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Costs and benefits of certification of independent oil palm smallholders in Indonesia

RESEARCH ARTICLE

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Abstract

Sustainable certification schemes have surged in recent years. The introduction of these schemes poses serious challenges to smallholders. One such certification scheme is the Roundtable on Sustainable Palm Oil (RSPO), which uses certification to increase equitable and sustainable production of palm oil. This study calculates upfront and recurrent costs and monetary benefits of RSPO certification for the Amanah Independent Oil Palm Smallholders Association in Ukui District, Indonesia. Survey and interview data was collected between 2013 and 2015. Results show that upfront costs of certification were 86 euro per hectare. Furthermore, despite generating up to 21% higher revenues from sales, certification created up to an 8% loss of net income per hectare on average per smallholder in the first year after certification, compared to the situation prior to certification. To motivate smallholders for RSPO certification, the economic performance of certified oil palm smallholders should be improved. This can result from further yield increases, a guaranteed premium price or the sales of GreenPalm certificates to provide additional income.

Keywords: RSPO, certification, smallholders, Indonesia, oil palm, costs and benefits

JEL code: Q1, O350, O13, L790

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1. Introduction

The growing demand for crude palm oil (CPO) and the resulting high prices have motivated growers and new investors to increase oil palm production through intensification, replanting, and expansion (Gillespie, 2012; Molenaar *et al.*, 2010; Teoh, 2010; World Bank and IFC, 2011). In Indonesia, the area under oil palm production more than tripled between 2001 and 2014. This made Indonesia the largest oil palm producer in the world, accounting for 46% of global production in 2014 (FAOSTAT, 2016).

Among smallholders, the substantial increase in oil palm production was achieved mainly through the expansion of plantations on peatlands and into forest areas, because most of the mineral soils are cultivated by large scale companies (Koh and Wilcove, 2007; Susanti and Burgers, 2013). The resulting massive and unmanageable oil palm expansion has been claimed to be the cause of deforestation, loss of biodiversity, greenhouse gas emissions, forest fires and land right conflicts (Danielsen *et al.*, 2008; Kessler *et al.*, 2007; Koh and Wilcove, 2008; Mayer, 2006; McCarthy and Zen, 2010). Since the end of the 20th century, following the vast forest fires in most palm oil producing countries, a growing awareness of global consumers about the negative externalities of palm oil industries has generated pressure on palm oil producers to stop deforestation, preserve biodiversity, and prevent pollution caused by forest fires and the use of chemicals in oil palm production. As a result, sustainable certification schemes have surged in recent years.

In 2001, World Wildlife Fund (WWF) launched the Forest Conversion Initiative to reduce the use of forests for development of oil palm plantations. In 2004, the Roundtable on Sustainable Palm Oil (RSPO) was established by international NGOs and private organizations to promote the sustainable production and trade of palm oil. Several European countries and companies have set targets to have 100% of oil palm imports RSPO certified by 2020 (MVO and IDH, 2015; RSPO, 2015). In 2007, the Indonesian government announced a national oil palm certification scheme called 'Indonesian Sustainable Palm Oil' (ISPO) which was supported by Indonesian Ministry of Agriculture Regulation (Indonesian Ministry of Agriculture, 2011, 2015; Wijaya and Glasbergen, 2016). The ISPO certificate is mandatory for oil palm mills and plantation companies that operate in Indonesia.

To reach certification for any of these schemes, growers, mills, companies, traders and other actors in the supply chain have to comply with the standards set by certification. These standards generally aim at sustainable production with fewer negative social and environmental impacts, and imply the introduction of a traceability system, good agricultural practices, improved natural resource management and environmental responsibility and compliance with existing regulations. These requirements for certification can pose several challenges to oil palm smallholders, for instance, in record keeping or acquiring adequate knowledge and skills and in getting access to financial means to improve practices. These challenges may create barriers for smallholder compliance. For example, Rietberg and Slingerland (2016b) find that about 5-10% of smallholders are currently excluded from certification projects due to requirements that are related to prior land use or availability of legal documents. Furthermore, the inability to comply may lead to smallholders' exclusion from global markets, if RSPO certification becomes mandatory, and from the local market if ISPO becomes fully implemented.

For RSPO certification to deal with the cited problems and to include smallholders, compliance with requirements needs at least to be financially attractive for smallholders. Furthermore, insight is needed in the costs of pre-certification trajectories for assisting smallholders to overcome their barriers to certification. A preliminary investigation by Rietberg and Slingerland (2016a) amongst projects supporting smallholders to reach RSPO certification revealed that (1) pre-certification costs were not transparently registered separately from other activities and that (2) financial costs and benefits of certification for smallholders or smallholder groups could not be assessed due to the lack of baseline data. The implementing organizations as well as the RSPO and the government of Indonesia confirmed at the same time that they need such data to assess what financial costs would be involved when going from pilots of limited numbers of farmers to national scale and to assess whether net financial benefits would be sufficiently attractive for smallholders to engage in

the certification process and to remain certified after the first successful audit. The main objective of this study is therefore to improve insight into the costs and benefits of RSPO certification.

More specifically, this study will assess the pre-certification financial costs and the average financial costs and benefits of RSPO certification for individual farmers and for the certified independent farmers group in Ukui, Indonesia. Pre-certification costs will be assessed in detail, disentangling them from costs for other activities. In addition, average farm level costs and benefits are approached from a crop management and yield perspective, not based on assumptions (see conclusions by Kuit and Waarts, 2014), but based on quantitative data on fertilizer application and labor inputs in management and on actually sold production and prices.

The next section will provide further background on palm oil production in Indonesia and a literature review on costs and benefits of certification. After a section on methodology, the paper will provide results on the following six issues:

- cost of the certification process;
- changes in oil palm plantation management practices and yield after certification;
- costs and benefits of implementation of RSPO principles and criteria for smallholders;
- marketing options and changes due to certification;
- GreenPalm certificates trade;
- price setting and changes due to certification.

After the results section, the overall impact will be discussed and compared to literature on impacts of certification of other commodities. The study provides insights in real costs allowing for extrapolation of pre-certification costs from pilot to larger scale. Cost implications of mandatory RSPO certification for all Indonesian smallholders will be assessed. Conclusions will be presented on real net benefits and means to increase profitability of certification for smallholders, informing farmers and other stakeholders on whether certification is worthwhile from a financial perspective. Finally, we will present the limitations of the study and recommendations for further research to investigate the impact of certification in more depth.

2. Literature review

2.1 Background on oil palm production and expansion in Indonesia

In the early 1970s large scale companies started the oil palm business in Indonesia with the government obliging each mill to have its own plantation (nucleus) and to source 80% of the produce from associated smallholders (plasma). This division between nucleus and plasma changed gradually towards 40-60% (Molenaar *et al.*, 2010). Palm oil companies were obliged to plant for the smallholders and manage the plantations until they started bearing fruits at 4 years of age. From that moment, the plantations were handed over to smallholders but the palm oil companies continued to provide technical and logistical support to them. Once the government policy was relaxed, plasma farmers started planting additional fields in their surroundings and also spontaneous migrants and local farmers started independent fields. This resulted in a rapid oil palm expansion and uncontrollable land use. Between 2001 and 2015 the total area planted in oil palm under smallholder management increased from 1.56 to 4.73 million ha, and the number of farmers increased from 0.7 to 2.3 million farmers (Directorate General of Estate Crop, 2015). Smallholders accounted for 33% to more than 42% of the total area of oil palm plantations in 2001 and 2015, respectively. In the same period the total area of oil palm plantings increased from 4.7 to 11.3 million ha showing that despite the large contribution of smallholders, large landowners were still responsible for most of the expansion. (Directorate General of Estate Crop, 2015).

