and average tree age is 24 ± 2.6 years. The old age of palm trees is reflected in low annual yields per hectare for PIR-TRANS smallholders. PIR-KKPA palm trees are on average 17.7 ± 3.3 years old, i.e. a variation between 14 to 22 years. Independent farmers have large variations in tree age, between 3 to 20 years with an average tree age of 13 ± 3.3 years. Agricultural practices in PIR-TRANS and PIR-KKPA are relatively similar since both types have a partnership with a plantation/mill. In the survey, the overall average size of smallholder plantations is 2.1 ± 0.6 ha: PIR-TRANS (2.0 ± 0.0 ha), PIR-KKPA (1.9 ± 0.2 ha), and independent smallholders (2.2 ± 1.0 ha).

The average annual yield per hectare of oil palm smallholders is 16.0 ± 6.1 tons $\text{ha}^{-1} \text{yr}^{-1}$. For PIR-TRANS smallholders this is 11.8 ± 5.8 tons $\text{ha}^{-1} \text{yr}^{-1}$, for KKPA smallholders this is 20.4 ± 4.7 tons $\text{ha}^{-1} \text{yr}^{-1}$, and for independent smallholders it is 16.3 ± 4.8 tons $\text{ha}^{-1} \text{yr}^{-1}$. The mills set the oil extraction rate between 20-22% for the scheme (PIR-TRANS and -KKPA) and 15-17% for the independent smallholders. The lower rate for independent smallholders can be

explained by their (assumed) lack of compliance with good agricultural practices and the use of inferior, non-certified, planting material.

Access to seed, fertilisers and the market

The ability of farmers to change from traditional practices to sustainable practices is not only determined by farm- and farmer-related characteristics but also by smallholders' ability to get access to technology, inputs, markets, supporting institutions and infrastructure. Certified smallholders in all types have high access to resources while non-certified smallholders have medium to low access. Non-certified independent smallholders have the lowest access to any of the resources. See Appendix 2 for further details.

Access to good quality plant material is important as it determines future oil palm yields. We find that most of the scheme smallholders use good plant material particularly from PPKS Marihat (Table 2). In contrast, only 56% of independent smallholders use good planting material either PPKS or non-PPKS. A large proportion of the independent smallholders that were interviewed did not know the quality of their planting material.

INSERT TABLE 2 HERE

Table 3 shows that the use of fertilisers by independent smallholders is slightly higher than that of PIR-TRANS farmers. Since independent smallholders have no leaf analysis on their plantations, they tend to imitate what the scheme farmers apply on their plantations. Scheme smallholders are informed on fertiliser use by the cooperative or mill that they belong to but independent smallholders need to access information about fertilisers from other farmers or traders. As PIR-TRANS plantations are old and yields are declining, it makes sense to use less fertilisers than PIR-KKPA plantations with trees in a more productive age. Fertiliser distributors only sell fertilisers to registered agents and the agents sell it to registered middlemen

and farmers. Fertilisers have to be ordered six months before delivery. The scheme cooperative is considered as a formal agent and the cooperative plans the use of fertilisers annually. In contrast, independent farmers have no planning in their plantations and usually buy a small quantity of fertiliser whenever they have money.

INSERT TABLE 3 HERE

The capability to sell FFBs varies amongst different types of smallholders. Scheme smallholders who joined village cooperatives have better access to mills than independent smallholders. When the scheme smallholders have completed their contract with the mill they can face a change in treatment depending on the mutual commitment to continue the business. Independent smallholders who have a small volume of FFBs only get access to a mill through cooperatives, middlemen and traders who can assure a minimum volume to the mill.

Oil palm plantations are usually developed in remote areas which lack roads and other transportation infrastructure. Particularly during the rainy season, access to plantations is difficult. Access problems affect transport of FFBs which have to be delivered to the mill within 24 hours after being harvested. The quality of fruits declines significantly after harvesting which leads to a decrease in price. The survey shows that scheme smallholders have better access to infrastructure than independent smallholders since their infrastructure was developed and maintained by a nucleus company. However, some scheme smallholders' access deteriorates when their contract ends because the mill no longer has the responsibility to maintain and develop infrastructure when there is no business link anymore. Independent smallholders depend largely on local government which usually does not have enough budget to develop roads and other infrastructures in rural and remote areas. Moreover, plantations of independent smallholders are not clustered in one location and the very large distances between them form an additional barrier to be served by government funded infrastructure.

