# DIAGNOSTIC STUDY ON INDONESIAN OIL PALM SMALLHOLDERS

## Developing a better understanding of their performance and potential

IFC International Finance Corporation
World Bank Group

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**September 2013**

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| | |
|---|---|
| BRI | Bank Rakyat Indonesia |
| BTN | Bank Tabungan Negara |
| CPO | Crude Palm Oil |
| EFB | Empty Fruit Bunch |
| FFA | Free Fatty Acids |
| FFB | Fresh Fruit Bunch |
| HCV | High Conservation Value |
| IFC | International Finance Corporation |
| IOPRI | Indonesian Oil Palm Research Institute |
| IPOC | Indonesian Palm Oil Commission |
| ISPO | Indonesian Sustainable Palm Oil |
| KKPA | Koperasi Kredit Primer Anggota (Primary Cooperative Credit for Members) |
| KUD | Koperasi Unit Desa (Village Unit Cooperative) |
| NES | Nucleus Estate and Smallholder |
| NESP | Nucleus Estate Smallholder Project |
| OER | Oil Extraction Rate |
| P2WK | Plantation Development Project Special Region |
| P & C | Principles and Criteria |
| PIR | Perusahaan Inti Rakyat (Nucleus Estate and Smallholder) |
| PIR KTI | Perusahaan Inti Rakyat Kawasan Timur Indonesia (PIR program aimed at Eastern Indonesia) |
| PIR-Trans | Perusahaan Inti Rakyat yang dikaitkan dengan program Transmigrasi (PIR programme aimed at transmigrants) |
| PKM | Palm Kernel Meal |
| PKO | Palm Kernel Oil |
| PNG | Papua New Guinea |
| POME | Palm Oil Mill Effluent |
| PTP(N) | Perseroan Terbatas Perkebunan (Nusantara) (State owned plantation company) |
| RSPO | Roundtable for Sustainable Palm Oil |

# EXECUTIVE SUMMARY

Indonesia's wet tropical climate provides ideal growing conditions for oil palm. Indonesia is the world's leading palm oil producer, and is responsible for approximately half of the global production of this commodity. Since 2000, the area of smallholder oil palm cultivation more than tripled, to over a 3.6 million hectares (ha) in 2011. The smallholder share in total Indonesian palm oil production increased between 2000 and 2011 from 27 percent to 38 percent (with 8.6 million tonnes of smallholder based CPO production). Oil palm cultivation has become an important livelihood strategy in rural Indonesia. Meanwhile, the expansion of oil palm plantations has led to increased concerns about deforestation, loss of biodiversity, increased greenhouse gas emissions and land rights conflicts. The need for sustainable production practices-intended to result in higher yields, better prices, and reduced social and environmental impact-has become more apparent and has gained increasing attention.

To develop such outcomes for smallholders, more specific information on the Indonesian smallholder sector is required. Only limited information was previously available on smallholder needs, on-farm investment strategies, means of accessing capital, and the enabling environment that facilitates increased investments in sustainable smallholder oil palm plantations. This study is an attempt to provide such information and, based on this information, to develop the outlines of support programs in sustainable oil palm smallholder production. This study was commissioned by the International Finance Corporation (IFC) and has the following objectives:

A. To contribute to the understanding of smallholders and their needs by collecting and analyzing data about the challenges and status of investments of oil palm smallholders in Indonesia.

B. To identify strategies promoting investments in sustainable smallholder production.

C. To develop a Smallholder Diagnostic Survey Instrument (SDSI) capable of evaluating smallholder production systems at various locations in Indonesia. The survey instrument helps to design or assess investment and support strategies in sustainable smallholder production, identify target groups and provide baselines data.

This report presents the results of the literature review and the implementation of the Smallholder Diagnostic Survey Instrument. This study is unique in that it is the first large-scale, statistically valid survey of smallholders. It presents a methodology for baseline assessment and analysis of smallholder issues in line with the approved IFC framework for engagement in the oil palm sub-sector. The report not only contributes to knowledge about smallholders in Indonesia, but also presents a practical instrument that can be applied to smallholder assessment elsewhere in the world.

According to official statistics and the relevant literature, smallholders have lower yields than large-scale plantations. These lower yields may arise from underinvestment in smallholder production. The relatively poor performance of smallholders and underinvestment are confirmed by the results presented in this study, which were obtained from a Smallholder Diagnostic Survey that was conducted among 1069 smallholders in various locations. Smallholders underperformed both in terms of yield and sustainable production practices. With 3 ha of oil palm plantation on average, smallholders had average yields of 13.1 t/ha of Fresh Fruit Bunches (FFB) per year. Taking into account the age of the palm trees, tied smallholders[1] produced 1.5 tonnes of FFB more per hectare than independent smallholders[2], equivalent to 10-15 percent higher production. Tied and independent smallholdings yielded 6 percent and 40 percent, respectively, below a good practice scenario for smallholders, and 46 percent and 116 percent below a good practice scenario for plantation schemes. The yield gap was particularly wide in the early years of cultivation, with smallholder yields not catching up until about year 16, by which time the most productive phase of the palms has passed.

[1] Smallholders contracted to a plantation company

[2] Smallholders not bound to a plantation company

Regarding sustainable practices, most smallholders also underperformed when measured against a selection of RSPO requirements included in the survey. Analysis showed that smallholders who performed well on these requirements had 25 percent higher yields than those who performed poorly. Although careful interpretation is required, this finding suggests that there was no trade-off between sustainability and productivity, but rather a positive relationship.

To evaluate the main causes of differences in smallholder performance and identify improvement strategies, the SDSI included a set of agronomic practices, smallholder characteristics, and indicators of the physical and enabling environment in which smallholders operate. The results of the diagnostic survey and the analysis of how the individual variables relate to smallholder performance resulted in the following key support strategies to upgrade smallholder performance:

I. Train smallholders in sustainable intensification of existing plantations.

II. Support replacement and replanting efforts in cases of high proportions of non-hybrid *Dura* and *Pisifera* palms or aging palm trees.

III. Ensure short lines of communication between smallholders and crude palm oil (CPO) mills regarding the flows of information (quality and pricing), FFB and payments for FFB.

IV. Provide smallholders with improved access to finance for on-farm investments and ensure increased investments in the enabling environment.

The above support strategies will be explained in more detail throughout the report, but are summarized briefly below.

### I. *Train smallholders in sustainable intensification of existing plantations*

The diagnostic survey indicated that current agronomic practices have an important potential to upgrade smallholder performance. Field maintenance practices did not meet good practice standards across all smallholder types. Especially fertilizer application was a key variable in yield performance. In addition, improvements in harvesting practices showed potential in realizing short-term yield improvements. Access to technical assistance was generally low, but when present it appeared to positively influence farm practices. Finally, the survey revealed that 55 percent of the smallholders were eager to improve their performance. The remainder were interested only if the required measures were simple and very low cost. One-third of the smallholders were willing to pay for training.

Guaranteed access to awareness-raising activities, training and extension services is crucial to promoting rehabilitation and sustainable intensification of existing plantations. As a priority to improve productivity on existing plantations, technical assistance should focus on ensuring that all available fruit is harvested and that plant nutrition and field maintenance meet good practice levels. Complementary to training on good agricultural practices (GAPs), a more entrepreneurial mindset could be promoted by improving financial literacy among smallholders. In support of technical assistance, clear business models for yield improvement should be developed. Social and environmental issues, such as occupational health and safety, labor rights and measures to reduce environmental impacts, should also be progressively integrated within technical assistance programs. All investments must be subjected to a cost-benefit analysis, which clearly demonstrates the benefits that smallholders will receive. The implementation of technical assistance must be organized, systematic, and thorough, and should be carried out rigorously.

Some organization of smallholders is a prerequisite for delivering support for rehabilitation and sustainable intensification activities, as it is for the Roundtable on Sustainable Palm Oil (RSPO) certification. However, the survey showed that only 46 percent of independent smallholders are members of a farmer group. Most of these groups do not provide adequate support services. Consequently, technical support is required to ensure better functioning of existing groups or to develop new group models (e.g. trader or input supplier networks).

## II. *Support replacement and replanting efforts in cases of high proportions of non-hybrid Dura* and *Pisifera*[3] *palms or aging palms*

The diagnostic survey identified tied smallholders having a high need for replanting due to a relatively high age of palms compared to independent smallholders. Of the independent smallholders, one-fifth possibly required replacement of palms, as they mainly had non-hybrid varieties on their plots. Soil quality turned out to be a key variable in yield performance, which is why it should be taken into account in any replanting effort. Furthermore, plantation establishment practices should be improved compared to current practice. Finally, despite their savings, most smallholders need additional funds to be able to replant according to good practice. Strategies to reduce the initial financial shortfall caused by replanting can be enhanced replanting and intercropping in immature years.

Replanting before the end of the economic yielding cycle is a significant investment and should only be done after a thorough examination of the block by a technical expert. The smallholder should be made aware of the tradeoffs involved, i.e. loss of income in the short term but the potential for higher income in the long term. Payback horizons for replanting can be up to 8 and 13 years (including the immature phase). In order to create a business case for replacement, the introduction of quality-based FFB pricing at the farm gate may be necessary. To assure future sustainable yields, the availability of certified hybrid planting material should be guaranteed for replacement and replanting efforts. The survey showed that access to certified hybrid planting material for independent smallholders and the awareness among all smallholder types on the importance of hybrid seedling scan be improved. In order to avoid the high yields gaps in the early years that were observed in this survey, extra attention is needed to assure full maintenance and fertilizer application from the beginning.

## III. *Ensure short lines of communication between smallholders and CPO mills regarding the flows of information (quality and pricing), FFB and payments for FFB*

Opportunities exist to increase FFB quality, and as such CPO yields, by improving market access. Smallholders demonstrated limited awareness of quality standards required at the mill or the quality of their FFB. Prices received by smallholders varied according to the market. On average smallholders who sold directly to a mill received about 20 percent higher prices for their FFB than those who sold to traders, and 3 percent higher prices when selling to a cooperative (but without accounting for transport costs and grading penalties). On average, tied smallholders who sold to a cooperative received 33 percent higher prices than independent smallholders who sold to traders. Farmers selling to a mill or cooperative had to wait longer for their money than farmers selling to a trader, which may increase the incentive for side-selling. Transport time of the produce to a mill was shown to bean issue for at least one-third of the smallholders(especially for independent smallholders), which may result in a poorer FFB quality at the mill gate. Most delays were caused by infrastructure challenges and waiting lines at mills.

Transparent, formal and inclusive business relationships will provide clarity about quality, quantity and price requirements between the parties and provide greater incentives for smallholders to invest. This requires better communication about the mill's quality standards, transparency in the calculations of FFB prices, the grading process and the corresponding financial incentives for higher quality FFB. These measures should be supported with prompt payment for FFB to smallholders and effectively organized harvesting cycles, especially at locations where queues tend to form at a mill. Market access could be improved by voluntary long-term delivery contracts based on transparent pricing and by reciprocal benefits between mills and smallholders. FFB traders can also play an important role in improving market access, as long they can ensure transparency about quantity, quality, and pricing.

[3] Inferior oil palm cultivars

## IV. *Provide smallholders with access to finance for on-farm investments and ensure investments in the enabling environment*

Overall, smallholders with good access to finance scored higher in terms of fertilizer use, the use of hybrid planting material, and they had a higher yield. The majority of smallholders needed to buy fertilizers on credit, which was generally available. However, smallholders often lacked access to mid-term and long-term finance. For instance, independent farmers rarely had access to adequate loans for plantation establishment or replanting. This lack of mid-term finance may pose problems for rehabilitation programs (which have a general payback of 2 to 3 years). Almost half of the surveyed farmers had no bank account or formal land title, which may constrain financial institutions from making loans available.

The promotion of a sustainable Indonesian smallholder sector requires investments at the on-farm level and in the enabling environment (e.g. access to training, access to inputs and infrastructure). The business case for on-farm smallholder investment depends on the given context. Under reasonable growing conditions and with GAP, oil palm cultivation should generate a positive return on investment. Under such conditions, various scenarios support a business case to invest in yield improvements of under performing smallholdings, whether by improving agricultural practices or by replacement or replanting. Depending on the investment, external financing may be necessary. However, formal financial institutions often fall short in providing financial services to informal and small entrepreneurs such as smallholders due to their combination of small size and high risk. To change this, more flexibility in collateral requirements and the development of dedicated credit lines are required. The role of micro-finance institutions could also be enhanced. Financing for fertilizer purchase, infrastructure maintenance and replanting could be organized through cooperatives or CPO mills, who can guarantee loan repayment by imposing a levy on FFB sales. Alternatively, commercial service providers or input suppliers (e.g. fertilizer suppliers) could play a role (preferably in combination with the provision of adequate training).