In smallholder plantations, the growing demand for palm oil has created a push towards oil palm expansion, especially into peatland and forest areas, instead of intensification or replanting because of the relatively lower costs of expansion (Angraini and Grundmann, 2013; Fairhurst and McLaughlin, 2009). Replanting is unattractive in the short term as it is costly to remove old trees, to pay for new planting materials and to

forego income of the old trees, while waiting four years before the new trees start yielding. Expansion into forest areas does not replace old, income yielding, oil palm trees and may even generate some income from the wood that has to be removed. For smallholders, intensification through good agricultural practices is also difficult to implement due to the lack of know-how, high investment costs in fertilizers, and the often low quality of planting materials (Molenaar *et al.*, 2010). Moreover, many farmers are not aware of the relation between the age of an oil palm tree and its productivity, and have not even considered replanting despite declining yields.

2.2 Background on costs, benefits and barriers to smallholder certification

Rietberg and Slingerland (2016b) provide insights into the barriers to certification for smallholders based on a literature review, RSPO audit reports and interviews in Indonesia, Malaysia, Thailand and Ghana. The results show that smallholders lack skills, knowledge and funds to acquire legal documents (land certificates, environmental impact assessment, business permit), to adopt better management practices, to keep records, and to meet organizational demands for certification. Furthermore, their institutional environment is often not conducive to change. Smallholders suffer relatively more from low access to resources (e.g. land or fertilizer), finance (credit) and markets and the risk of price variability than large scale companies.

Similar and additional challenges to certification have been cited by several authors. Molenaar *et al.* (2013) state that the majority of smallholders cultivate their oil palm plantation sub-optimally, using low amounts of inputs, low quality of plant material, and hence reach low levels of productivity. Brandi *et al.* (2015) conclude that independent oil palm farmers lack both the knowledge and the organizational capacity required for certification. The introduction of a certification scheme with specific requirements regarding plantation management and administration is therefore a serious challenge for smallholders. These challenges are reflected in the limited numbers of smallholders that are RSPO certified so far: only 129,155 smallholders are certified worldwide, whereas an estimated total of 2.3 million smallholders are active in oil palm production in Indonesia alone (data of 2015; Directorate General of Estate Crop, 2015; Verburg, 2015). Moreover, the majority of the certified smallholders are plasma smallholders mainly because, contrary to independent smallholders, they are already organized which is a prerequisite for certification.

Kuit and Waarts (2014) have analyzed 270 studies of certification for eight certification schemes in the cocoa, coffee, cotton, and fruits and vegetables sectors for small scale farmers to do a cost-benefit analysis of certification. They find that many certification programs are co-funded by donors, making it difficult to assess the net benefits of certification when donor support is withdrawn. Costs are often unclearly distributed over several intervening parties, leading to a lack of transparency, and some of the project implementers do not share information about their costs to “protect their market”. Due to the lack of data, many studies base their cost-benefit analysis on assumptions about production volumes and premium prices. For all commodities studied, Kuit and Waarts (2014) conclude that smallholder farmers need to produce above average volumes to make certification profitable. In addition, they claim that a selection bias may occur meaning that mainly better and wealthier farmers enter certification schemes and that they are also more likely to benefit from them. Based on their overview, annual (recurring) costs of certification are between 1 and 2,604 euros/farmer/yr, and upfront costs between 18 and 403 euros/farmer, hence a large variation both within and between commodities and certification schemes (Kuit and Waarts, 2014). Furthermore, the results show that evidence of potential benefits, such as increased farm gate prices and increased yields, is inconclusive for most commodities and schemes. This shows that there are clear difficulties in assessing the costs and (net) benefits of certification schemes.

For oil palm, implementing RSPO certification for smallholders requires monetary investments, whereas the benefits in the short-term are poorly investigated. The number of studies on the impact of certification on small scale independent oil palm farmers is limited because the first independent farmer group received its RSPO certificate as recently as 2013. Until then, the focus of RSPO was directed towards plasma farmers that benefit from their relation with a mill and that, through their existing level of organization, are easier and

potentially cheaper to target. At the time of the data collection for the current research, in 2013, only 6 groups of independent smallholders were certified (3 in Thailand, 2 in Malaysia and 1 in Indonesia) (RSPO, 2014).

McCarthy (2012) states that whereas downstream producers increasingly focus on sustainability concerns, upstream producers are motivated primarily by economic motives. Beall (2012) also states that despite numerous non-financial benefits, smallholders' motivation to make efforts for certification is hampered by a lack of clear and sufficient benefits. Rietberg and Slingerland (2016a,b) find that certification costs combined with the low uptake of certified palm oil and low premium prices may hamper farmers' motivation for certification especially when visible benefits are lacking. The assumption is therefore that smallholders will only adhere to certification when financial benefits are substantially higher than costs. While the above mentioned authors have looked at barriers of certification which may lead to costs to overcome them, others have focussed on perceived or potential benefits (Hidayat *et al.*, 2015). Yet both costs and benefits are often expressed in a qualitative or non-monetary way and no one has actually measured financial costs and benefits for farmers related to RSPO certification. Furthermore, no data are available on the costs of the trajectory towards certification mainly for the reasons that Kuit and Waarts (2014) put forward. This justifies the objective of the current study, namely, to provide an in-depth analysis of pre-certification financial costs and average costs and benefits of RSPO certification for individual farmers as well as for a certified independent farmers group in Indonesia.

3. Methodology

The study focused on the Amanah Independent Oil Palm Smallholders Association located in Ukui District, Pelalawan Regency, Riau Province, Indonesia. The Association consists of 349 independent oil palm smallholders who were certified as a group. The Association was supported by Carrefour Foundation International, PT. Inti Indosawit Subur, WWF, RSPO, and the District Government Office of Forest and Estate Crops. The Amanah Association comprises three village cooperatives (koperasi unit desa, KUD; KUD Bakti, KUD Bina Usaha Baru, and KUD Karya Bersama), ten farmer groups and an area planted under oil palm of 763 ha. They are located in three villages: Bukit Jaya (2 groups), Trimulya Jaya (7 groups) and Air Emas (1 group). The farmer groups started the process of group certification in March 2012 and obtained RSPO certification in July 2013. All farmers in the Amanah Association were previously part of a transmigration project.