Household income

Smallholders' household income consists of income from oil palm plantations, non-oil palm agricultural activities (e.g. rubber and rice) and non-agricultural activities (e.g. trade and paid labour). Oil palm income for smallholders is on average 182 ± 108 euro month⁻¹. The share of oil palm revenues in the total household income is 70.2% while income from other agricultural products and income from non-agricultural activities is 6.3% and 22.6% respectively (Table 4). PIR-KKPA farmers have the highest share of their household income from oil palm compared to independent and PIR farmers. With an average share of about 70%, income from oil palm is very important in the total household income for all types of smallholders.

INSERT TABLE 4 HERE

4.3 Determinants of yield differences

Household income from oil palm depends on yield and FFB price. RSPO certification has the potential to affect both: yields are expected to increase as a result of introducing agricultural and management practices to comply with RSPO P&C; FFB prices can increase if a premium price is paid for RSPO certified oil palm fruits. However, especially the potential for yield increases due to certification will depend heavily on initial starting conditions and these may differ significantly between different smallholder types. In this section, we will therefore analyse the determinants of yields, paying special attention to the differences between smallholder types. Two models are estimated, the first focuses on differences in yields between scheme smallholders and independent smallholders; the second analyses differences in yields between different groups of independent smallholders. Table 5 presents the results for both models (See Appendix 3 for variable descriptions).

INSERT TABLE 5 HERE

Results for model 1 show that KKPA smallholders have a higher annual yield compared to independent smallholders while annual yields of the PIR group do not significantly differ from that of independent smallholders. RSPO-certified smallholders have a higher annual yield per hectare than non-certified smallholders. Other yield-determining factors include: having a plantation on mineral soil, good quality plant material, good harvesting practices, average tree age and formal education of the smallholder. Variables that have no significant effect on yields are fertiliser use, previous land use (forest area) and smallholders' age.

Model 2 results show that there is substantial diversity also within the sample of independent smallholders. The comparison group of smallholders (IND1) is the group of RSPO-certified independent smallholders that are member of the Amanah Association. Table 5 shows that annual yields of certified smallholders is significantly higher than that of the IND2 group, significantly lower than yields of the IND3 group and not significantly different from yields of the IND4 group of independent smallholders. On the one hand, this provides evidence of the heterogeneity across smallholders, on the other, it also shows that certified smallholders do not necessarily outperform non-certified smallholders (at least in terms of yield performance). Other factors that are significantly, and positively, related to yields of smallholders are: tree age; plantation on mineral soils; use of good plant material and applying good harvesting practice.

5. Discussion

Certification of palm oil production was intended to promote better environmental, social and economic performance of actors in the supply chain and their communities. Certification was initially directed to palm oil companies and mills. However, there are more than two million

smallholders in Indonesia involved in this business that account for about 40% of the total production area (Directorate General of Estate Crop, 2015). Therefore, including smallholders in the certification process for sustainable production is crucial (Brandi et al., 2015). To this end, the Task Force of the RSPO has adapted the RSPO standards to match the needs for smallholder certification.

However, since the initiation of RSPO certification for smallholders (RSPO, 2009, RSPO, 2010), fewer than 3,500 farmers in three farmer groups have been certified in Indonesia, i.e., Asosiasi Amanah (346 farmers), Gapoktan Tanjung Sehati (227 farmers) and Gapoktan Sapta Tunggal Mandiri (2,716 farmers). At the moment of the current research, there are only three other farmer groups in the process of certification, i.e., Forum Petani Swadaya Merlung Renah (174 farmers), Asosiasi Petani Sawit Swadaya Mandiri (120 farmers), and Gapoktan Kopau Jaya (29 farmers). Other farmer associations such as Asosiasi Anugerah and Asosiasi Mekar Sari have taken the first step by creating farmer groups, but they cannot apply for RSPO certification because of land conflicts. Hence, the number of RSPO-certified smallholders is far below the total number of 2.3 million smallholder oil palm farmers in Indonesia. Having a better understanding of the barriers faced by smallholders to meet certification standards and the heterogeneity of smallholders in being able to address these barriers is therefore important. The next section will discuss these barriers in more detail.