Investments in the enabling environment that may need to accompany on-farm investments are the establishment of technical assistance infrastructure and off-plantation infrastructure, and the production and distribution of inputs. Although part of these investments may be absorbed by smallholders (e.g. for training programs), they require different types of financers and investors, such as CPO mills, CPO buyers, the Government of Indonesia, and international donors. Despite some efforts by these actors, the currently available resources and delivery mechanisms are inadequate to scale up and promote investments in sustainable smallholder production across the country.

The above-mentioned strategies on rehabilitation and intensification, replacement and replanting, market access and access to finance are key to improving smallholder sustainability performance in the Indonesian oil palm sector. However, the survey also revealed high variability in the practices and enabling environment between different types of smallholders, both across and within regions. Consequently, the relevance and design of each of the above mentioned strategies may differ. To improve smallholder performance, tailor-made solutions for each context are thus required. The impact of a single investment model is likely to be limited, as specific constraints may appear in each context, which require specific solutions. In addition, the survey revealed that not all farmers were willing to invest in their farms, even if the conditions for making such investments were made more favorable. Therefore, a detailed initial assessment of farmer performance, needs, willingness to invest and the enabling environment is essential before a support program can be established. The Smallholder Diagnostic Survey Instrument provides a systematic approach to make such an assessment and enables specific recommendations of support strategies in specific circumstances to be formulated.

# INTRODUCTION

Palm oil can be used in a multitude of products, ranging from cooking oil, food products, cosmetics, industrial applications to biodiesel. Palm oil has become the world's most widely produced vegetable oil, and the global demand for vegetable oils continues to increase. One the one hand, the rise in production to meet this demand has increased pressure on the available farmland and has led to concerns about the effects of direct and indirect land-use changes. Stakeholder concerns include deforestation, loss of biodiversity, increased greenhouse gas emissions and land rights conflicts.[4] On the other hand, palm oil offers important opportunities for economic and rural development for the producing countries.[5]

In the case of Indonesia, palm oil is the second largest agricultural product and the most significant agricultural export product.[6]Indonesia is the largest producer of palm oil worldwide. Its annual production of nearly 26 million tonnes (2012) represents approximately 50 percent of global production.[7]In Indonesia, oil palm is cultivated both on large-scale plantations and on smallholdings.

### *Research objectives*

Reports of low smallholder yields, probably caused by inferior planting material, incorrect fertilizer use and sub-optimal management practices, give the impression that underinvestment is a problem in Indonesian smallholder production.[8] Due to a lack of reliable data, however, it is difficult to estimate the extent of underinvestment. Little or no data is available about smallholders, such as their numbers, relationship to the market, the yield, plantation size, age and condition of their smallholdings. Nonetheless, relevant literature points to various constraints on oil palm smallholder productivity. The findings suggest that this sector has a major potential for yield improvement if such constraints are correctly managed. To promote sustainable development, more specific information on smallholders is required: their specific needs, on-farm investment strategies, means of accessing capital, and the enabling environment that facilitates investment in sustainable smallholder oil palm development.

Based on a multi-site diagnostic survey, this study not only provides such information, but also identifies support or investment strategies in sustainable oil palm smallholder production. This study was commissioned by the IFC and arose from a World Bank Group stakeholder consultation process in 2011, which identified a lack of information on Indonesian smallholder perspectives. The IFC surmised that there was a great diversity of opinion on smallholders in Indonesia and that little unbiased, robust research was available to describe the smallholders' agricultural and social landscape and their challenges. The IFC also recognized that in-depth analysis of the causes of the perceived under-investment on independent oil palm smallholder farms was unavailable.

This study therefore had three objectives:

A. To contribute to the understanding of smallholders and their needs by collecting and analyzing data about the challenges and status of investments of oil palm smallholders in Indonesia

B. To identify strategies promoting investments in sustainable smallholder production.

C. To develop a diagnostic survey instrument capable of evaluating smallholder production systems at various locations in Indonesia. The Smallholder Diagnostic Survey Instrument helps to design or assess investment and support strategies in sustainable smallholder production, identify target groups and provide baseline data.

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[4] See for example Casson (1999), Wakker (2004), Colchester *et al*., (2006), Reijnders and Huijbregts (2008), SarVision (2011)

[5] See for example Ahmad Tarmizi (2008), Gillespie (2012), Sheil *et al*. (2009) and Zen et al. (2005)

[6] World Growth (2011)

[7] ISTA/Mielke, Oil World Annual (2012)

[8] See for example IPOC (2010), Sawit Watch (2010), Sheil *et al*. (2009) and Zen et al. (2005)

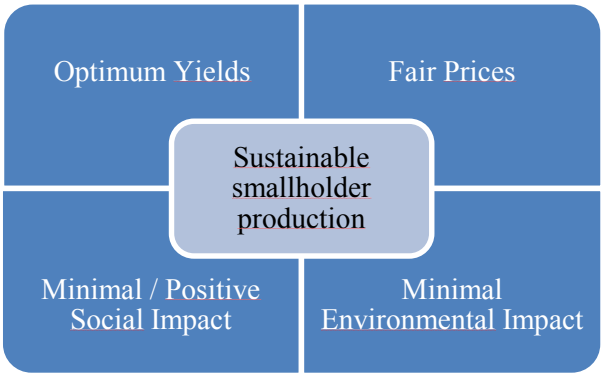
This study is unique in that it is the first large-scale, statistically valid survey of smallholders. It presents a robust methodology for baseline assessment and analysis of smallholder issues in line with the approved IFC framework for engagement in the palm oil sub-sector. The report contributes to knowledge about smallholders in Indonesia and presents a practical instrument that can be applied to smallholder assessment elsewhere in the world.

*Methodology*

In this study, the hypothesis that underinvestment is a characteristic of smallholder production was considered and tested. As a first step, the various aspects that determine sustainable smallholder performance were identified, and then a Smallholder Diagnostic Survey Instrument was developed around this framework. The UN 2005 World Summit definition of sustainability, which referred to the reconciliation of environmental, social and economic components, was used.[9] Consequently, in this study sustainable smallholder performance was defined as a balance between economic, social and environmental performance factors (see Figure 1).More specifically:

- long-term economic and financial viability for smallholders by optimizing yields and obtaining fair prices;
- responsible consideration of employees, individuals and communities that are affected by smallholders;
- environmental responsibility and conservation of natural resources and biodiversity.

**Figure 1:** Key elements of sustainable smallholder production




*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013*

The Smallholder Diagnostic Survey Instrument was tested and further developed in six field cases (for more detailed background information on the Instrument, see Appendix I). In total, the survey included 1069 smallholders. It provided insight into the deficiencies of case-specific smallholder production systems as compared to good practices. It also identified constraints and opportunities in sustainable smallholder production at the farm level and in the enabling environment. Smallholder support strategies were identified on the basis of the survey results and additional literature research

This report is structured as follows. In Section 1, Indonesian oil palm small holders are classified and their contribution to the total Indonesian oil palm production is clarified. Subsequently, the report outlines how smallholders perform in terms of yields and social and environmental practices. Section 2 presents four key strategies to promote sustainable palm oil production. The relevance of these strategies is underpinned with results from the survey.

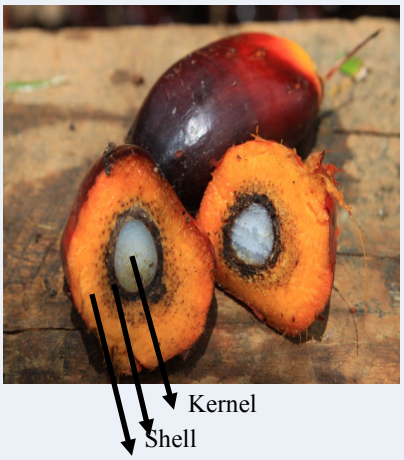
The report concludes with a selection of overall considerations on smallholder support strategies and on the use of the Smallholder Diagnostic Survey Instrument. Appendices are referred to throughout the document

[9] UN (2005)

and provide more detailed information on the Instrument, the history of oil palm smallholder development in Indonesia, and the variables that define smallholder production in Indonesia.

### *Oil Palm*

The oil palm (*Elaeis guineensis* Jacq.) is a tropical palm that originates from the coastal regions of West and Central Africa. In the 20th century, the palm was exported to countries in Central America and Southeast Asia (notably Malaysia and Indonesia).[10] Palm oil is derived from the harvested fruit clusters of this palm, known as fresh fruit bunches (FFB). In general, oil palms start to bear fruit three or four years after field planting (although with optimal fertilizer application fruits can be harvested after 24 months) and continue to do so economically for a period of 25 to 30 years. Once productive, the trees can be harvested year-round on a regular basis (at least every 14 days). Maximum yield occurs between eight to twelve years after planting. Each fruit contains a single seed (palm kernel), surrounded by a soft oily pulp (or mesocarp), as shown in the picture on the right. FFB must be processed by a mill within 48 hours after harvest. This is important to maintain the oil content and prevent the buildup of free fatty acids (FFA), which reduces the quality of the oil. At the mill, crude palm oil (CPO) is extracted from the pulp of the fruit, while palm kernel oil (PKO) is extracted from the kernel. A third product is palm kernel meal (PKM), derived from the crushed kernel. It is mainly used as a component of animal feed for livestock. The Empty Fruit Bunches (EFB), produced when the fruit is removed, can be recycled back to the plantation as an organic fertilizer.[11] The milling process produces a liquid waste product called palm oil mill effluent (POME). If discharged untreated to waterways, POME is very harmful for the environment as it is high in organic matter. Treatment of this effluent to lower the organic matter levels is standard practice prior to discharge. If treated appropriately, it can be applied to the land as important source of organic nutrients.



***The oil palm fruit***

[10] FAO (2002)

[11] Rupani *et al*. (2010)

# 1. Smallholder oil palm production in Indonesia is growing, but is characterized by underperformance

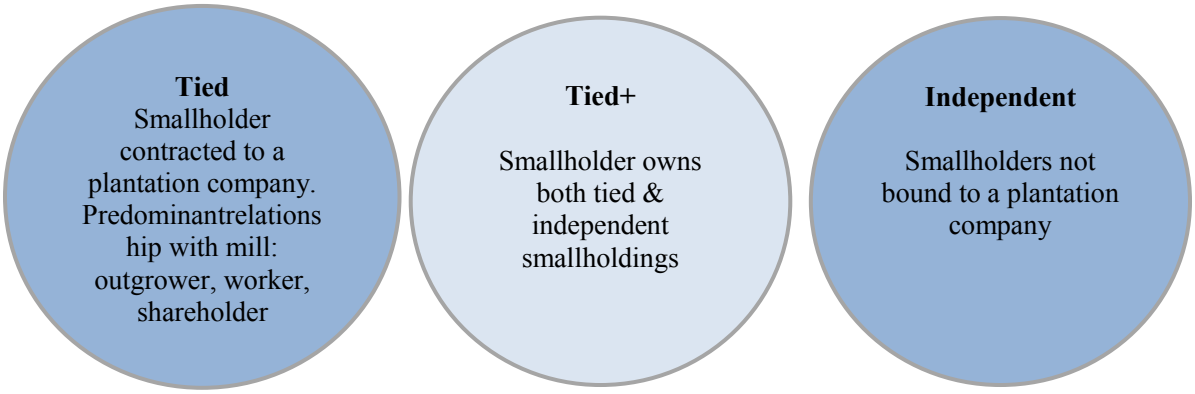
This sectioned scribes how Indonesian smallholders have acquired an increasing share in the palm oil production of the world's largest palm oil producing country. It also outlines how they underperform in terms of yields and sustainable production practices. This section begins with an overview of the different types of smallholders in Indonesia.