The study follows a case study approach (Eisenhardt, 1989; George and Bennett, 2005; Yin, 2014). The case study focuses on Amanah, as the first and only association of independent smallholders in Indonesia that had obtained certification at the time of the study. The case study provides in-depth information about the change in management practices and other farm indicators of a sample of Amanah smallholders, before and after certification. However, due to the limitations of our sample, no quantitative data were available for smallholders outside of the Amanah Association. In essence, this means that a counterfactual in the strict sense is lacking for our case study. This may lead to some limitations of the study and warrants a careful interpretation of the presented results. The main potential drawback of the lack of counterfactual is that observed changes (in management practices, production costs, yields or other indicators) before and after certification may not be attributable to the certification process but to other – unobserved – factors that apply both to certified and non-certified smallholders. The lack of counterfactual prevents us from controlling for such unobserved factors and may lead to issues of incorrect attribution.

Despite the lack of counterfactual, some specific characteristics of the case study exist that mitigate the potential issues of attribution. First, by comparing the situation before and after certification in our case study, we have controlled for the major potentially confounding factors for explaining yield increases. Specifically, rainfall conditions and average temperatures, which need to be >2,000 mm/yr, >100 mm/month and between 24-28 °C for oil palm growth (Corley and Tinker, 2008), were more than adequate before and after certification and cannot explain increases in yield. In 2012, 2013 and 2014 rainfall data were 2,750, 3,086 and 2,634 mm/yr respectively and palms never suffered a water deficit as all monthly rainfall data

were between 150 and 350 mm/month whereas monthly average temperatures were between 25 and 28 °C (<http://sdwebx.worldbank.org/climateportal>). Furthermore, at the time of the study, palm trees were 14 years of age and hence in the phase of yield stability such that increases in yield due to the maturing of trees is excluded. Finally, prices of Fresh Fruit Bunches (FFB) for independent farmers and for certified independent farmers were the same before and after certification, apart from the loyalty premium for certified farmers.

Second, changes in management practices such as decisions on fertilizer or pesticide use and labor use for weeding or pruning are directly attributable to certification because these practices are prescribed in detail by the RSPO. In addition, certification encompasses grouping and joint decision-making and hence certified smallholders cannot be seen as merely individual managers. Specifically, members of a group certification have to run their business based on group management control and group decisions (Internal Control System). Once the farmers join the group, individual farmers no longer have the authority to make their own decisions on their oil palm plantation. For instance, fertilizer use and harvesting frequency will be planned and prescribed by the Internal Control System, while weeding and herbicide use will be planned and executed by a spraying unit team. This detailed prescription of farm management activities and the reduction in individual control over such activities, increases the probability that observed changes in management practices and resulting farm indicators are attributable to certification.

The lead author of this paper followed the certification process from the start till the end, as an action researcher, associating with each of the stakeholders on numerous occasions and in various settings and forms. Data was collected between June and October 2013 and during additional, shorter field visits in 2014 and 2015. A total of 130 smallholders were selected randomly from the population (Association members involved in the group certification). Data on costs of certification and management practices at farm level were obtained through surveys. The survey included questions on agricultural management practices and associated costs of inputs (fertilizer, pesticides, herbicides) and labor. These were compared with RSPO imposed practices. Annual sales data of FFB of individual farmers prior to and after certification were obtained through records from the farmers' cooperative. Sales data were triangulated by verifying sales with informal farmer group leaders. Farmers with recorded sales larger than the average plus one standard deviation, hence >23 ton/ha, were excluded from the analysis, as this was considered an unrealistically high yield and these records might have been affected by illegally including FFBs from other fields. As a result, 28 farmers were excluded, leading to a final sample of 102 farmers.

Price data for FFB prior to certification were obtained through interviews with the leaders of informal farmer groups, who made an estimate of the average price obtained depending on the marketing channel. Data on FFB prices paid by the mill after certification were available through records from the farmers' cooperative. From 2014 onwards, GreenPalm facilitates trade in certificates from RSPO certified palm oil production by providing a confidential trading platform for buyers and sellers. GreenPalm is a certificate trading program. It allows manufacturers and retailers to purchase GreenPalm certificates from an RSPO certified palm oil grower. RSPO certified palm oil growers can convert their certified tonnage into certificates, each ton converts to one GreenPalm certificate. This means that there is no guarantee that the end product contains certified, sustainable palm oil, but it allows direct support of RSPO certified growers and farmers, despite complicated supply chains (Greenpalm, 2017). Prices are based on demand and supply and they are called premiums as they are a voluntary payment in addition to the normal selling price of FFBs. Certificates fit into the book and claim systems. In the GreenPalm mechanism, premiums are transferred directly from end user to grower. However, GreenPalm only facilitates links between specific buyers (end user) and sellers (certified grower) via an Off Market Deal. This means that the prices agreed upon by buyers and sellers are not published. GreenPalm premiums were not included in the calculation of annual income as no information about these certificates or their prices was available during the research.

The study also collected data from stakeholders such as cooperatives, associations of smallholders, mills, local estate crops agency, middlemen, and NGOs to gather data on changes in input provision and marketing channels and to triangulate results from the surveys at farmer level. Such qualitative data were gathered

through interviews and informal meetings, group discussions, field visits and a validation workshop with the key actors/institutions. Semi-structured individual in-depth interviews were held with the cooperative management (2 people), internal control system (ICS) inspectors (5), leaders of farmer groups (10), the plasma manager (1), WWF staff (1), and the head of the district office of the estate crops agency (1) to obtain information about activities and associated costs in the process of certification. Secondary quantitative data include sold production, prices of inputs and FFBs, number of smallholders and land area and were provided by cooperatives, government agencies and non-government actors.

The study distinguishes between costs for smallholders and for third parties, and between initial and recurrent costs. To calculate initial certification costs, all activities and their costs were summed and the total was divided over the number of farmers and number of hectares. Time expenditure of smallholders in attending trainings etc. were not included for two reasons: (1) it would be difficult to attach opportunity costs to these time investments; and (2) the purpose was to calculate the financial investment of third parties to assist smallholders to obtain certification, not to assess farmers' time investment. Additional time expenditure by smallholders for applying adapted management practices as required by RSPO were included as recurrent costs against the price of hiring labor in the market. Data on benefits and costs after certification were analyzed using the financial benefit and cost ratio by comparing additional benefits and additional costs in the process to obtain the RSPO certification. The additional benefit is the change in total benefit that results from complying with the RSPO standard while additional cost is the change in total cost arising from complying with the RSPO standard. These costs are composed of production costs or annual fees that do not have a temporal component because costs and benefits are occurring in the same year. Variable costs are related to production volume (kg FFB) whereas fixed costs are not, for example, annual membership fees to be paid to the association. The certification program is beneficial for farmers if the additional financial benefit exceeds the additional cost. To do justice to differences between smallholders before certification we divided the smallholders in four quartiles based on their initial yields, and calculated average costs and benefits per quartile. Quartile 1 (Q1) consists of the 25% smallholders with lowest yields, Q4 the 25% with the highest yields. Break even points for the Amanah Association were calculated in terms of changes in yields and FFB prices needed to cover recurrent certification costs.