The need for group certification

RSPO standards include two basic standards for smallholders. First, the standard for group certification that must be complied with by a farmer group. Second, the standards that apply to every farmer in the group certification (RSPO, 2010, RSPO, 2012). Before applying for RSPO certification, smallholders must establish a farmer group that organizes farmers in the production process, maintenance, marketing, and administration. Individual farmers cannot apply for RSPO certification. Establishing a farmer group is therefore a crucial step towards

RSPO certification for smallholders (Bitzer et al., 2013, Hellin et al., 2009, Markelova et al., 2009). This prerequisite might not be a barrier for PIR and KKPA scheme smallholders because both types of smallholders are already organized through the scheme (Manggabarani, 2009, Molenaar et al., 2013). However, there are a large number of independent farmers that are not associated to any farmer groups or associations (Rahadian, 2013). Principles 3, 6, 7 and 8 of the RSPO standard are based on the assessment of the group certification, consequently, the degree of compliance of non-certified independent smallholders will be much lower than of non-certified scheme smallholders (RSPO, 2010).

Moreover, many independent smallholders do not have the appropriate title to their land for oil palm plantation (SHM), almost none of the independent smallholders register their oil palm business (STD-B) and most do not have a statement of environmental monitoring and management (SPPL). Because these documents are basic requirements to become a member of a group certification (Principles 2 and 4), the absence of these documents will exclude independent smallholders from group certification (RSPO, 2012). In addition, the RSPO certification system applies a collective responsibility system, which means that if one member of the group cannot meet the standards, then the whole group cannot be certified (Rahadian, 2013). A survey of the members of the Asosiasi Amanah, the first RSPO-certified independent smallholders in Indonesia, confirmed some of the difficulties in obtaining the necessary documents. All the documents can be applied for at local government agencies at district level: the National Land Agency (land title); the local estate crops agency (business registration); and the local environmental agency (statement of environmental monitoring and management). Major constraints were found to be the lack of capacity, knowledge and information of the local agencies' staff and the bureaucratic system of local agencies. Chalil (2012) found that access to these documents for scheme smallholders is easier than for independent farmers because of the support from the already registered company or mill.

Other barriers to establish farmer groups among independent smallholders are due to heterogeneity in: land size and quality; wealth; access to labour; education; type of seedlings; distance to the mill; distance between oil palm plantations; old age of palm trees; and access to information (Lee et al. (2011). Experience from two farmer groups in the process of certification shows that more variation within a group causes more difficulties in the process of certification. The Asosiasi Amanah in Riau Province has less variation compared to the Gapoktan Tanjung Sehati in Jambi Province. Farmers in Asosiasi Amanah have almost similar land size, age of palm trees, and distance to the mills (PT. BSI Group, 2014) while in GAPOKTAN Tanjung Sehati in Jambi the variations are larger (TUV Rheinland, 2014). These differences influence the capability of farmer groups to manage their members to meet the standard of RSPO (Rahadian, 2013).

Challenges in transforming to sustainable practices for smallholders

Principles 4 and 5 of the RSPO refer to transforming agricultural practices from traditional to good agricultural practices. Changing agricultural practices does not only entail changing farmers' skills set through training but it also involves additional costs for inputs. (Lee et al., 2011) identified the cost of implementing good agricultural practices as the main obstacle to smallholder certification. However, different farmers will already have differences in input use prior to certification and also different initial wealth levels. These considerations are crucial because financial repercussions were found to be the main reason for smallholders to join RSPO certification (Hidayat et al., 2015).

Heterogeneity among farmers can also be found in their level of education and age. These personal characteristics can affect living styles, attitudes and way of working (Rahadian, 2013) and hence also the likelihood and ease of adopting new, sustainable practices. Transforming traditional practices to modern management practices is challenging, especially for smallholders that have no tradition to record, monitor and evaluate the activities in their

farm business, and that lack the habit of planning on their plantations. For scheme smallholders this transformation in practices is less driven by personal constraints because the mill or the cooperative generally oblige them to comply with the RSPO principles as long as they want to keep selling their FFB to the mill / cooperative.

6. Conclusions

Certification is an instrument to promote sustainable oil palm production and cooperation among actors throughout the supply chain. The majority of smallholders engaged in oil palm production in Indonesia has a plantation size of less than or equal to 2 ha and about 70% of their household income comes from oil palm production. From a poverty alleviation perspective, it therefore makes sense that smallholders are prioritized for empowerment through certification. The RSPO P&C have been adapted to match the conditions of smallholders. However, there is large variation between smallholder types (scheme and independent) and the variation is even larger within the group of independent smallholders. This results in different starting points for different smallholders in the process of certification. Scheme smallholders are considered to have less difficulties to meet the certification requirements since by design they are supported by the nucleus and other institutions. However, certification puts independent smallholders in a less advantageous situation given limited economies of scale, agronomic constraints and institutional barriers. A more flexible treatment throughout the certification process would better allow different smallholders to achieve certification according to their specific conditions.