## 1.1 Market segmentation of Indonesian smallholders

The Indonesian oil palm sector consists of various types of smallholders. They vary in terms how smallholders relate to the production and marketing of FFB. Smallholders in Indonesia are usually divided into two categories, *tied* (alternatively called scheme, plasma, dependent or affiliated) and *independent*. Tied smallholders participate in outgrower or contracting schemes, where farmers transfer a portion of their land to an oil palm company for inclusion in an estate plantation (referred to as "nucleus estate" or "inti"). The farmers' remaining land is also planted by the company, but is retained as individual smallholdings by the farmers (referred to as "plasma").[12] Tied smallholders supply their produce to the plantation company's palm oil mill. Their relationship is based on a contract, while the plantation company retains responsibility for technical assistance and marketing.

In contrast to tied smallholders, independent smallholders are not tied or contractually bound to an estate or CPO mill. They are free to sell to any buyer. In practice, they sell either directly to a mill or to local traders (middlemen). If independent smallholders do not have their own means of transport, they may rely exclusively on one particular trader or on the closest mill.[13] The development of independent smallholders was facilitated by the emergence of independent mills[14]that offer new market channels outside the tied arrangements, which had formerly bound smallholders to estate mills.[15]Independent smallholders can be organized in farmer groups or cooperative structures, or they can act individually. Some smallholders have both tied and independent plots. Mostly, these are smallholders who previously participated in the outgrower and contracting scheme sand were able to save money from their original block of two hectares or obtain a loan, and have used this capital to expand their plantation area. In this report, these smallholders are referred to as *tied+ smallholders*. Figure 2 depicts the different smallholder types.

**Figure 2:** Segmentation of smallholders according to their relationship with a plantation company




*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013*

[12] Rist *et al*. (2010)

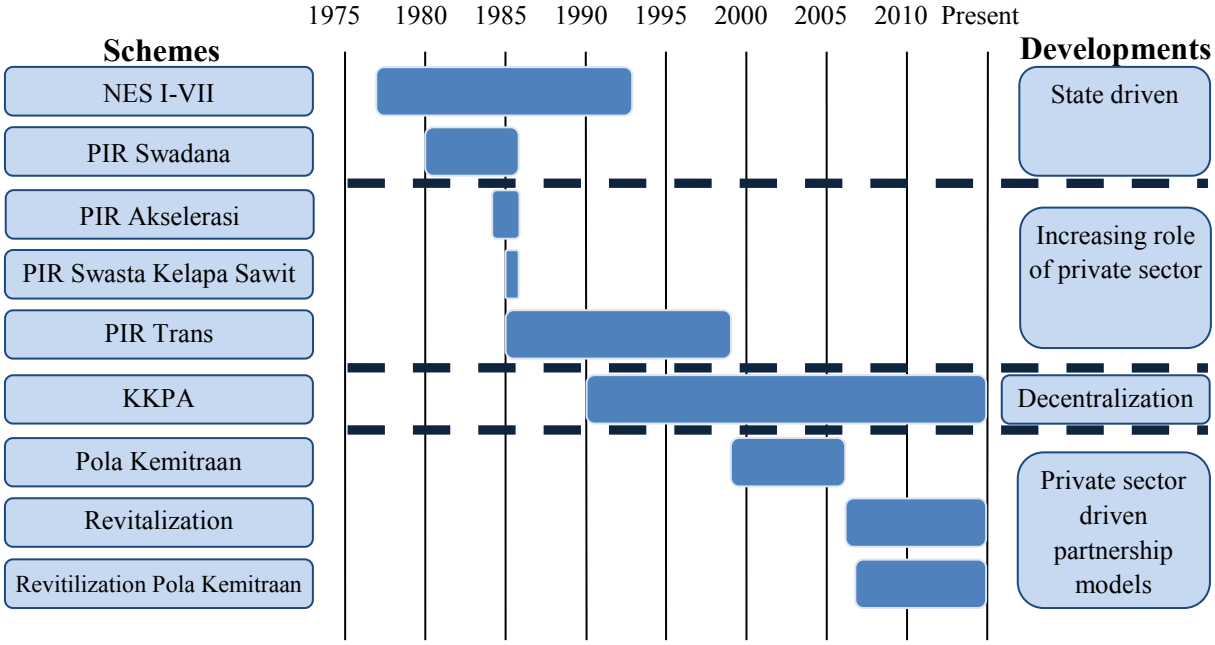
[13] Papenfus (2000)

[14] Some of these mills can be considered illegal, as regulations stipulate that mills with a capacity 5 t FFB/hour or more should have their own plantation, see Minister of Agriculture Decree No. 26/Permentan/OT.140/2/2007

[15] McCarthy *et al*. (2011)

The historical development of the large-scale plantation schemes, including outgrower and contracting arrangements with smallholders, resulted in different subtypes of tied smallholders. Since the introduction of palm oil in Indonesia in the late 1970s, the Indonesian government has promoted oil palm cultivation as a major vehicle for rural socio-economic improvement. Over time, various models of the schemes have been applied in Indonesia. An overview of these systems is presented in Figure 3 (for a more detailed description of the various schemes, see Appendix II).

**Figure 3:** Overview of major Indonesian smallholder schemes




***Smallholder schemes***

The first state-led schemes in Indonesia were introduced in the late-1970s. In the mid-1980s, the governmental role in these schemes decreased, and private partners (plantation companies/mills) were encouraged to become more involved. The KKPA program in the 1990s introduced a new decentralized governance system, in which farmer organizations became engaged in the coordination of smallholder plantations. In 1999 *Pola Kemitraan* introduced new partnership models, including shareholder models, which could result in a reduced autonomy of smallholders regarding plantation management. The most recent models have a private sector focus and include replanting efforts.

*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013*

These schemes have developed many variations in land tenure arrangements, involvement of transmigrants, services offered by the plantation company, plantation management responsibilities, degree of involvement of individual smallholders in cooperatives, initial debt, interest rates and conditions for repayment.[16] While detailed legislative processes govern the location of oil palm development in Indonesia, the means by which this occurs, i.e. the particular deals offered to communities, vary significantly.[17] This may, to a large extent, depend on various elements: the district Regent's (*Bupati*) philosophy concerning oil palm for rural development, the role of the village or *adat*[18] leader, the role of producer organizations and access to alternative sources of income.[19]

[16] Feintrenie and Levang (2009), McCarthy *et al* (2011).

[17] Rist *et al*. (2010)

[18] An Adat leader is a village leader or a leader of an ethnic group

[19] Gillespie (2011)

An important historical development in the Indonesian plantation schemes has been the increasing control of private sector actors over the supply of FFB production. Driven by the higher returns from nucleus plantations than those from outgrower schemes, the ratio between nucleus and plasma shifted from 20:80 in the earlier NES/PIR schemes to 80:20 –or even 90:10 – in more recent schemes.[20] This allowed plantation companies to maximize profits by reducing their reliance on poorer quality FFB from smallholders[21] and released them from part of the burden of managing a smallholder scheme.

These developments have resulted in a reduced role of smallholders in the Indonesian plantation schemes. The smallholder's role has shifted from outgrower to worker and, increasingly, to shareholder (see the text box below). In the context of Indonesian oil palm cultivation, the basic distinction between smallholder/farmer and smallholder/worker or shareholder is as follows: the smallholder/farmer takes risks and invests in his or her land, while the smallholder/worker or shareholder are paid a salary or receive a periodic share. In practice, however, the distinction between these segments is not always clear. Many intermediate forms exist, and the degree of interdependency with the plantation company has changed over time and varies according to location.

***Different roles of tied smallholders***

The historical development of plantation schemes resulted in the following three basic roles of tied smallholders. The distinction between these roles is based on the relationships between plantation companies and smallholders with regards to plantation management.

- *Smallholder as outgrower*
  The company (either directly or via the cooperative) provides inputs, technical assistance and finance, while the smallholders cultivate their land and are obliged to sell their FFB to the company. The degree and quality of services may vary from nearly absent to highly professional. As long as the smallholders have not repaid their loan for plantation establishment, the formal ownership of this land remains in the hands of the company. Sometimes each smallholder works individually on his or her holding on one block. Smallholders receive income according to the yield of their individual plot or a share in the total FFB sales of the entire block.
- *Smallholder as worker*
  The company arranges laborers to work the land, while providing inputs and monitoring the quality of production. Through this system, tied smallholders may have the option to work on the nucleus or plasma plantation as a worker, either directly hired by the estate company or via the cooperative. Plantation workers may also come from outside the scheme.
- *Smallholder as shareholder*
  The company (either directly or via the cooperative) is fully responsible for the management of the smallholder blocks. This arrangement resembles a lease contract between the company and smallholder. The planters' rationale is efficiency, thus casting doubt on the ability of smallholders to reliably apply fertilizer at the recommended rate, or to manage their own holdings in a uniform and professional manner. The smallholders play no role at all in farm management. They collect their income once per month based on their share from two or more hectares, for which they may or may not hold the formal land ownership certificate.

The variety of smallholder types (tied, independent or tied+) influences smallholder investment strategies. In this study, we focused on smallholders who have reasonable control over the management of their plots.

[20] Jelsma *et al*. (2009), in fact, FFB production consists of a significant part of the value added of a CPO mill (44 percent for a 'best practice' plantation and CPO mill) (Source: IPOC cited in Gillespie 2011)

[21] Gillespie (2011)

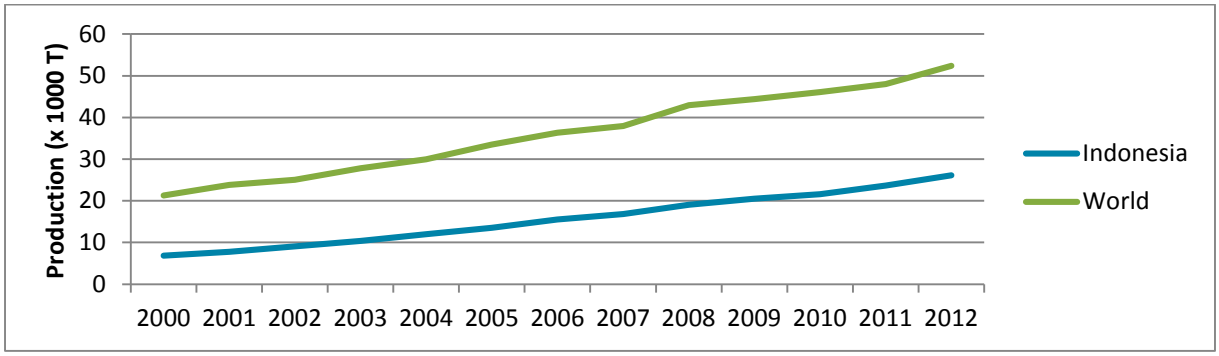
This excluded tied smallholders who are essentially workers or shareholders. The RSPO definition of Indonesian smallholders was used as starting point:[22]

> "Farmers growing oil palm, sometimes along with subsistence production of other crops, where the family provides the majority of labor and the farm provides the principal source of income and where the planted area of oil palm is usually below 25 hectares in size."

## 1.2 Smallholders increase their production share in the world's largest producing oil palm country

For Indonesia, palm oil is an important agricultural crop, with export revenues between 7.8 and 12.4 billion USD (2007- 2009).[23] Indonesia is the largest producer of palm oil with an annual CPO production of nearly 26 million tonnes in 2012, representing approximately 50 percent of global production.[24] Its annual production grew more than 10 percent per year in the last decade (see Figure 1). Plans for further growth in production are being implemented. Other important producers are Malaysia (36 percent), Thailand (3 percent), Nigeria (2 percent) and Colombia (2 percent).

**Figure 4:** Indonesian palm oil production compared to global production (2010-2012)




*Source: ISTA/Mielke, Oil World Annual*[25]

Indonesia's wet tropical climate provides ideal growing conditions for oil palm. Land is abundant and labor is relatively cheap.[26]Most palm oil is produced on Sumatra, while plantations are expanding rapidly on Kalimantan and Indonesian Papua.

The overall Indonesian palm oil sector is characterized by strong growth, but smallholder production grew even faster (see Figure 5).Between 2000 and 2011, the smallholder oil palm production area tripled, to 3.6 million ha. Over that same period, total smallholder yield increased by450 percent, to 8.6 million tonnes of CPO in 2011.This growth has considerably increased the share of smallholders in the total Indonesian production. In 2000, about 28 percent of the total production area of Indonesian oil palm consisted of smallholder plantations; in 2011 this figure increased to 41 percent. The share in FFB production of smallholders increased from 27 percent to 38 percent in the same period.[27]

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[22] National Interpretation RSPO Principle and Criteria for Sustainable Palm Oil Production: Republic of Indonesia, May 2008, Note: Indonesian law provides no clear definition of smallholders in terms of planted area, but it does require a Plantation Permit for any holding larger than 25 ha. This would declassify a farmer as being smallholder. However, if a farmer has several plantations in different locations, each below 25 ha, no Plantation Permit is required, even though the farmer's total planted area may exceed the 25 ha limit. Note that the RSPO's global definition of smallholders refers to 50 ha.