4. Findings and analysis

4.1 The process of certification

The process to obtain the RSPO certificate for the Amanah Association group certification required around 65,550 euros (Table 1). This is equivalent to 188 euros per farmer or 86 euros per ha. The initial costs of certification comprised of eleven cost items. This section provides a detailed description of the activities related to these cost items. An overview of challenges in the certification process and the parties responsible to deal with those challenges can be found in Supplementary Materials S1 and an overview of all phases of the certification process is provided in Supplementary Materials S2.

Certification started with the establishment of the group certification unit followed by identification of candidates to act as group manager and ICS administrators, legalization of the Association of independent farmers as a group certification unit by a legal agency (Notary office), identification of candidate members, creation of an internal mechanism arrangement, and establishment of structures and mechanisms for administrators and ICS. Identification of candidate farmers is a crucial activity because RSPO requires that the plantations are not located in a High Conservation Value – Forest area, are free of land and social conflicts, and are free of labor disputes (Rahadian, 2013). The RSPO certification system requires collective responsibility for compliance with standards by all members without any exception (Darussamin *et al.*, 2012).

A series of trainings was implemented to prepare the ICS in accordance with the RSPO Principles & Criteria (P&C). The trainings and the appointment of ICS inspectors were organized by BIOCert. The participants in the ICS trainings were representatives of farmer groups i.e. the chairman, secretary and treasurer. Following

Table 1. Initial costs of certification for the Amanah Association.¹

Activities	Costs (Euro) ²	%
ICS establishment	615	0.9
ICS trainings	3,069	4.7
Group member trainings	23,119	35.3
Group certification documents	2,090	3.2
Farmers' documents	25,226	38.5
Internal assessment I	586	0.9
Internal assessment II	69	0.1
RSPO member registration	259	0.4
Pre audit	4,828	7.4
Remedial CARs	172	0.3
Main audit	5,517	8.4
Total costs of certification	65,550	100

¹ ICS = Internal control system; CAR = correction action request. ² Data collected in Indonesian Rupiah (IDR) – recalculated to euro with exchange rate 1 euro = IDR 14,500.

the trainings, the ICS inspected candidate members against RSPO P&C. Training of candidate group members was organized by the ICS. A series of trainings was implemented to prepare farmers in relation to the RSPO P&C. These trainings were one of the largest costs items (35.3%).

Group certification documents were prepared by the group manager and ICS administrators following the ICS training. These included a map of plantations (individual and group area), primary information on group members, a copy of individual member documents, production records, standard operation procedures (SOPs), results of the internal control system, operational business records and other administrative affairs. The standard of agricultural practices was prepared by the ICS through a number of SOPs. The SOPs include guidelines for the cultivation system, and for environmental, social, and marketing aspects. The availability of these documents is crucial for RSPO auditors.

Documents to be prepared by individual farmers were a land ownership certificate, a business permit (Surat Tanda Daftar Usaha Perkebunan), a statement of capability to manage and monitor environmental impact (Surat Pernyataan Kesanggupan Pengelolaan Lingkungan), and farmers' record books. The acquisition of these documents was expensive, particularly to obtain a land ownership certificate, a business permit, and a statement of environmental management. Individual access to those documents proved to be problematic due to unclear procedures and risked taking a lot of time. Therefore the members of the Association acquired the documents collectively against extra fees. This was the largest cost item (38.5%).

In the first internal assessment, ICS inspectors checked to what extent management quality of the oil palm plantation met RSPO P&C. There are eight principles, 39 criteria, and 78 indicators that the farmers and the group must comply with according to RSPO standards (Darussamin *et al.*, 2012). The administrator recorded all processes and activities, and documented and managed those records (Asosiasi Petani Sawit Swadaya Amanah, 2012). Any non-compliance with the standards and practices was met with a sanction and Correction Action Requests (CARs) to be taken by the farmers within a time frame set out by the internal approval committee. The second internal assessment was conducted to evaluate farmers' compliance with the RSPO standards after the corrections had been made. All corrections requested in the previous assessment had to be accomplished by each individual member and the group. The candidate farmers that complied with the RSPO P&C were accepted as the members of the Amanah Oil Palm Independent Smallholders Association. However, any farmer that could not comply with the standard was rejected as a group member. The selected farmers were offered a contract and asked to sign it. In this case, the contract also implied that all agricultural management decisions in the group regarding smallholders' plantations would be taken by the ICS (Asosiasi

Petani Sawit Swadaya Amanah, 2012). After the internal assessments, the Amanah Association applied for RSPO membership, in order to be eligible for group certification. The Amanah Association became a member of RSPO in 2013 (RSPO No.: 1-0133-12-000-00).

The internal assessments were followed by two external audits: a pre-audit and a main audit of both the Association and the farmers. The pre-audit report included indicators that have been fully complied with and indicators for which performance should be improved to meet the standards. The group manager, the ICS inspectors and the group members had to take action so that non-compliant farmers would meet the RSPO standards (Remedial CARs). In the main audit, all the major indicators had to be complied with, while the standard for minor indicators must be met one year after the main audit at the latest. The results of the main audit were reviewed by an RSPO team and the review was sent back to the Certification Body. Based on the final report, the Certification Body issued the RSPO certificate. In the following two years, there are annual surveillances from the external auditor that cost the farmers an additional 11 euros/ha/yr. The audit is paid for per group, irrespective of how many of the members are selected to be audited. Hence, costs are just divided over the number of farmers in the group. All costs of the Amanah Association certification process were borne by the Carrefour Foundation.

4.2 Does certification change management practices and yields?

Prior to certification, smallholders were free to choose how to manage their plantation and management practices varied widely amongst oil palm independent farmers. After certification, fertilizer use and harvesting frequency were planned and prescribed by the ICS, integrated pest management (weeding and herbicide use) was planned and executed by a spraying unit team (Team Unit Semprot, TUS) and hence the variation in practices was reduced.

Prior to certification, the use of fertilizers was often based on experiences of peers in the plasma, and generally low due to financial limitations. Mean fertilizer use was 5.5 ± 0.7 bags/ha of nitrogen (ammonium sulphate, 21% N), 3.0 ± 0.4 bags/ha of phosphorous (rock phosphate, 28% P_2O_5), 5.4 ± 0.7 bags/ha of potassium (muriate of potash, 60% K_2O) and 3.0 ± 0.6 bags/ha of magnesium (dolomit, 18% Mg). Each bag contains 50 kg of fertilizers (Table 2). These types of fertilizer were chosen because of their low prices and their accessibility. For example, ammonium sulphate and rock phosphate are easily available in the local market and the price is lower than the price of urea and single super phosphate (SP-36). Dolomit is usually used in

Table 2. Means and standard deviation of annual management practices of smallholders prior to and after certification (n=102).