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Table 1. Smallholder types and sample size

Smallholder Types		Location	Certification	#
PIR-TRANS (n = 270)				
CPIR1	PIR of PT. Inti Indosawit Subur	Ukui	RSPO-certified	110
PIR2	PIR of PT. Sari Lembah Subur	Kerumutan	Non-certified	80
PIR3	PIR of PT. Surya Bratasena	Meranti	Non-certified	80
PIR-KKPA (n = 243)				
CKKPA1	KKPA of PT. Ramajaya Pramukti	Kampar	RSPO-certified	85
KKPA 2	KKPA of PT. Perkebunan Nusantara V	Kampar kiri	Non-certified	80
KKPA3	KKPA of PT. Peputra Masterindo	Kampar	Non-certified	78
Independent Smallholders (n = 316)				
CIND1	Amanah Association	Ukui	RSPO-certified	102
IND2	Independent farmers at Ukui	Ukui	Non-certified	83
IND3	Independent farmers at Kerumutan	Kerumutan	Non-certified	70
IND4	Independent farmers at Bangkinang	Bangkinang	Non-certified	61
Total				829

Table 2. Quality of plant material used (in percentage, n=829)

Type of groups		High quality PPKS	High quality non PPKS	Low quality plant material	Do not know	
		Independent	47	9	16	
Type of groups	PIR scheme	93	2	0	4	100
	KKPA scheme	85	12	0	3	100
Total		73	7	6	13	100

Source: Own calculations based on survey

Table 3. Fertilizer use by different smallholder types

Fertilizer Use	Units	PIR-TRANS	PIR-KKPA	Independent
Urea	kg/ha/year	278 ± 96	364 ± 81	283 ± 92
SPS-36	kg/ha/year	131 ± 48	170 ± 58	167 ± 68
Muriate of Potash	kg/ha/year	241 ± 83	325 ± 83	255 ± 95
Kieserite / Dolomite	kg/ha/year	159 ± 58	234 ± 114	155 ± 61

Source: Own calculations based on survey

Table 4. Smallholders' household income (euro per month)

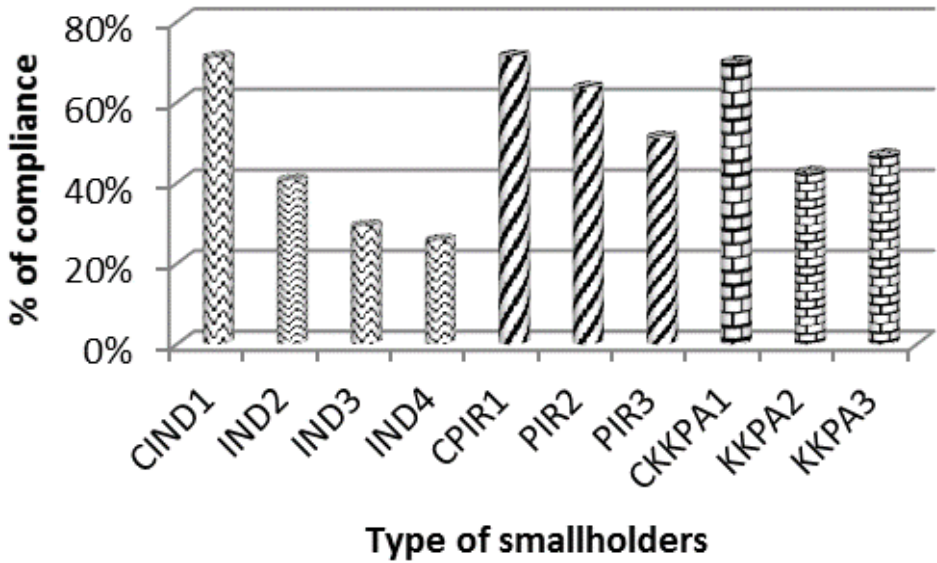
		Oil palm income (euro/month)	Agric. non- oil palm inc. (euro/month)	No-agric. income (euro/month)	Total income (euro/month)
PIR-TRANS	Mean	118	3	53	174
	SD	83	17	122	142
	%	67.9	0.8	27.4	100.0
PIR-KKPA	Mean	227	28	59	314
	SD	73	56	105	129
	%	72.3	8.9	18.8	100.0
Independent	Mean	203	20	68	291
	SD	123	72	166	234
	%	69.7	7.0	23.3	100.0
Total	Mean	182	16	59	260
	SD	108	56	137	189
	%	70.2	6.3	22.6	100.0