[23] IPOC (2010)

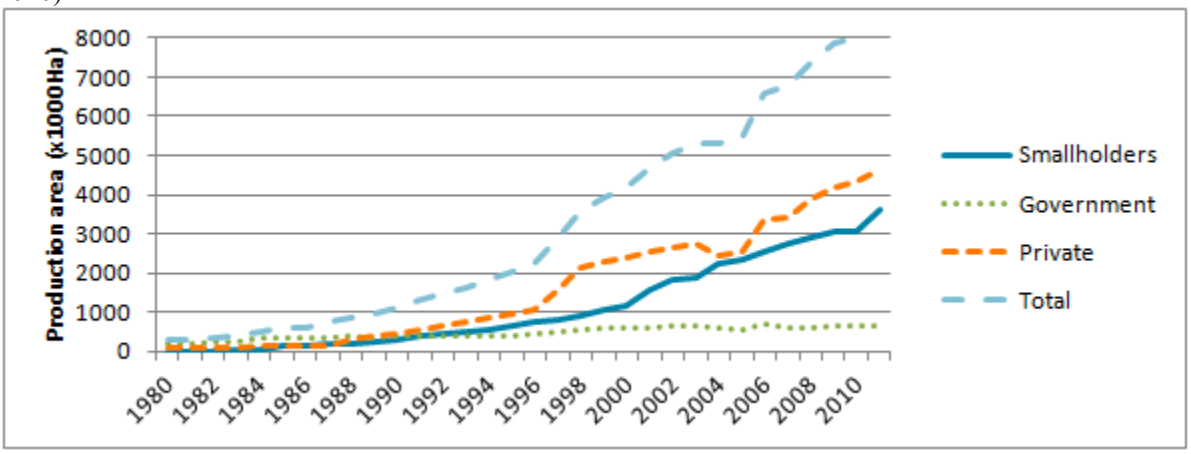
[24] ISTA/Mielke, Oil World Annual 2012

[25] Note that the ISTA/Mielke production figures for palm oil deviate to some extent from the production figures supplied by the Indonesian government, which were used predominately in this report.

[26] Sheil *et al*. (2009)

[27] Directorate General of Plantations, Department of Agriculture, 2011

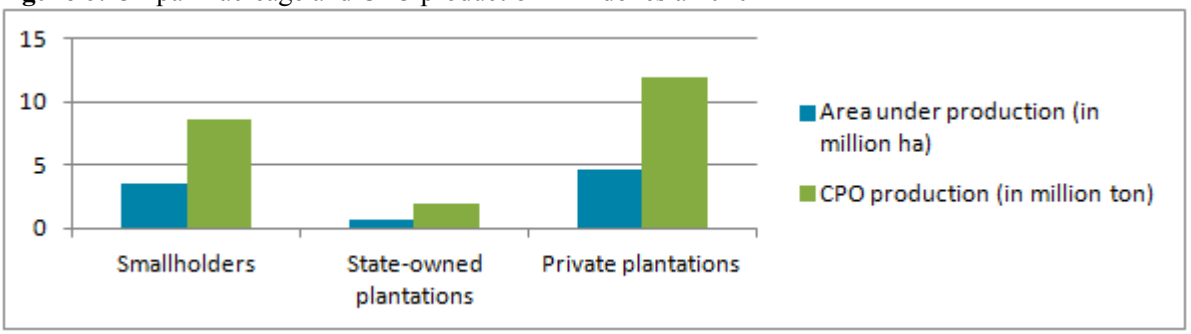
**Figure 5:** Development of plantation area for smallholders, government and private plantations (1980-2010)




*Source: Directorate General of Plantations, Department of Agriculture, 2012*

In 2011, 53 percent of the CPO production originated from privately owned large-scale plantations. State-owned plantation produced 9 percent of the Indonesian CPO, and smallholders were responsible for 38 percent of total production (see Figure 6).

**Figure 6:** Oil palm acreage and CPO production in Indonesia 2010




*Source: Directorate General of Plantations, Department of Agriculture, 2011*

Although the data on planted area and production differed between sources, all sources showed a significant increase in the role of smallholders. Based on Indonesian government estimates, 1.7 million oil palm smallholder households cultivated 3.1 million ha of land in 2009,[28] of which 81 percent of the total area was on Sumatra and 15 percent on Kalimantan (see Table 1). The contribution of smallholders to total CPO yield is higher on Sumatra than on the other islands, presumably because of a relatively higher percentage of mature plantations.

No data has been found on the proportions of tied, independent and tied+ smallholders. However, the majority of the increased share of Indonesian smallholder cultivation is ascribed to tied + and independent smallholders. The profitability of participating in an oil palm scheme motivated many tied smallholders to invest in additional plantations, independent of the large-scale plantation schemes. Oil palm can be highly competitive with rubber cultivation and is much more profitable than rice production [29] Many entrepreneurial smallholders and rural elites responded to the booming oil palm market and invested in new oil palm plantations. In 2009, the Indonesian Oil Palm Commission reported a total of 1.8 million ha of independent smallholdings. This could correspond to between half a million and nearly one million independent smallholders.[30] It is likely that this number has increased since then.

[28] Directorate General of Plantations, Department of Agriculture (2011)

[29] Belcher *et al*. (2004) and Feintrenie (2010)

[30] Suharto (2009)

**Table 1:** Smallholder plantations in Indonesia (2009)

| Province | Area (ha) | Estimated palm oil Production (t) | Number of Farmers |
|---|---|---|---|
| Sumatra | 2,481,327 | 6,513,744 | 1,353,122 |
| Java | 6,794 | 8,387 | 4,845 |
| Kalimantan | 468,008 | 795,775 | 245,211 |
| Sulawesi | 79,510 | 157,584 | 46,048 |
| Maluku and Papua | 25,753 | 42,264 | 20,770 |
| Indonesia | 3,061,412 | 7,247,979 | 1,669,996 |

*Source: IPOC (2010) Indonesian Oil Palm Statistics and Directorate General of Plantations, Department of Agriculture, 2009*[31]

## 1.3 Smallholders underperform in productivity and sustainability

Although the share of smallholders in total Indonesian production has increased rapidly, previous studies and the field survey conducted as part of the present study have shown that smallholders underperform in terms of productivity and sustainable practices.

### *1.3.1 Tied and independent smallholders have a 6 percent and 40 percent yield gap in comparison to a good agricultural practice scenario*

Throughout Indonesia, palm oil productivity varies significantly. These variations can be attributed to agronomic constraints, but are also related to the type of plantation organization (smallholder, state plantations, etc.). Research has shown a large potential for increased oil palm yields. However, estimates of potential yields vary greatly. The largest reported oil yield at the estate scale (approximately 2,000 ha) in Malaysia was more than 8 t/ha per year. Leading plantation groups in Indonesia and Malaysia have achieved average oil yields of 6 t/ha per year on a larger scale.[32] The potential maximum oil yield of oil palms planted on a commercial scale has been estimated at 10 to 11 t/ha per year.[33] Yields from some recent research trials have already exceeded 10 t/ha per year.[34] Such trials indicate the potential yields that can be achieved from breeding. In Papua New Guinea, for example, the increased yield due to breeding and selection is estimated at 1.6 percent per year.[35] For existing plantations, the potential for yield improvements is considerable. Plots with best management practices implemented at six plantation sites across Sumatra and Kalimantan between 2006 and 2011showed that the average annual FFB yield can be increased by 15 percent, reaching almost 26 t/ha.[36] With an Oil Extraction Rate (OER) of 22 percent, this would result in an annual CPO yield of 5.7 t/ha. Although still far from the maximum yield levels obtained in research trials, such results show that improved management practices on existing plantations can result in significant yields increases.

Realistically, smallholders cannot be expected to obtain similar yields. However, their potential for yield improvement is still high because the gap between actual and best management practices is often larger than the gap on plantations. The overall impression from the reviewed literature is that smallholders consistently underperform in terms of productivity when compared to large-scale plantations. Figures from the Department of Agriculture show that average smallholder yields in 2009 were 3.31 t CPO/ha (see Table 2), which is approximately equivalent to between 16 t and 18 t FFB per year (with an OER rate between 18 percent and 22 percent). This indicates that smallholder yields per hectare are 11to 14 percent lower than the average yields on large private or government plantations in Indonesia. Figures per province show a

[31] Secretariat of Directorate General of Estates, Directorate General of Estates, Ministry of Forestry. 2009. Statistik Perkebunan Indonesia - Tree crop estate statistics 2008-2010. Jakarta, December 2009

[32] Donough *et al*. (2006)

[33] Breure (2003)

[34] Corley and Tinker (2003), cited in Wicke *et al*. (2008)

[35] Personal communication S. Lord

[36] Fairhurst *et al*. (2010)

large variation in average smallholder yields, ranging between 1.5 and 4.3 t CPO/ha per year. Various other studies have shown that smallholder yields are considerably below those attained by large-scale plantation companies.[37] However, examples also exist where smallholders outperform plantations in productivity, such as at PT MISP in Bengkayang,[38] West Kalimantan, and the Ophir NESP project in West Sumatra.[39]Table 2 shows the average yield figures of smallholder plantations, government plantations and private plantations.

**Table 2:** CPO Yield figures by type of producer (2009)

| Type of producer | | Smallholders | Government | Private |
|---|---|---|---|---|
| Area(ha) | Immature | 750,942 | 121,355 | 951,577 |
| | Mature | 2,270,593 | 516,951 | 3,252,654 |
| | Damaged | 39,877 | 12,910 | 32,530 |
| | Total | 3,061,412 | 651,216 | 4,236,761 |
| Production (t) | | 7,515,724 | 1,943,212 | 11,929,390 |
| Yield (t/ha) | | 3.31 | 3.76 | 3.67 |

*Source: IPOC, Indonesian Oil Palm Statistics, 2010*

The present study included a Smallholder Diagnostic Survey that was conducted among 1069 smallholders in various locations on Sumatra and Kalimantan between January 2012 and May 2013.Of these 1069 smallholders, 30 percent were tied smallholders, 13 percent tied+ and 57 percent independent smallholders (see Table 3).The average age of the smallholders was 47 years, and 11 percent of the smallholders were women.

**Table 3:** Characteristics of sample population

| Smallholder type | Male (count) | Female (count) | Age (years) | Household size (number of people) | Average oil palm farm size (ha) |
|---|---|---|---|---|---|
| Tied smallholder | 299 | 27 | 49 | 4.2 | 2.4 |
| Tied+ smallholder | 123 | 14 | 47 | 4.5 | 5.2 |
| Independent smallholder | 533 | 73 | 46 | 4.3 | 2.9 |
| ***Total*** | ***955*** | ***114*** | ***47*** | ***4.3*** | ***3.0*** |

*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

An average smallholder had 3 ha of oil palm plantation, and 37 percent had more than one plot. The 1069 smallholders had 1509 plots in total, with palm ages between 3 and 23 years. The average yield of the smallholders surveyed was 13.1 t/ha FFB per year (see Table 4).[40]

[37] Koczberski *et al*. (2001); Hasnah *et al*. (2004); Zen *et al*. (2005)

[38] Observations of research team

[39] Jelsma *et al*. (2009)

[40] Yield records were generally not available. The yield/ha per individual plot of a farmer has been calculated on the basis of an average of the highest and lowest yield in the last 12 months multiplied by 12 months.

**Table 4:** Plantation age and yield per individual smallholder plot type with plot ages between 3 and 23 years old

| Type of smallholders with plots 3 to 22 years old | Number of plots included in survey | Average age of palms | Yield/ha/year in t FFB |
|---|---|---|---|
| Tied plots | 487 | 18.8 | 17.7 |
| Independent plots | 1022 | 8.8 | 11.0 |
| All plots | 1509 | 12.0 | 13.1 |

*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

A distinction has been made between plots that were part of a plantation scheme (tied plots) and those that were not (independent plots).The survey revealed a higher average age for tied plots compared to independent plots. Taking into account the age of the palms, tied smallholdings produced 1.5ton of FFB per year more per hectare than independent ones. This corresponds with 10 to 15 percent higher production. Statistical analysis showed that demographics such as age, gender and educational level did not have a significant relationship with yield performance, with one exception: women who were part of a plasma scheme performed significantly better than their male counterparts (see Appendix IV).