Management practice	Units	Before certification	After certification
Fertilizer use			
Ammonium sulphate (NH_4) ¹	Bags/ha ²	5.5 ± 0.7	10 ± 0.0
Rock phosphate (P_2O_5) ³	Bags/ha	3.0 ± 0.4	3 ± 0.0
Muriate of potash (K_2O) ⁴	Bags/ha	5.4 ± 0.7	8 ± 0.0
Dolomit (MgO) ⁵	Bags/ha	3.0 ± 0.6	4 ± 0.0
Other management			
Pesticide use	l/ha	0.0 ± 0.0	2 times/yr
Herbicide use	l/ha	3.8 ± 0.7	2 times/yr
Circle weeding	Times/yr	2.0 ± 0.0	2.0 ± 0.0
Block weeding	Men/day/ha	2.4 ± 0.5	2 times/yr
Fertilizing	Bags	16.9 ± 1.9	25 ± 0
Pruning	Men/day/ha	2.0 ± 0.1	4.0 ± 0.0
Harvest frequency	Times/yr	32.9 ± 5.3	36 ± 0

¹ 21% N. ² One bag of fertilizer contains 50 kg. ³ 28% P_2O_5 . ⁴ 60% K_2O . ⁵ 18% Mg.

peat soils with low pH. In the process of certification, the amount of fertilizer use was determined by the ICS based on a leaf analysis done by the oil palm mill. After certification, fertilizer application was 10 bags/ha of nitrogen, 3 bags/ha of phosphorous, 8 bags/ha of potassium and 4 bags/ha of magnesium. The same types of fertilizer were used as prior to certification. The study showed that farmers applied nitrogen and potassium two times per year and phosphorus and magnesium once a year. Farmers never applied boron or copper in their plantation.

Maintenance practices were not implemented appropriately and regularly before certification. Circle weeding was conducted 2 times/yr by all farmers and the number of trees weeded depended on the weed condition for each tree. Farmers usually used herbicides in the entire block 2.4 ± 0.5 times/yr, and conducted weeding without discriminating between weed types. Recommended practices include cleaning of all weeds in a circle around the palm tree stems, cleaning the path for access to the plantation and maintenance of a desired weed cover in the remaining area of the plantation, mainly by manual weeding. After certification, there was no change in circle weeding practices, however, the TUS was responsible for dealing with pests, diseases and weeds. All the materials and chemicals needed by the TUS were provided by the Amanah Association. Farmers utilized TUS services on average twice a year. The price of this service depended on the condition of the plantations. Before certification, pruning was often done only during harvest and hence the majority of the oil palm trees were lightly pruned. In the process of certification pruning became more intensive which increased the labor needs from two to four man days/ha.

Before certification farmers did not have a strict planning for harvesting and selling FFBs. Harvest frequency varied between 24 and 36 times/yr or every 10-15 days. The plantations yielded on average 17.9 ± 4.6 tons/ha/yr. After certification, harvest was set by the Association every 10 days and the mean yield slightly increased to 19.6 ± 4.9 tons/ha/yr. Timing and frequency of harvesting was managed and controlled by the Association. The ICS made standard procedures and planning for harvesting based on the recommendations from the mill. The quality of FFBs was taken into account during harvest including ripening stage and number of loose fruits.

A final important management practice relates to the use of plant materials. There are two different types of plant materials used by the farmers: good quality plant material (*tenera*) originating from the Indonesian Oil Palm Research Institute of Marihat in North Sumatra and low quality plant materials (*dura* and *pisifera*) that the farmers buy from illegal nurseries or obtain from the oil palm fruit from existing plantations. The majority of the farmers do not know the variety of their plant material. The oil extraction rate (OER) set by the mill for the FFBs from the independent farmers was 15-17% which is lower than that of the plasma (20-22%). The OER indicates that according to the mill most of the independent farmers use low quality plant materials. As no replanting took place during the research period and in the process of certification, planting material was not affected by certification. Therefore, the effect of best management practices on yield increase may be limited by inferior plant material, hence limiting the potential benefits of certification.

4.3 Cost-benefit analysis of complying with RSPO principles and criteria

After certification, costs of oil palm plantation management increased from 430 to 765 euros/ha/yr, an increase of 78.1% (Table 3). This was due to increased management costs and fees. Fees to be paid to the Association, including Operational Work Plan (Rencana Kerja Operasional), road maintenance and group fees, accounted for 40.4% of this difference, whereas increased fertilizer costs made up 33.2% of the difference (Figure 1).

Mean yields of the oil palm plantations increased by 9.8% from 17.9 tons/ha/yr to 19.7 tons/ha/yr (Table 3 and Table 4). Farm sales value improved by 16.2% due to a combination of additional yield (9.8%) and increased FFB price (5.8%). As the increase in costs was higher than the increase in farm sales value, net farm income after certification was 5.3% lower than before certification. Nevertheless, the value of farm income was still positive because farmers are exempt from paying taxes, interests and rent. The minimum land size of farmers in the Amanah Association is 1.2 ha, leading to a monthly income of 116 euros which

Table 3. Mean costs and benefits for smallholdings prior and one year after the Roundtable on Sustainable Palm Oil-certification (in euro ha/yr and in % of total cost change).

	Without certification	With certification	Change ¹	
	(Euro ³)	(Euro)	(Euro)	%
Production ² (kg/ha/yr)	17,916	19,672	1,756	9.8
Fertilizer costs	199	311	112	55.8
Herbicide and pesticide costs	18	24	6	31.5
Harvest labor costs	124	136	12	9.5
Other labor costs (weeding, pruning, applying fertilizers, herbicides and pesticides)	65	66	1	0.9
Weighing and transport of harvest	0	71	71	
Other costs (RKO ⁴ , road maintenance, group fee)	0	136	136	
Land, building tax and depreciation	23	23	0	0.0
Total farm costs	430	765	336	78.1
FFB ⁵ price/ton	93.1	98.6	5.4	5.8
Premium through GreenPalm	0	0 ⁶	0	0.0
Farm sales (farm revenues)	1,668	1,939	270	16.2
Farm income (profit)	1,239	1,173	-65	-5.3

¹ The absolute difference (euro/ha/yr) is calculated as with-without certification. For the % difference, the value before certification is set at 100%. ² Production is based on FFB sold to middlemen or cooperative. ³ Data collected in Indonesian Rupiah (IDR) – recalculated to euro with exchange rate 1 euro = IDR 14,500. ⁴ RKO = operational work plan. ⁵ FFB price prior to certification was based on farmer group leaders estimates, FFB price after certification was based on cooperative records; FFB = Fresh Fruit Bunches. ⁶ Individual farmers were not aware of GreenPalm premiums and no data about these could be obtained through the cooperative.

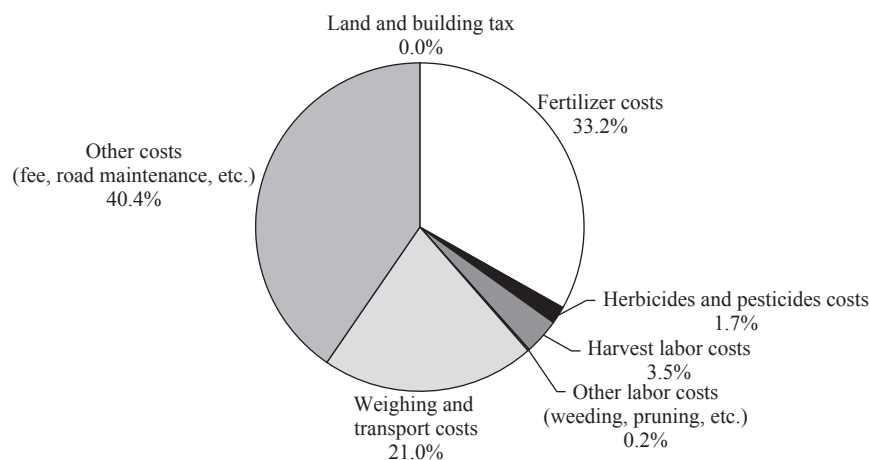


Figure 1. Share of cost categories in additional costs of farm management after the Roundtable on Sustainable Palm Oil-certification. Total mean costs difference of 336 euros/ha/yr is set at 100%.

is still above the regional minimum monthly wage of 97 euros set by the local government. However, 116 euros is less than what the same farmers received before certification (123 euros).