Source: Own calculations based on the survey

Table 5. Results of the analysis of yield differences

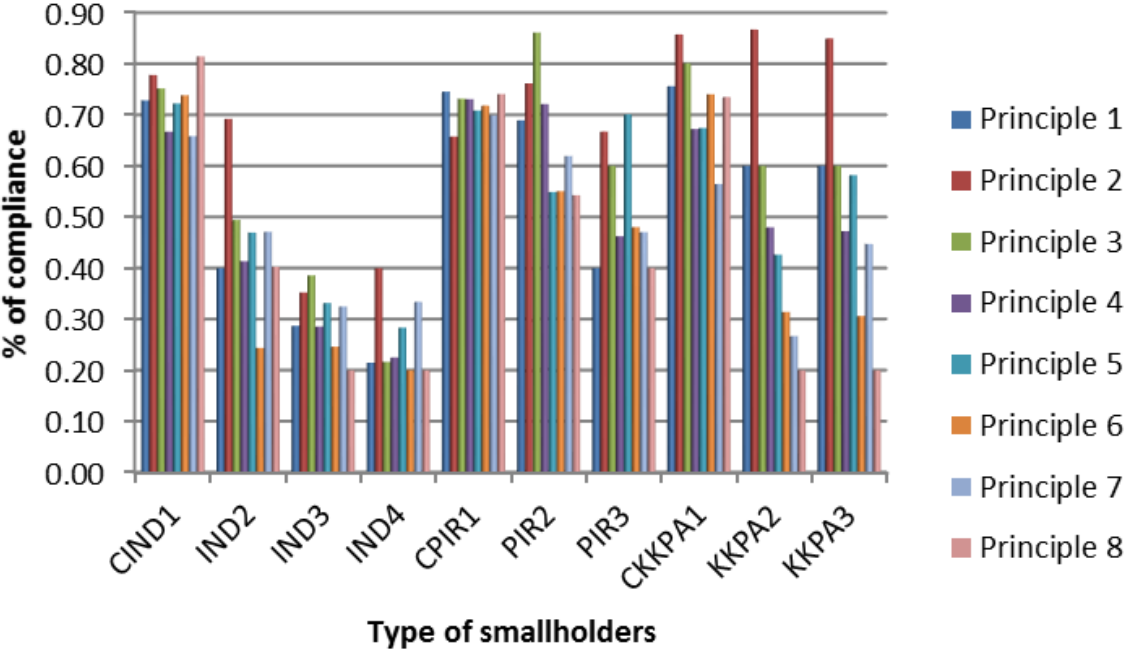
	Model 1			Model 2		
	Coeff.	t-value	Sign.	Coeff.	t-value	Sign.
IND2	-			-1542.3	-2.884	***
IND3	-			2486.9	3.716	***
IND4	-			-816.3	-1.252	
PIR	62.0	0.086		-		
KKPA	2550.1	5.214	***	-		
CERT	3479.7	6.537	***	-		
AGE	26.4	1.780	*	40.1	2.064	**
EDU	135.5	2.740	***	62.7	0.900	
INCOME	0.0	2.160	**	0.0	2.430	**
TREE AGE	1967.6	11.190	***	1590.2	5.001	***
(TREE AGE) ²	-70.4	-12.491	***	-58.6	-4.515	***
SOIL	2451.5	7.941	***	1654.7	3.877	***
FOREST	-78.4	-0.233		-645.7	-1.452	
PLANT	2874.4	6.745	***	3714.2	8.950	***
FERTILISER	2.2	1.381		2.173	0.899	
HARVEST	2572.5	7.767	***	3338.3	6.294	***
Constant	-4751.5	-2.980	***	-2320.0	-0.967	
Adj. R ²	0.579			0.560		
F-value	88.661			31.778		
Observations	829			316		

Figure 1. Degree of compliance of different smallholder types and groups with the RSPO certification standard



Source: Own calculations based on survey

Figure 2. Degree of compliance of different smallholder types with RSPO principles



Source: Own calculations based on survey

Appendix 1. Gap analysis between current practices and the RSPO standards

Methodology for criteria separately:

$$\bar{X}_k = \frac{\sum_{s=1}^n X_{ks}}{n}$$

where :

k = number of criterion

s = number of smallholders per smallholder type

n = total number of smallholders in smallholder type

\bar{X}_k = average score for criterion k per smallholder type.