Looking at yield performance per type of smallholder (see Table 5), tied + farmers out performed both tied smallholders with their tied plots and independent smallholders with their independent plots. However, the independent plots of tied+ farmers produced lower yields than their tied plots. This indicates that tied smallholders were unable (or unwilling) to replicate plasma standards to the full extent when investing in additional independent plots.

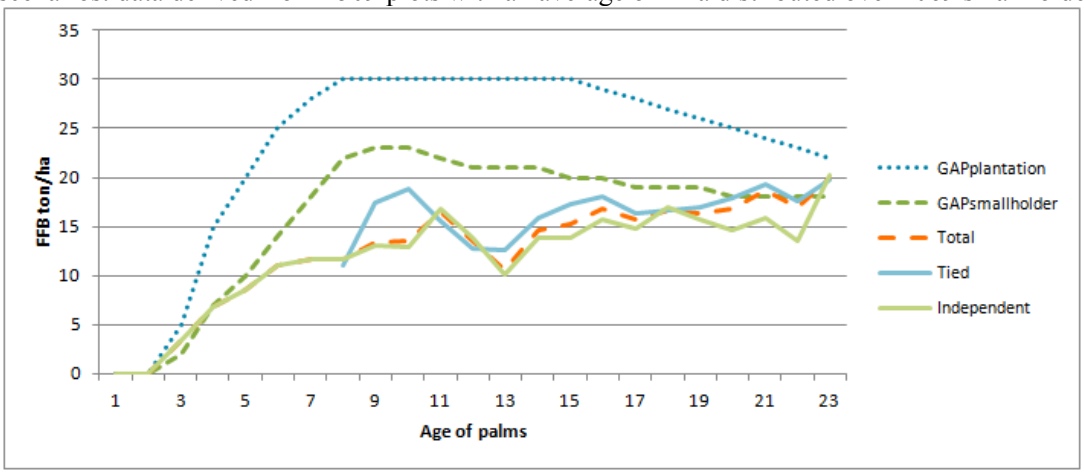
**Table 5:** Yield differences between different farmer types with age-corrected averages (assuming an average age of 12years)

| Plot type | Yield difference in ton FFB/ha |
|---|---|
| Tied smallholders | 14.0 |
| Tied+ smallholders: tied plots | +0.8 |
| Tied+ smallholders: independent plots | -0.7 |
| Independent farmers | -1.4 |

*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

Figure 7 shows how yields were distributed over the various plot ages. It also includes good practice scenarios for large-scale plantations and smallholders, which provide a benchmark for the actual yield figures. These good practice scenarios were based on the experience of the research team and examples from plantation companies. The difference between the two scenarios is based on lower levels of management, inputs and planting material for smallholders. It shows a particularly wide yield gap in the early years of cultivation, with smallholder yields not catching up until about year 16, by which time the most productive phase of the palms has passed. This can be caused by poor maintenance and nutrition during the immature phase, which delays maturity. It shows that good practices in the early years result in the biggest improvements in total yields. Because the plantations in the survey that were less than 16 years old were mainly from independent farmers, it is unknown whether tied smallholders also have an early yield gap.

**Figure 7:** Yield per age of plantation for smallholders (tied and independent) and various good practice scenarios: data derived from 1509 plots with an average of 2 ha distributed over 1069 smallholders




*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

Tied smallholdings produced on average 1.1 t/ha per year below the GAP smallholder scenario, while independent smallholdings produced4.3t/ha below this. The differences with the GAP plantation scenario were 8.2 t/ha for tied smallholdings and 12.8 t/ha for independent smallholdings. Achieving the average yields of the GAP smallholder scenario would increase the yields of tied plots by 6 percent and independent plots by 40 percent. Achieving the average yields of the GAP plantation scenario would increase yields of tied and independent plots by 46 percent and 116 percent, respectively.

Relative to the GAP smallholder scenario, 59 percent of tied plots and 78 percent of independent plots underperformed. If support strategies were to focus only on these underperforming smallholders, then upgrading their performance to the GAP smallholder scenario would result in a 4.8 ton FFB/ha increase for tied smallholdings and a 6.6 ton FFB/ha increase for independent smallholdings.

**Table 6:** Yield gap with smallholder and plantation good practice scenarios for various types of plots

| Plot type | | Yield gap GAP Smallholder (t FFB/ha) | Yield gap GAP Plantation (t FFB/ha) |
|---|---|---|---|
| All plots | Tied | 1,1 | 8.2 |
| | Independent | 4.3 | 12.8 |
| Plots producing below good smallholder practice (%of sample) | Tied plots (59%) | 4.8 | |
| | Independent plots (78%) | 6.6 | |

*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

It is possible to differentiate between good, medium and poor performing smallholders, while taking into account multiple plots and age categories of the palms. Table 7 provides an overview of the distribution of the types of smallholders between these categories.[41]

[41] To compare the yield performances of the total holdings of individual smallholders, while taking into account multiple plots and age categories of the palms, a classification has been made based on poor, medium and good practice. For example, a smallholder producing 14 t on a 8-year old plot is classified as medium, while a farmer producing 24 t on a 14-year old plot is classified as good.

**Table 7:** Distribution according to yield performance per type of smallholder

| | | Yield performance | | |
|---|---|---|---|---|
| Type smallholder | | Poor | Medium | Good |
| | Tied | 4% | 46% | 49% |
| | Tied+ | 10% | 49% | 41% |
| | Independent | 24% | 49% | 27% |
| | All | 16% | 48% | 36% |

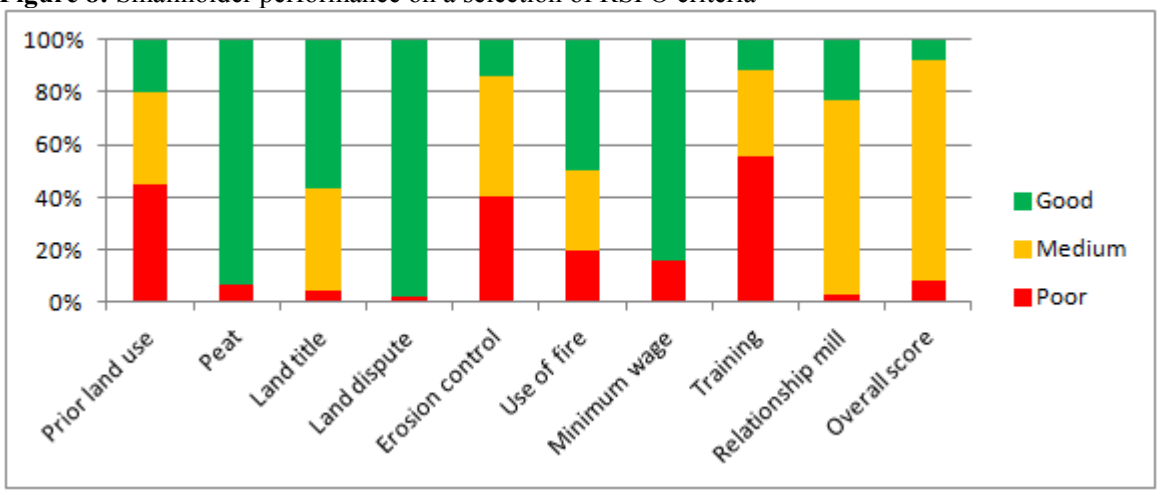
*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

Table 7 shows the divergent yield performance between smallholder types. Almost one quarter of the independent smallholders performed poorly, and slightly more than one quarter performed according to good practices. Tied and tied+ smallholders performed better, with a relatively small percentage being classified as poor and 49 percent and 41 percent, respectively, classified as good. However, the overall picture is that the majority of smallholders, regardless of the type, underperform compared to good practice scenarios.

### *1.3.2 Smallholders underperform in terms of sustainability, but sustainability matters*

The diagnostic survey included other questions relating to the sustainability performance of oil palm cultivation. These questions were based on a selection of the criteria in the Principles and Criteria of the Roundtable of Sustainable Palm Oil (RSPO). Table 8shows the scores of smallholders on these selected criteria.

**Figure 8:** Smallholder performance on a selection of RSPO criteria




*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

In this sample, smallholder oil palm cultivation predominantly took place in forest areas. In 45 percent of the cases, prior land use was primary forest, in 35 percent secondary forest and in the remaining 20 percent agricultural land. Regarding soil type, seven percent of all plots were located on peat soils. The majority of the smallholders (57 percent) had a formal land title with a copy of the title certificate, while 39 percent of smallholders had either customary ownership or a legal title, but the ownership certificate was held by another party. Only 4 percent of the smallholders (all independent smallholders) had no title to their oil palm land. Disputes over land were reported in only two percent of the cases in the study. This suggests

that land disputes occur less frequently with smallholder production systems than with large-scale estates, where conflicts are reported to be widespread.[42]

Erosion control measures varied substantially between smallholders, with only a minority applying good practices. Half of the smallholders reported not using fire when replanting, 30 percent were not sure yet and 20 percent reported that they will continue to use fire. Most smallholders (84 percent) reported that they paid more than the minimum wage to their workers. The majority of the smallholders (56 percent) received no or limited training on issues such as maintenance, fertilizer use, replanting or bookkeeping. Only 12 percent received considerable training or technical assistance, and the remaining 33 percent received some training. Most smallholders (84 percent) had no direct relationships with CPO mills. In cases in which relationships between smallholders and CPO mills existed, half of them were considered good collaborations and half were considered as less harmonious. The results from the survey show that tied smallholders perform better on sustainability criteria than independent smallholders.

The variables in Figure 8 represent only a small percentage of the total set of criteria that can be used to define sustainability. Nonetheless, the regression analysis showed a strong positive relationship between the scores on sustainability and productivity, particularly for independent smallholdings: those with a good sustainability score had a 25 percent higher yield than those with a poor sustainability score. However, caution must be used in inferring a causal relationship between sustainable practices and productivity; one likely interpretation is that it concerns a self-reinforcing dynamic where sustainability enhances productivity and productivity also enhances sustainability. A more cautious -but still positive- interpretation is that there does not appear to be a negative trade-off between sustainability and productivity, but rather a positive association.

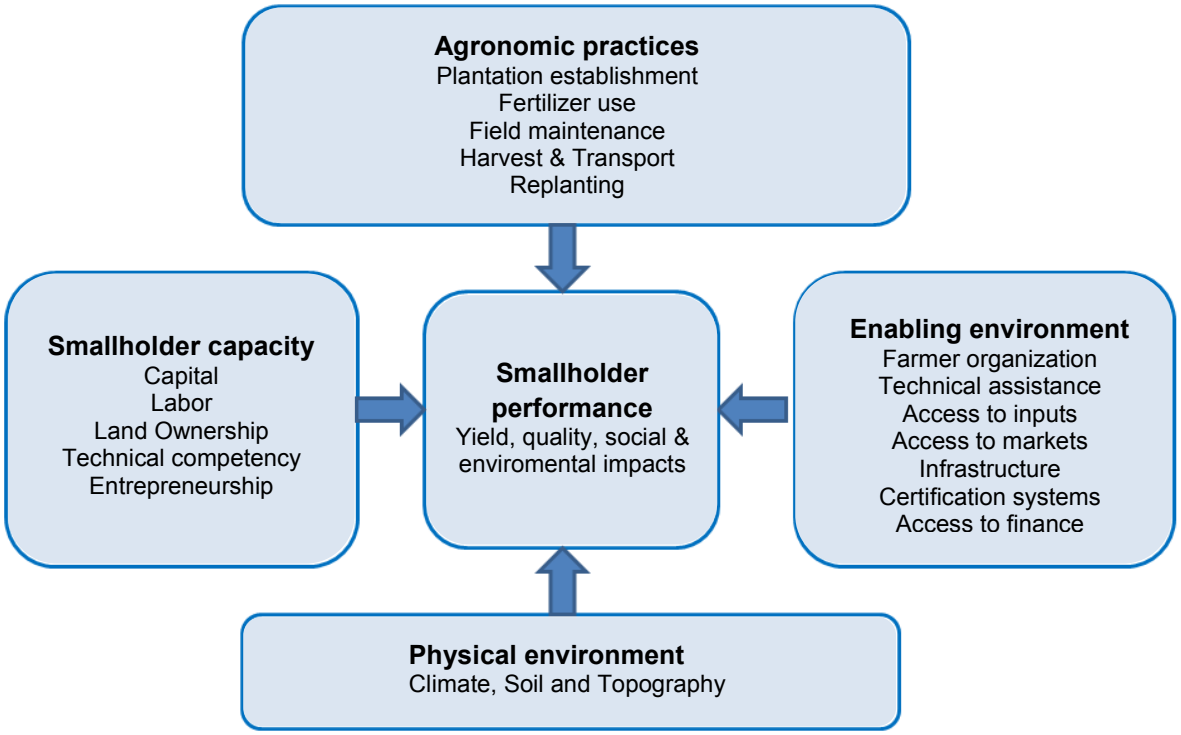
[42] See for example Colchester (2012)

# 2. Investments are necessary to close existing gaps in smallholder performance

The general consensus is that opportunities exist to remove some of the constraints that currently limit smallholder yields.[43]Previous studies in this field have ascribed the lower yields of smallholders relative to large-scale plantations primarily to less suitable soils, lack of access to good quality planting material, incorrect fertilizer use and sub-optimal management practices.[44]Secondary reasons included labor shortages, limited mechanization, old (and therefore excessively tall) palms, fluctuating palm oil prices, economic instability, increased production costs, pests and serious droughts.[45] The higher performance of tied smallholders compared to independent ones was often attributed to their access to superior planting material provided by the plantation company,[46] as well as benefits such as access to technical assistance via their links to plantations, support in input acquisition and provision, and organized harvesting cycles. Independent smallholders may lack access to such services on a broad scale.