To explore whether the result of certification was related to the starting position, smallholders were grouped in quartiles. Costs and benefits were calculated the same way as for the average of all smallholders in the sample. The results (Table 5) show that despite an increase of 11 to 21% in revenues from sales, farm profit decreased by 5 to 8% per ha.

Table 4. Calculated price and yield increases that are necessary to cover additional recurrent costs for individual farmers after certification, compared to observed findings.¹

		Yield			Price	
		Observed findings	Additional costs covered		Observed findings	Additional costs covered
Before certification	ton/ha/yr	17.9	17.9	Euro t/FFB ²	93.1	93.1
After certification	ton/ha/yr	19.7	20.5	Euro t/FFB	98.6	101.9
Increase	%	9.8	14.3	%	5.9	9.4
Additional costs	Euro/ha	336	350	Euro/ha	336	336
Additional revenues	Euro/ha	270	350	Euro/ha	270	336
BC ratio ³	–	0.8	1	–	0.8	1

¹ Increased yields would lead to increased costs for harvesting, weighing and transport among others, which is taken into account in this calculation. ² Data collected in Indonesian Rupiah (IDR) – recalculated to euro with exchange rate 1 euro = IDR 14,500.

³ BC ratio = additional benefit/additional costs.

Table 5. Average yield, costs and benefits per quartile before and one year after certification and calculated yield and price increases needed for benefit cost ratio of one.

	Q1			Q2		
	Before	After	Change	Before	After	Change
Yield (kg)	12,710	13,954	10%	16,907	19,283	14%
Fixed costs (€)	301	416	38%	313	417	33%
Variable costs (€)	90	243	168%	121	335	177%
Total farm costs (€)	392	658	68%	434	752	73%
FFB price (€/ton)	92	99	7%	93	99	6%
Farm sales, revenues (€)	1,165	1,375	18%	1,575	1,900	21%
Farm profit (€/ha/yr)	774	717	-7%	1,141	1,149	1%
BCR ¹	0.8			1		
To make BCR=1						
Yield (price constant) increase by	12,710	14,653	15.3%	16,907	19,283	14.1%
Price (yield constant) increase by	92	102.6	11.9%	93	99	5.8%
	Q3			Q4		
	Before	After	Change	Before	After	Change
Yield (kg)	19,026	20,760	9%	24,198	25,870	7%
Fixed costs (€)	309	416	35%	301	416	38%
Variable costs (€)	130	361	178%	157	450	187%
Total farm costs (€)	439	777	77%	458	866	89%
FFB price (€/ton)	93	99	6%	95	99	4%
Farm sales, revenues (€)	1,773	2,046	15%	2,291	2,550	11%
Farm profit (€/ha/yr)	1,334	1,269	-5%	1,833	1,684	-8%
BCR ¹	0.8			0.6		
To make BCR=1						
Yield (price constant) increase by	19,026	21,559	13.3%	24,198	27,707	14.5%
Price (yield constant) increase by	93	101.7	9.2%	95	104.3	12.0%

¹ BCR = benefit cost ratio.

4.4 Certification, Fresh Fruit Bunches marketing chains and price

All members of the Amanah Association were previously non-certified independent oil palm farmers. Most of them had no direct access to mills. We identified four marketing channels for FFBs prior to certification (Figure 2). In the first channel, the farmers were located far from each other and middlemen acted as collectors in the rural area. The middlemen sold the FFBs to local traders who had a contract with the mill. The second channel, through the cooperative, was used by the members of a cooperative because the cooperative had a contract with the mill. Third, farmers who were relatively close together but had no link with cooperatives could sell their FFB to middlemen that had a contract with the mill. Fourth, the farmers who sold their FFBs directly to mills usually were large scale farmers, as mills do not accept small volumes.

Prior to certification, the harvested fruits were often put at the roadside to be picked up by a middleman. There was no guarantee that the fruits could be delivered to the mill within 24 hours as required for good quality palm oil, and often fruits stayed at the roadside for more than two days. Some farmers had a good relation with the cooperative and could sell their fruits through the cooperative channel. However, in other cases, the fruits were not sold and abandoned. After RSPO certification, the FFBs from certified smallholders were only sold through the mill PT. Inti Indosawit Subur (PT. IIS) via the village cooperatives that were part of the Amanah Association. Thus, the number of marketing channels for certified smallholders was reduced to one. Transportation was arranged by the mill and the cooperative via several collection points in the villages. According to the procedures of the ICS, all harvested FFBs had to be sent to the mill at the day of the harvest. Thus, there was a more secure demand for FFBs and timely delivery of fruits to the mill was improved.

The production of FFBs by certified smallholders can be valorized through the GreenPalm book and claim system. FFB from certified producers can be sold to any certified or uncertified mill at the market price (without premium price). Certificates of the certified sustainable palm oil (CSPO), certified sustainable palm kernel oil (CSPKO) and/or certified sustainable palm kernel expeller (CSKE) are traded separately through the GreenPalm trading platform. Each certificate represents one ton of CSPO, CSPKO or CSKE that is produced by a certified oil palm smallholder group. This system thus functions in addition to the physical supply chain through which FFBs are sold to the mill.

The role of GreenPalm is to link certified growers with second parties and provide a trading platform. Manufacturers and retailers can buy certificates through GreenPalm, use the GreenPalm logo and claim that they have supported the production of CSPO, CSPKO or CSKE. Consumers can support RSPO certified palm oil production by buying palm oil products with the GreenPalm logo (Norman, 2014). Certificates can be sold 'on market', whereby live bids and offers are matched on an anonymous market and premium prices

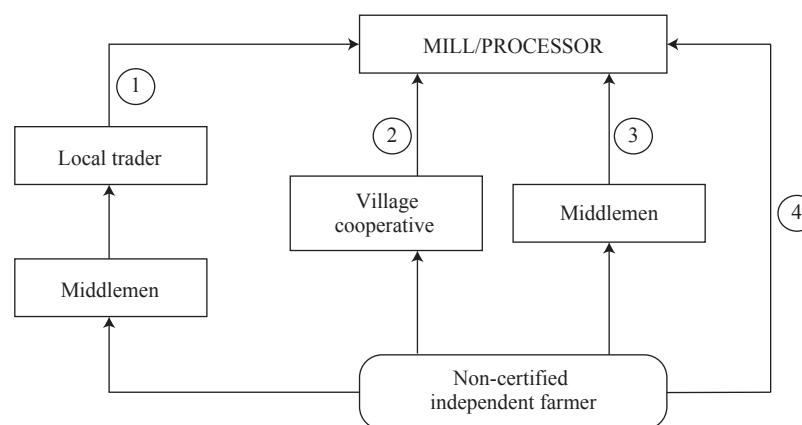


Figure 2. Fresh Fruit Bunches flows of independent smallholders prior to certification.

are publicly available. Under a so-called off-market deal, however, manufacturers and retailers can choose which specific groups of independent smallholders they want to support and directly negotiate a certificate price with them. These prices are not publicly available. The buyer transfers the value of certificates directly to the certified growers. Sales in the GreenPalm market function as a direct premium to certified growers through their representative, the cooperative. In addition to the premium price for producers, buyers pay one dollar to GreenPalm and one dollar to the RSPO for each certificate bought.