X_{ks} = score for criterion k of smallholder s.

Methodology for principles separately:

$$\bar{X}_p = \sum_{k=1}^r \left[\frac{\sum_{s=1}^n X_{ks}}{n} \right]$$

where :

k = number of criterion

r = total number of criteria in principle p

s = number of smallholders per smallholder type

n = total number of smallholders in smallholder type

\bar{X}_p = average score principle p per smallholder type

X_{ks} = score for criterion k of smallholder s

Methodology for all criteria:

$$\bar{X} = \sum_{k=1}^q \left[\frac{\sum_{s=1}^n X_{ks}}{n} \right]$$

where :

k = number of criterion

s = number of smallholders per smallholder type

n = total number of smallholders in smallholder type

q = number of criteria over all principles in the RSPO standard

\bar{X} = average score for all criteria per smallholder type

X_{ks} = score for criterion k of smallholder s

Appendix 2. Access to resources, markets, support institutions and infrastructure by different types of smallholders

Smallholder type	Access Information	Access Inputs	Access Market	Access Financial	Access Institutions	Access Infrastructure
CIND1	high	high	high	high	high	high
IND2	medium	medium	medium	medium	medium	low
IND3	low	low	low	low	low	low
IND4	medium	low	low	low	low	low
CPIR1	high	high	high	high	high	high
PIR2	high	high	high	high	high	high
PIR3	medium	medium	medium	medium	medium	medium
CKKPA1	high	high	high	high	high	high
KKPA2	medium	medium	medium	medium	medium	medium
KKPA3	medium	medium	medium	medium	medium	medium

Appendix 3. Variables for statistical analysis

Variable	Unit/Level	Description
KKPA	0 = NonKKPA 1 = KKPA	“KKPA” includes the PIR-KKPA smallholders; “NonKKPA” includes PIR-TRANS and independent smallholders
CKKPA	0 = NonCKKPA 1 = CKKPA	“CKKPA” refers to the group of certified KKPA smallholders; “NonCKKPA” refers to all other smallholders
PIR	0 = NonPIR 1 = PIR	“PIR” includes the PIR-TRANS smallholders; “NonPIR” includes PIR-KKPA and independent smallholders
CPIR	0 = NonCPIR 1 = CPIR	“CPIR” refers to the group of certified PIR-TRANS smallholders; “NonCPIR” refers to all other smallholders
CIND1	0 = NonCIND1 1 = CIND1	“CIND1” refers to the group of certified independent smallholders; “NonCIND1” refers all other smallholders
IND2	0 = NonIND2 1 = IND2	“IND2” refers to Group 2 of independent smallholders; “NonIND2” refers to all other smallholders
IND3	0 = NonIND3 1 = IND3	“IND3” refers to Group 3 of independent smallholders; “NonIND3” refers to all other smallholders
IND4	0 = NonIND4 1 = IND4	“IND4” refers to Group 4 of independent smallholders “NonIND4” refers to all groups other than Independent 4
CERT	0 = NonCert 1 = Cert	“Cert” includes all certified smallholders (PIR-KKPA, PIR-TRANS and independent); “NonCert” includes all non-certified smallholders

Appendix 3. Variables for statistical analysis (ctd.)

Variable	Unit/Level	Description
AGE	years	Age of farmer
EDU	years	Farmer's years of education
INCOME	rp/month	Farmer's non-oil palm income
TREE AGE	years	Age of palm trees
(TREE AGE) ²	years	Square root of age of palm trees
SOIL	0 = Nonmineral 1 = Mineral	"Mineral" refers to mineral soil; "Nonmineral" refers to soil types other than mineral
FOREST	0 = Nonforest 1 = Forest	"Forest" refers to land previously used as forest; "Nonforest" refers to previous land use other than forest
PLANT	0 = low quality plant material 1 = high quality plant material	"High quality plant material" refers to certified plant material; "Low quality plant material" refers to non-certified and illegal plant material.
FERTILISER	kg/ha/year	Amount of nitrogen used in oil palm plantation per year
HARVEST	0 = Bad harvesting practices 1 = Good harvesting practices	"Good harvesting practices" refer to harvesting based on 3-5 loose fruits on the ground; "Bad harvesting practices" are usually based on fruit colour or other reasons.
YIELD	kg/ha/year	Yield harvested per year