The Smallholder Diagnostic Survey Instrument included a number of variables to evaluate smallholder performance, which are shown in Figure 9. These variables cover agronomic practices, smallholder characteristics, as well as the physical and enabling environment in which smallholders operate. These aspects explain much of the actual smallholder performance and determine the constraints and opportunities to improve this performance. A more detailed description of these variables can be found in Appendix III**.**

**Figure 9:** Aspects determining smallholder performance




*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013*

[43] Fairhurst and McLaughlin (2009) & Drajat *et al*. (2013).

[44] Zen *et al*. (2005)

[45] Sheil *et al*. (2010)

[46] Vermeulen and Goad (2006)

The results of the Smallholder Diagnostic Survey and the analysis of how the individual variables relate to smallholder performance resulted in the following key strategies to upgrade smallholder performance:

I. Train smallholders in sustainable intensification of existing plantation

II. Support replacement and replanting efforts in cases of high proportions of non-hybrid *Dura* and *Pisifera* palms or aging palms

III. Ensure shortlines of communication between smallholders and CPO mills regarding the flows of information (quality and pricing), FFB and payments for FFB

IV. Provide smallholders with improved access to finance for on-farm investments and ensure increased investments in the enabling environment.

The next sections elaborate on the relevance and potential *impact* of each strategy and explore what each strategy could look like.

## 2.1 Rehabilitation and sustainable intensification

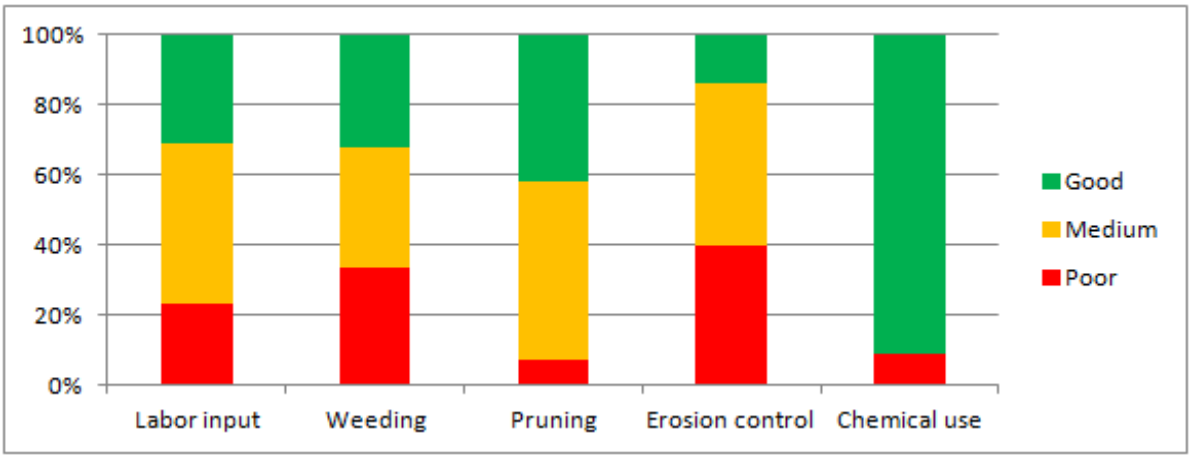
This section outlines the important potential for upgrading smallholder performance by promoting rehabilitation and sustainable intensification of oil palm plots. The first part shows that current field maintenance and harvesting practices are below good practice standards. Yields can be increased by improving access to technical assistance and by promoting efficient fertilizer use, especially when the more engaged smallholders are targeted. The second part outlines a possible rehabilitation and sustainable intensification program.

### *2.1.1 Current agronomic practices have an important potential to upgrade smallholder performance*

*Field maintenance practices do not meet standards across all smallholder types*

The survey revealed divergent smallholder practices, with much room for improvement (see Figure 10 and Figure 11).Only 31 percent of both tied and independent smallholders invested at least three days of labor input in field maintenance, as prescribed by good agricultural practice. Of the independent smallholders, 38 percent spent less than one day per month on field maintenance, compared to 18 percent for the tied smallholders. Of all smallholders, access to external labor input was never a constraint for 71 percent, sometimes a constraint for 19 percent and a frequent constraint for 10 percent.

**Figure 10:** Performance of smallholders on field maintenance criteria



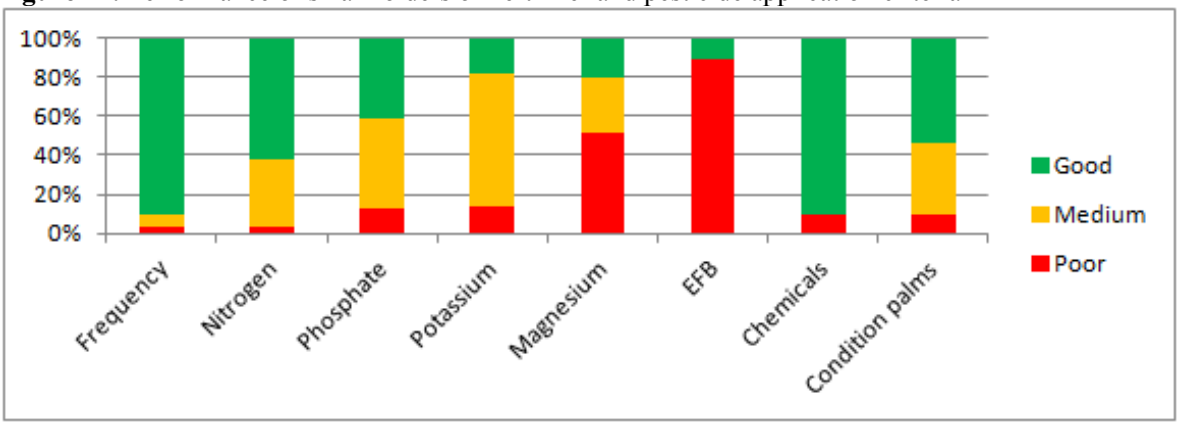

*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

The limited time invested in field maintenance was reflected by the condition of smallholder plots. The majority of smallholders had poor to medium weeding practices (68 percent), pruning practices (58 percent) and erosion control measures (86 percent). Tied and independent smallholders had similar performance on these criteria. Of all smallholders, 97 percent of the tied smallholders and 86 percent of the independent smallholders used herbicides and/or pesticides, to which they generally had good access.

*Fertilizers application is a key variable in yield performance*

Fertilizers were generally applied more than once per year, as good practice prescribes (see Figure 11). In terms of quantity per type of fertilizer, nitrogen fertilizer (without other minerals) was applied by almost all farmers, of which 63 percent used adequate quantities. Phosphate, potassium and especially magnesium were applied below the recommended quantities or not at all. On average, tied smallholders applied more fertilizers (all types) than independent smallholders. EFB was generally not returned to the field as a soil conditioner. Almost all smallholders used some kind of pesticides and/or herbicides. Field observations showed a divergent picture: 54 percent of the plots showed limited nutrient deficiency symptoms, 36 percent had some deficiency symptoms in most palms, and 10 percent had palms showing a complete range of deficiency symptoms.

**Figure 11:** Performance of smallholders on fertilizer and pesticide application criteria




*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

The regression analysis showed that substantial productivity gains can be achieved by improving fertilization practices: according to the level of fertilizer application (see Appendix IV), the yield varied by approximately a 1.5 ton FFB/ha per year between plots. Independent smallholdings have the biggest potential for improvement. As mentioned previously, good fertilization practices during the early years of the plantation is crucial for obtaining good yields. Smallholders seem to have difficulty in applying sufficient fertilizer during the plantation establishment phase and early years of production.

**Table 8:** Access to chemical fertilizers and pesticides/herbicides

| Availability | Non-subsidized fertilizers | Subsidized fertilizers | Chemical pesticides and herbicides |
|---|---|---|---|
| Never | 6% | 13% | 1% |
| Sometimes | 30% | 61% | 10% |
| Always | 65% | 26% | 89% |

*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

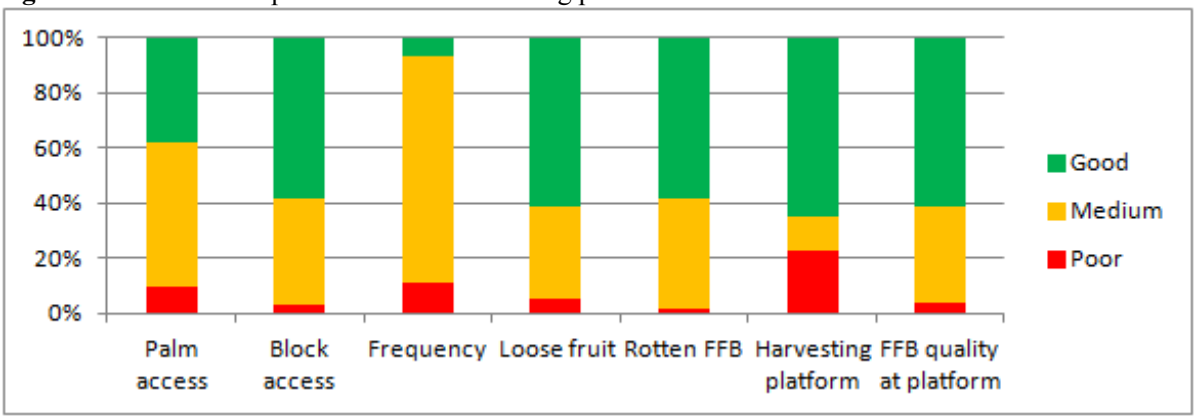
In Indonesia, subsidies are available for certain fertilizers, but only one fourth of the smallholders reported having access to these subsidized fertilizers. Of all smallholders, 36 percent reported having occasional or frequent difficulties in accessing the right fertilizers (see Table 8). Tied smallholders had slightly better access to fertilizers than independent ones. Access to fertilizers, whether subsidized or non-subsidized, did not have a significant impact on whether farmers actually used these fertilizers. Still, it could be argued that

access to the right kind of inputs (the survey did not distinguish between access to different kinds of fertilizers) is a precondition to increased yields.

*Harvesting practices show potential for rapid yield improvements*

The results of the survey identified a potential for achieving rapid yield gains by improving harvesting practices. The majority of smallholders (63 percent) faced severe difficulties in accessing all of their palms, which can prevent full harvesting (see Figure 12). Poor palm access can be partly explained by inadequate weeding or drainage practices and very steep slopes. Independent smallholders have the most difficulties in accessing all of their palms, while the majority of tied smallholders also faced some difficulties. Harvesting may also be influenced by whether the entire block is accessible or not. Almost 40 percent faced seasonal difficulties to access their block from the main road, and three percent faced difficulties year round, with tied and independent farmers showing similar results.