The Amanah Association became a member of GreenPalm in August 2013 (GreenPalm No.: GP00000704) (GreenPalm, 2015), and has registered its products with GreenPalm since 2013. The registered products consist of palm oil, palm kernel oil and palm kernel expeller. In 2013, the Amanah Association produced 15,010 tons of FFBs which is equivalent to 2,961 tons of CSPO, but only 1,408 tons (48%) were traded through GreenPalm. Their production of CSPKO was 666 tons but only 143 tons (22%) were traded through GreenPalm.

Certification led to a small improvement in FFB price and to an (unknown) premium price. The FFB price increased by 5.8% from 93.1 to 98.6 euros per ton. With certification, the price of FFBs was the average FFB price in 2013 set by the FFB price team¹ at Riau Province of 95 euros/ton FFBs (Dinas Perkebunan Provinsi Riau, 2013) plus a 4 euros/ton FFB loyalty incentive from the mill (PT. IIS). Except for the price incentive from PT. IIS, the price for certified FFBs was similar to the price set by other mills for non-certified independent smallholders but below the price of FFBs for certified and non-certified plasma smallholders (112 euros/ton FFBs) (Rangkuti *et al.*, 2015).

Information about the premium price that Amanah Association obtained through GreenPalm certificates was not accessible for the researchers, nor for the smallholders because Amanah engaged in an off-market deal and details were not shared with Amanah members. Nevertheless, the price would be at least as high as the on-market price, which varied between 1.2 and 3.2 USD/ton for CPO and between 6.1 and 85.7 USD/ton for palm kernel oil in 2013 (calculations based on GreenPalm, 2015).

5. Discussion

This section puts the research findings in a broader context. First, an assessment is made of the yield or price increase that would be needed to overcome all of the recurrent costs related to certification. Next, we put our findings into the context of existing literature and show how our study builds on and contributes to earlier research findings. In this respect, we reiterate that any comparison with earlier studies should be made with care because of the uniqueness of the sample (certified group of independent oil palm smallholders) as well as of the data and analysis (detailed micro-level data on group- and farm-level practices, costs and benefits) that was used in the current research.

5.1 How high should the yield or price increase be to cover the recurrent costs of certification?

In the case of Amanah, the cost of certification can be divided into two categories, i.e. the initial cost to obtain certification, and recurrent costs. The latter consists of surveillance and audit costs (for the group) and costs to apply all of the certification standards (for individual smallholders). For individual farmers to cover the recurrent costs of certification, additional yield and/or price increases are necessary. The certification scheme will be feasible economically (ratio between additional benefits and additional costs, BC ratio, equal to one) if yield can be raised by 14.3% to 20.5 ton/ha/yr, assuming that the FFB price remains unchanged at 98.6 euros. Increased yield will lead to increased costs for harvest, weighing and transport among others, which is taken into account in this calculation.

¹ In Indonesia, the FFB prices for oil palm smallholders are set by a price team at provincial level (Dinas Perkebunan Provinsi Riau, 2013), to guarantee FFB prices of oil palm growers at mill gate and to prevent unfair competition among millers (Indonesian Ministry of Agriculture, 2013). The team consists of representatives of provincial and district governments, companies, smallholders and other related institutions. The FFB prices are set based on an index k , price of CPO, oil extraction rate of CPO, price of palm kernel oil (PKO) and oil extraction rate of PKO.

Alternatively, to make the additional benefit equal to the additional cost, the price should increase by 9.4% to 101.9 euros per ton, assuming that the yield is constant at 19.7 ton/ha/yr. When looking per quartile, Q1, Q3 and Q4 need either a yield increase by 13.3 up to 15.3% or a price increase by 9.2 up to 12.0%, depending on the quartile, to reach a BC ratio equal to one. The absolute yields and prices needed vary per quartile (Table 5): for Q1 the yield needs to increase to 14.7 ton, for Q2 to 19.3 ton, for Q3 to 21.6 ton and for Q4 to 27.7 ton. Analyses per quartile show that starting positions differ, that smallholders in the entire sample and in most quartiles incur losses in profit when getting certified, but also that break even points are at lower yields when smallholders start with lower yields. For certification to be profitable, the yield target is therefore a relative one, even for farmers with palm trees of similar ages.

5.2 Findings on the costs and benefits of certification in the context of the existing literature

Some studies on coffee show positive impacts of certification, for example, reducing farmers' livelihood vulnerability in Nicaragua (Bacon, 2005) and improving yield and growers' welfare in Mexico (Weber, 2011). Studies of certified coffee growers in Mexico and Peru show that farmers benefit mostly from increased yields and not from a price premium (Barham and Weber, 2012). A review of certification systems in five commodities found that farmers are often focused on price premiums whereas the main benefits are to be gained from production increases and better marketing (Kuit and Waarts, 2014).

Our study finds only minor positive impacts on yields after certification. One of the reasons for this may be that at the Amanah Association, most of the farmers have low quality plant materials, with an assumed oil extraction rate of 15-17%, and substantial (oil) yield increases can therefore not be expected. As stated by Ngoko *et al.* (2004) genetic quality of plant material accounts for more than 59% of the yield in oil palm, while Cochard *et al.* (2001) estimated that the use of low quality plant material might cause about a 61% loss of yield. This indicates that the quality of plant materials is a crucial factor to be taken into account in certification schemes, particularly for perennial crops. Improved harvesting practices under certification may, however, improve average ripeness of harvested FFB supplied to the mill, affecting average OER. Therefore, Amanah might ask the mill to test the average OER of their collectively supplied produce to establish a price based on facts and not on assumptions. This may lead to a small price increase. On the other hand, in the case of Amanah, observed production increases were most likely due to better weeding, making fallen ripe fruits better visible, and consequently better harvesting practices, as well as an increased use of fertilizers leading to heavier FFBs. Harvesting frequency did not change much and a yield increase due to ageing of the trees is unlikely given the age of the trees (14 years on average). As yield responses to increased fertilizer use in perennials are slow, the full effects are likely to become visible only after four years (Corley and Tinker, 2008). In the long term, replanting will offer the opportunity to start with better quality of plant materials.