**Figure 12:** Smallholder performance on harvesting practice criteria




*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

Almost all farmers harvested twice per month, which is consistent with medium practice. Loose fruits and rotten FFB were identified in approximately 40 percent of all cases. In 61 percent of the cases, the visible quality of the harvested fruit complied with mill standards. In the remaining cases the fruit had either excessively long stalks (31 percent) or was unripe/overripe (4 percent). Independent smallholders performed especially poorly: 54 percent had FFB below mill standards, compared to 25 percent of tied and tied+ smallholders. Conditions at the harvesting platforms could be further improved, as only 65 percent of the platforms were clean and located on compacted soils.

These results show that in any yield improvement program, promoting full harvesting should be one of the first priorities, which should include ensuring good access to blocks and individual palms.

*Access to technical assistance is poor, but has a positive influence on practices*

Table 9 shows that only twelve percent of all smallholders (and seven percent of the independent smallholders) received training or technical assistance at the good practice level. Training was directed towards a range of issues, including plantation development, fertilizer use, pesticide and herbicide use, field maintenance, harvesting and bookkeeping. One third of all smallholders had medium access to technical assistance, and 56 percent had no or very limited access.

The most important sources of training for tied smallholders included the plantation company (55 percent), the farmer cooperative (15 percent) and family or personal acquaintances (13 percent). For independent smallholders the most important sources were family or personal acquaintances (50 percent), government extension services (19 percent) and farmer cooperatives (8 percent). Some smallholders also received training or assistance from local traders, input suppliers and financial institutions.

**Table 9:** Access to technical assistance per smallholder type

| | Access to technical assistance | | | |
|---|---|---|---|---|
| | | Poor | Medium | Good |
| Smallholder type | Tied | 50% | 33% | 17% |
| | Tied+ | 36% | 42% | 21% |
| | Independent | 63% | 30% | 7% |
| | All | 56% | 33% | 12% |

*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

As spouses can have a role in plantation management (see Appendix III, 2.3), the survey also included questions on whether spouses had joined existing training programs. With 90 percent of the respondents, this was not the case, although about 75 percent answered that they would allow their spouses to join such training programs if the corresponding costs, distance travelled and timing were acceptable. The relevance of spouse participation should therefore be taken into account in the design of training programs.

Although the regression analysis showed a statistically significant but limited effect of training on smallholder practices (see Appendix IV), there were strong correlations between training and practices on plantation establishment, planting material, fertilizer use, pesticide use, sustainability practices and financial management. Farmers who received assistance or training in these issues performed considerably better than those who did not. Positive correlations, although weaker, were also apparent with harvesting practices and the use of planting material.

### *The majority of smallholders are eager to improve their performance but only one third is willing to pay for training*

Furthermore, the survey included questions to evaluate entrepreneurial behavior. For instance, most smallholders had plans to expand their plantation area (80 percent), plans to save at least some money for replanting (63 percent), had a budget for fertilizers (79 percent), knew that improvements in plantation management would increase yields (88 percent), felt responsible for infrastructure maintenance (53 percent) and were willing to invest in more fertilizer use to increase yields (63 percent). This indicates -at least to some extent- that smallholders are entrepreneurial and look to the future.

However, some of the results contradicted this picture of smallholders being entrepreneurial: only 45 percent stated that would apply fertilizer regularly if it was not subsidized, 32 percent would pay for training or technical assistance and only 28 percent actually expanded their plantation area in the last three years. This gives the impression that farmers, although aware of the advantages of improving their agricultural practices, still face some constraints or have other priorities that restrain them from making the necessary investments. This is confirmed by the data analysis which showed no clear relationship between entrepreneurship and yield performance. If higher yields are to be achieved, it is very important to correct this lack of willingness to invest. One measure would be providing better advice and helping smallholders to calculate the costs and benefits of rehabilitation and intensification of existing oil palm plots.

Only 13 percent of all smallholders kept full records of their oil palm business, 21 percent kept some records and two third kept no records at all. Tied smallholders performed better than independent ones with regard to keeping records and general administration.

The overall impression of the surveyors on the smallholder responses and field observations was that 55 percent of the smallholders are eager to improve their performance, while the remainder would be interested to do this only if the required measures are simple and very low cost.

### 2.1.2 Support strategy: Train smallholders in sustainable intensification of existing plantation

The single, most essential activity to increase smallholder productivity in the long term is technical assistance, including awareness building and training. It should be the foundation of any attempt to increase smallholder sustainability performance. The survey showed that smallholders generally have limited access to technical assistance. To improve farm management, technical assistance is therefore needed at the farm, household and group level.

As a priority to improve productivity on existing palm blocks, technical assistance should focus on ensuring that all available fruit is harvested and improving plant nutrition and field maintenance to good practice levels. The introduction of a systematic harvesting and fruit collection routine will ensure maximum crop collection and result in a rapid yield improvement. The conditions for systematic harvesting and fruit collection must be in place before the improvement of plant nutrition and field maintenance becomes a priority. Improving nutrition without effective harvesting is not a profitable investment. This may require investments in roads to enable farmers to reach their block year round; ensuring access to all palms also encourages regular field maintenance and harvesting.

***Towards improved yields***

Provided that the location of the plantation is suitable for oil palm cultivation, a management plan to improve yields to good practice levels could include the following steps:

1. Acquire good planting material
2. Ensure access to block by all-weather road
3. Ensure access by foot/wheelbarrow to every palm
4. Ensure understanding of technical processes for plantation management
5. Perform regular weeding of palm circles
6. Apply regular fertilizer inputs
7. Perform regular pruning
8. Perform regular harvesting
9. Ensure prompt delivery of FFB to mill
10. Ensure communication with CPO mill about grading penalties

GAPs that should be included in capacity building efforts include fertilizer use (quantity, quality, price and sustainability), field maintenance, and harvesting practices.

Complementary to training on GAPs is the development of a more entrepreneurial mindset by improving financial literacy among smallholders. This includes issues such as household bookkeeping, debt management and savings. Particular attention should be paid to gender balance; this will prevent women from being excluded a priori from the financial management of the household.

Furthermore, social and environmental issues such as occupational health and safety, labor rights and measures to reduce environmental impacts should be progressively integrated within technical assistance programs. As a minimum, these efforts should ensure legal compliance (i.e. compliance with the Indonesian Sustainable Palm Oil requirements, a mandatory public standard – see Appendix III, 2.4). Depending on the business case, RSPO certification could also be considered.

In support of technical assistance, clear business models for yield improvement should be developed. All investments must have a cost-benefit analysis that clearly demonstrates the benefits to the smallholder. This could also increase the willingness of smallholders to pay for training, but another possibility is to use levies on future plot earnings to fund farmer training programs.

The implementation of technical assistance must be organized, systematic and thorough, and be carried out rigorously. Possible strategies include the use of demonstration plots, although experience has shown that these alone are insufficient. Follow-up support to the smallholders is generally required during the first one or two years before any new practices are adopted. The creation of farmer learning groups (such as the Farmer Field Schools) and the facilitation of contacts with a bank or fertilizer distributor may be required during such an initial period. Simple recommendations from the milling company for fertilizer use should be provided, initially based on the fertilizer use on the nucleus plantation. Recommendations for specific

smallholders can be made if leaf analysis across the smallholder blocks can be arranged. The recommendations should be simple and general, and should preferably not require different rates to be applied to different parts of the block. However, different recommendations for different blocks owned by the same smallholder should be considered, based on the age of the palms and the soil type.

In support of any rehabilitation and sustainable intensification program, including the option to become RSPO certified, the organization of smallholders is a prerequisite. Producer groups can play an important role in organizing technical assistance in addition to issues such as quality management, promoting smallholder commitment, creating economies of scale in service delivery and aggregating data and FFB. Cooperatives can organize or facilitate many of the required on-farm investments and mitigation strategies referred to in this section. The results of the survey showed that all tied smallholders belonged to a cooperative, while only 46 percent independent smallholders were members. However, the majority of these cooperatives did not provide adequate services in terms of training, inputs or finance. Although the survey did not include an analysis of cooperatives, previous research suggests that the farmer groups in Indonesia often lack the commitment and capacity to improve their service provision.[47]To assure well-functioning farmer groups, technical support is needed in terms of governance, leadership, administration, monitoring, logistics and finance. Alternatively, new group models could be introduced or improved, such as trader or input supplier networks.

## 2.2. Replacement and replanting

This section outlines the need for immediate support in replacing and replanting oil palms as a key strategy to upgrade the performance of a minority of smallholders. The first part addresses the urgency of replacement and replanting efforts, farmer preparedness and the importance of plantation establishment practices. The second section briefly outline show support on this issue could be provided.

### *2.2.1. Replacement and replanting in combination with good plantation establishment practices is a key improvement strategy for a minority of smallholders*

*Due to plot age, replanting is a crucial need for tied smallholders. Due to poor palm varieties, one fifth of independent smallholders may require replanting.*

With an average palm age of almost 19 years, many tied smallholders need replanting now or in the near future. Independent smallholders have a lower average palm age (almost 9 years).Replanting, based on age, is thus less urgent for most of them.

Regarding their planting material, 9 percent of the smallholders stated that they used hybrid planting material with a certificate of origin, 13 percent bought hybrid planting material without a certificate and the remaining 78 percent did not know the origin of their planting material or purchased non-hybrid seedlings. Most tied smallholders are not aware of the quality of their planting material. This may influence the perceived importance of using hybrid planting material when investing in new plantations.

**Table 10:** Quality of planting material of independent smallholders

| Palm variety | Share of independent plots |
|---|---|
| Mainly hybrid | 50 % |
| Mix hybrid and non-hybrid | 30 % |
| Mainly non hybrid | 20 % |

*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

Field checks showed that tied plots had mainly hybrid seedlings. This also applied to half of the independent plots (see Table 10).Of the independent plots, 30 percent had a mix of hybrid and non-hybrid seedlings and almost 20 percent had mostly non-hybrid seedlings (*dura* or *pisifera*). For the latter category

[47] Elson, D. (2007)

of smallholder, replanting could be a viable option. Data analysis showed no significant relationship between the type of seed used and yield. The lack of positive relationship between the quality of planting material and the yields of independent smallholders is rather surprising. One possible explanation is that under certain circumstances, such as poor agricultural practices, FFB yield differences between hybrid and non-hybrid palms may be limited. Furthermore, while farmers may report similar FFB yields between hybrid and non-hybrid species, the actual CPO yield could be considerably different: non-hybrid FFB has a lower Oil Extraction Rate (OER). As long as farmers are not paid according to the oil content in their FFB (this is the case for the majority of independent smallholders – see Section 2.3), there is little incentive for smallholders to replace non-hybrid palms. In addition, any investments in replacement palms will only make sense if other conditions, such as good agricultural practices, are in place. Another possible explanation is that the methods or skills of surveyors to identify palm varieties were inadequate.[48]

*Soil is a key variable in yield performance*

Of the total group of smallholders, 7 percent (all independent smallholders) have plots located on less suitable soils (peat soil and swamp, very coarse sand, heavy clay, many large rocks), 34 percent have plots with small patches of swamp or sandy clays, and 59 percent have plots located on good soils (mineral soil or deep, well-drained, loamy soil). Most smallholdings (73 percent) are located on flat or gently sloping land at an altitude below 300meters, which are both are good conditions for oil palm cultivation. Only 1 percent of the smallholdings are located on steep slopes, which can be considered unsuitable for cultivation. Of these variables, data analysis showed that soil quality has a significant and large impact on yields (see Appendix IV). A possible explanation is that smallholders currently use a relatively low input production system, so yields are highly determined by soil quality. Smallholders who operated on less suitable soils also used less fertilizer, indicating that they did not attempt to compensate for the poorer soils or decided it was not worth the investment.

*Plantation establishment practices require improvement*

Inadequate drainage measures were reported by seven percent of the smallholders. The regression analysis showed that this influenced yields significantly (see Appendix IV). The remainder either did not need drainage measures or already had adequate measures in place. Erosion control practices were medium to poor. The average number of palms planted per plot was 133, with a higher variation among independent smallholders. Almost one quarter of the smallholders had lost some palms in their block over time which they did not replace. Tied smallholders had slightly more missing palms than independent smallholders. As stated above, field maintenance and fertilizer input practices were poor during the immature phase of the plantations (at least for independent smallholders), which negatively impacts yields in the early years of production.