Contrary to the studies describing the potential benefits of yield increase after certification, Beuchelt and Zeller (2011) found that the revenue from the technological changes in the certification scheme for Nicaragua's organic coffee could not compensate the cost involved in the process of production. Their study suggests that other factors are needed to make certification beneficial, such as a price premium, price stabilization, technical assistance and product diversification. This finding is supported by our case study. In the case of the Amanah Association, technical assistance was provided by Asian Agri who owns the mill. Price stabilization occurred as farmers received the price set by the FFB price team which is supported by government regulation. This could be seen as a side-effect of their closer relation with the mill. However, these measures were not sufficient to improve the economic performance of the certified smallholders. In the case of the Amanah Association, the premium price cannot be guaranteed because the GreenPalm market depends on third parties including retailers and manufactures, and demand for CSPO and CSPKO is lagging behind supply. As mentioned earlier, Amanah sold less than 50% of their certificate through GreenPalm in 2013. A lack of transparency on this issue does not guarantee that increased premiums will effectively reach the farmers. Price premiums paid by the mills might help smallholders to overcome increased production costs in the short-term.

6. Conclusion and recommendations

The RSPO puts certification forward to increase equitable and sustainable production of palm oil for people, planet, and prosperity. However, the costs of certification are high and not fully covered by the financial benefits in the short term. This case study shows that currently, despite generating up to 21% higher incomes from sales, certification creates up to 8% losses of net income per hectare in the first year after certification compared to the situation prior to certification. The economic performance of the certified oil palm smallholder plantations might be improved if yields increase further, a guaranteed premium price is applied or the sales of GreenPalm certificates can provide additional income.

6.1 Implications for policy and practice

This study finds that upfront costs of certification are 86 euros/ha, and the mean cost increase for fees and to improve the plantation to meet the standards is 336 euros/ha. Since the oil palm smallholders area covers 4.55 million of hectares, Indonesia would need 1.92 billion euros to certify all the Indonesian smallholders, i.e. 391 million euros for initial costs of certification and 1.53 billion euros to improve agricultural practices and pay for fees, assuming that certification costs would be similar in other cases. Furthermore, annual auditing will cost about 11 euros/ha. This raises the question of who is going to pay for these costs.

A first argument could be that smallholders need to bear both initial and recurrent certification costs as well as the increase in production costs, as they are supposed to be the main economic beneficiaries. In due time, they are supposed to achieve higher yields and hence more income, better access to a mill through the cooperative that has a contract with the mill, and hence a more secure income. But are these benefits indeed present and do they cover the costs?

This study finds that smallholders of the Amanah Association did indeed have more secure access to mills through the cooperative. They also had a modest increase in yield but despite this, they suffered a slight decrease in income. In the case of the Amanah Association, certification proved not to be economically feasible in the first year because the additional value of sales could not cover the additional production cost. Nevertheless, the perception of the majority of farmers regarding the impact of certification on income was positive (Hidayat *et al.*, 2015). The certification would have been economically feasible if the yield had increased by at least 14.3% compared to the yield before certification or the FFB price had increased by 9.4%. However, the yield and price increased by only 9.8 and 5.8%, respectively, while the price increase could only be partly attributed to certification as prices also increased for non-certified FFBs.

When farmers would also have to bear initial certification costs of 86 euros/ha in the first year, the average financial loss compared to non-certification would increase from 5.3 to 12.2%. However, as oil palm yield responds very slowly to improved management practices, further yield improvements are expected. Ideally, therefore, cost-benefit analyses need to include multiple years to conclude whether and when yield increases will cover annual investment costs in production and auditing. Nevertheless, negative income effects in the first year after certification could be a serious burden to smallholder certification because their time horizon is generally short and their capacity to deal with a decrease in income is limited. In other words, they may not have the willingness or possibility to wait a few years to be rewarded for their temporary loss in income. Furthermore, in our analysis, only production costs have been included but farmers have many other certification-related costs such as spending time on trainings, meetings, committees, record keeping, and field inspections and this time is not compensated for. Altogether, these costs and efforts may negatively affect smallholders' motivation to engage in certification or to comply to certification once achieved, which was observed for independent oil palm smallholders in Thailand (Beall, 2012).

RSPO has acknowledged the problem of investment by smallholders in certification related costs and have set up an RSPO Smallholder Support Fund to cover upfront costs of certification. RSPO generates income through the sales of GreenPalm certificates (10% from RSPO income comes from GreenPalm sales) and by

allocating 50% “of any remaining surplus of income” to the Fund. Smallholder groups can apply for funding for support and training as a preparation to certification (up to 50% of costs) and auditing (up to 100%). In this way, RSPO aimed to support 4,000 independent smallholder groups by the end of 2015 (Business News, 2014; RSPO, 2016). The question remains whether this is enough to make certification attractive, as this would cover only half of the costs for certification preparation, and farmers still need to pay the additional costs of complying with RSPO standards.

One could also argue that the full costs for initial certification and regular auditing should not be borne by the smallholders but by society in return for public goods such as protected forests, biodiversity, clean water and clean air when these are indeed the benefits from certified palm oil production. Society could refer to nation states such as the state of Indonesia, or to private enterprises benefitting from oil palm production, as part of their corporate social responsibility. The latter was the case in this study where initial certification costs were covered by the Swiss Carrefour Foundation. To convince society to invest in certification, sustainable development accounting of ecosystem services may be needed (Mäler *et al.*, 2008) as well as research investigating the impact of RSPO smallholder certification on the provision of public goods.

6.2 Limitations and future research

One of the main limitations of the study is that it followed a case study approach, focused on the Amanah Association and its certified members, for which a clear counterfactual including non-certified oil palm producers was lacking. This means that observed changes, for instance in yields, before and after certification may not be uniquely attributable to the certification process. Another limitation for drawing strong conclusions based on our findings is the fact that the data that were used in the quantitative analysis have been gathered only a short period after the Association and its members gained certification. Because some of the changes in management practices may take several years before they result in significant yield increases, our study may not yet have picked up on all certification effects and hence our calculation may underestimate part of the benefits. Finally, despite the substantial care and effort that was put into the data collection process, some information (e.g. on actual GreenPalm premiums) remained unavailable to us. This may also have resulted in an underestimation of either costs or benefits in our analysis.

Several avenues for further research can be identified. To convince society to share in the responsibility – and hence the costs – of the provision of public goods such as forests and biodiversity through certification, investigating and monetarising such ecosystem service benefits may be important. To get better insights in costs and benefits of certification for smallholders, a further distinction should be made between smallholders with different starting positions in terms of yield, planting materials and practices they apply and access to different marketing channels. Cost calculations should also include non-monetary costs such as time allocated to trainings and management tasks. The benefits in terms of yield should be calculated over longer time frames given the physiology of fruit development in oil palm. Also non-monetary benefits such as increases in biodiversity and reduced deforestation should be taken into account. Furthermore, it would be helpful when economic calculations could underpin until which tree age it is worthwhile to invest in better management practices depending on quality of planting material, and when it would be better to replant.

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Supplementary material

Supplementary material can be found online at <https://doi.org/10.22434/IFAMR2016.0162>.

Materials S1. Challenges to the process of certification.

Materials S2. All phases of the RSPO certification process.

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