The challenge is to ensure that replanting is done with certified hybrid seedlings in combination with optimal inputs. Only 27 percent of the smallholders reported having access to certified seedlings, 29 percent had occasional access and 44 percent did not have access or did not know whether they had access to certified seedlings. Lack of access to hybrid planting material may have severe consequences for the potential yields of new plantations.

*Smallholders save money for replanting, but not enough*

A total of 35 percent of the farmers reported that they saved money regularly for replanting, and 28 percent reported that they saved money occasionally for this purpose (see Table 11). The remaining 37 percent of farmers did not save for replanting at all.

[48] Surveyors were asked to take 20 FFB from the harvesting platform (f there were any) and 15 FFB from 15 different palms and then check the thickness of the shell. This method may skew the results in favor of hybrid planting material frequency because hybrids are likely to produce more bunches than non-hybrid palms. A full check of every palm would be needed before deciding whether to replant or not.

**Table 11:** Frequency of savings for replanting per smallholder type

| | | Saving for replanting | | |
|---|---|---|---|---|
| | | Never | Occasional | Regular |
| Smallholder type | Tied | 19% | 11% | 69% |
| | Tied+ | 18% | 24% | 58% |
| | Independent | 51% | 37% | 11% |
| | All | 37% | 28% | 35% |

*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

Tied smallholders saved more than independent smallholders: 69 percent of the tied smallholders saved regularly, compared to 11 percent of independent smallholders. Of the independent smallholders, 37 percent saved occasionally and 51 percent did not save at all. Farmers appeared to increase their savings in proportion to the age of their plot. This could be a result of the reimbursement obligation of loans linked to plantation management, the observed yield gap in the early years of the plantation and little sense of urgency when replanting is still many years ahead. Despite their savings efforts, most farmers believed they would need an additional loan to be able to replant.

### 2.2.2 Support strategy II: Support replacement and replanting efforts in cases of high proportion of Dura/Pisifer palms or aging palms

For plantations with a very high proportion of poorly performing palms with low fruit quality (*Dura* and/or *Pisifera*), replanting may be the only viable rehabilitation strategy. In general, any tree that is 25 years or older should be replanted. Replanting before the end of the economic life cycle is a very big step and should only be done after a thorough examination of the block by a technical expert. The smallholder needs to be made aware of the tradeoffs involved, i.e. loss of income now, but the potential for higher income later. Payback horizons for replanting can be up to 8-13 years (including the immature phase). Lack of farsightedness and alternative income opportunities can lead to resistance to replanting. Moreover, quality-based pricing will be necessary to create a business case for replacement; otherwise the smallholder will not benefit fully from the required investment.

To assure future sustainable yields, the availability of certified hybrid planting material must be guaranteed for replacement and replanting efforts. The survey showed that access to certified hybrid planting material for independent smallholders can be improved. To mitigate supply risks and ensure the use of good planting material, the following actions are recommended:

- increase accessibility to good planting material by increasing the number of official nurseries and improving independent smallholders' access to plantation material;
- promote smallholder groups to set up collective nurseries with high quality germinated seed as input and good practices (women can be given an important role in nursery management);
- increase quality control of planting material at the CPO mill's supply base and avoid illegal nurseries;
- ensure that smallholders know that hybrid planting material is actually available;
- introduce quality-based pricing for FFB to the farm gate; this will create the right incentives to replace non-hybrid palms.

As shown in the previous section, yield gaps appear to be particularly high in the early years of the plantation, thus indicating poor maintenance practices during the immature phase. Consequently, extra attention is needed to assure full maintenance and fertilizer application from the beginning. This requires technical assistance and some form of farmer organization. As there is no income in the immature years, additional needs may exist for financing these practices. Due to the necessary amount of investment, the income loss during the immature and early production years and the long payback horizon, financing replacement and replanting efforts is a major challenge to smallholders. Although most smallholders reported saving money for replanting, their savings were not sufficient. As shown in support strategy IV, access to financing for such longer-term investment needs improvement. To reduce the debt burden,

organized farmers or farmers with large plots or multiple plots could be assisted in phased replanting. Phased replanting means that replanting efforts are spread over several years (e.g. with a primary focus on poorly performing palms). This enables farmers to continue to receive some income during the early years, in contrast to the situation where all palms are replanted at once. An alternative is to promote intercropping during the immature years, which could offset immature plantation maintenance costs.

## 2.3 Market linkages between smallholders and CPO mills

This section addresses the market access of smallholders at the time of the survey. The first part shows how prices are affected according to the market channel, how smallholders are generally unaware of the quality they produce and how transport issues may influence FFB quality and consequently CPO yields. The second part briefly outlines how market linkages could be improved.

### *2.3.1 Opportunities to increase FFB quality and CPO yields by improving market access*

The regression analysis showed that market access has a significant impact on yield performance (see Appendix IV). The following key observations have been made with regards to market access.

*Smallholders are hardly aware of quality standards and the quality of their produce*

Prices depend partly on the grading process at the mill. However, only 10 percent of the smallholders fully understood this process. Approximately one quarter of them understood it partly and 63 percent had no idea of how it works and how it might influence prices. This could be explained by the fact that only 5 percent of the smallholders were in direct communication with a mill (these smallholders were among the good performers in terms of yield).

**Figure 13:** Smallholder level of understanding of FFB grading process (per type of smallholder)

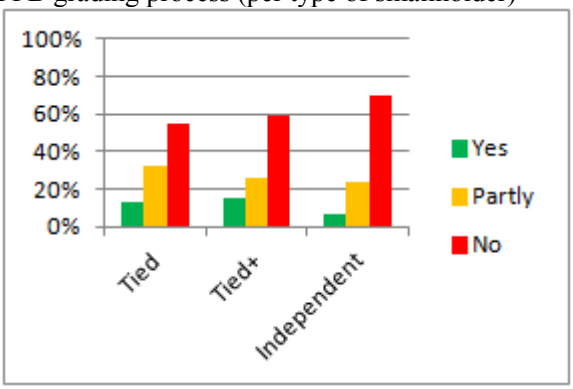
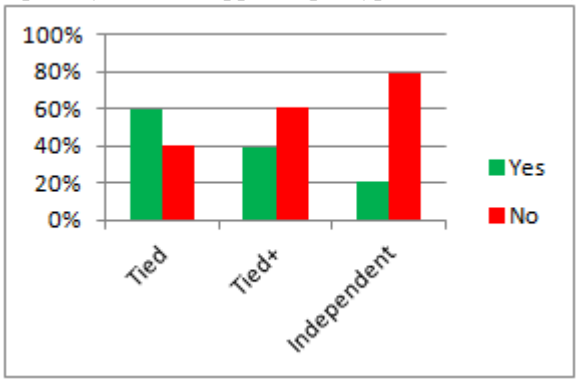



**Figure 14:** Smallholder knowledge on grading penalty of FFB supplied (per type of smallholder)



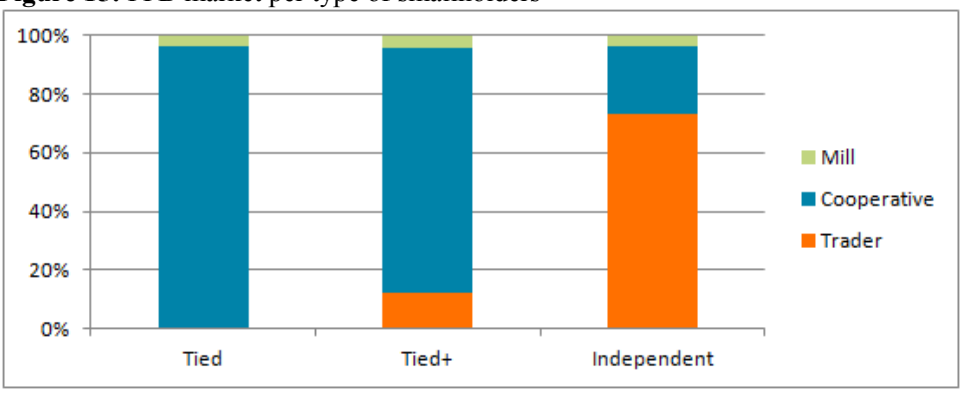

*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

Of all smallholders, one third knew their grading penalty (60 percent of tied smallholders and 21 percent of the independent smallholders). The remaining two thirds did not know the quality of the FFB they sold. The average grading penalty for smallholders who knew the penalty was 5 percent, which can be considered as good. However, because the majority of smallholders did not know their grading penalty, it is doubtful that this figure reflects the actual situation. It is plausible to assume that the smallholders who had taken the trouble to ask about the penalty were among the best performers. The survey also revealed that some mills do not advertise their grading standards or explain why penalties are applied.

*Price differences between tied and independent smallholders can be up to 33 percent*

Only four percent of all smallholders delivered directly to a mill (see Figure 15). Of all tied smallholders, 96 percent delivered to a cooperative. For independent smallholders 23 percent delivered to a cooperative and 73 percent to a local trader (or middleman). For those selling to a local trader, 52 percent sold only to one trader, 21 percent to two traders and 27 percent to three or more trader. Of those selling directly to a mill, 40 percent had two or three mills to choose from.

**Figure 15:** FFB market per type of smallholders




*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

Before harvesting, smallholders generally had no clear idea of the selling price for their FFB. Almost three quarters of the independent smallholders had no contract or agreement with FFB buyers, 12 percent had a verbal agreement and 4 percent had a written contract. Most tied smallholders (79 percent) had a verbal agreement with their buyer, 6 percent a written contract in their possession and 15 percent reported having no contract at all. Most written contracts in the sample were with cooperatives.

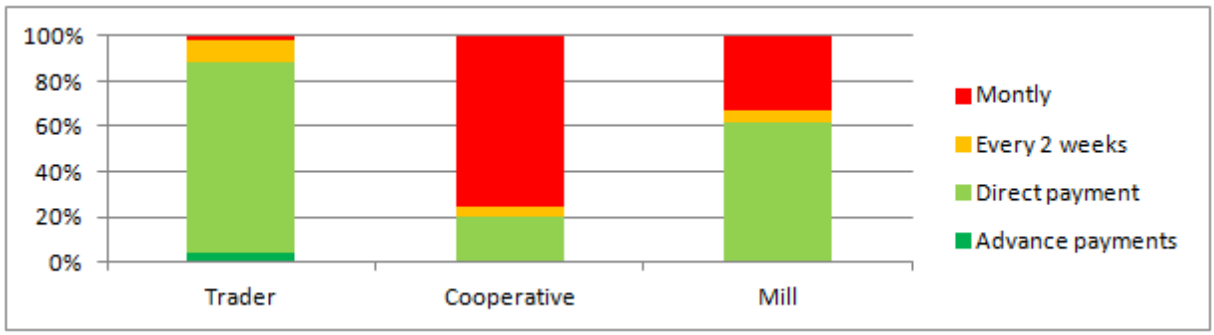
Average prices received per kg of FFB by smallholders varied between 1015 Rp and 1476 Rp during the field research period. Average prices per case were approximately 5-36 percent lower than the K-index price[49] (not taking into account price differences in the K-index price according to age of palms, and in some cases not taking into account transport costs and grading penalties). Excluding transport costs and grading penalties, farmers selling directly to a mill received about 20 percent higher prices for their FFB than those selling to traders and 3 percent higher prices when selling to a cooperative. Independent smallholders selling directly to a mill received 16 percent higher prices compared to selling to a trader and 5 percent higher prices compared to selling to a cooperative. Tied smallholders selling to a cooperative received on average 33 percent higher prices than independent smallholders selling to traders. This represents a significant loss to the farmer, but also offers an important opportunity if marketing can be improved. The number of potential buyers did not have a significant impact on the price received by smallholders for FFB. Smallholders who knew the transport costs (44 percent of all smallholders), estimated them as about 7 percent of the FFB value.

### *Farmers selling to a mill or cooperative have to wait longer for their money than farmers selling to a trader*

Of the smallholders delivering to a cooperative, 4 percent were paid every two weeks and 76 percent once a month, while 20 percent received immediate payment (see Figure 16). Of smallholders selling to a trader, 84 percent were paid on the spot, 4 percent received advance payments and 12 percent received payments after every two weeks or per month. Of smallholders selling directly to a mill, 62 percent received payment on the spot and the remainder had to wait for two weeks or more. Immediate payments for FFB may be an important incentive to sell to traders and as such may increase the incentive for side-selling to traders. Conversations with smallholders supported this type of thinking; smallholders often accepted lower prices for their FFB from a trader because they get paid more quickly.

[49] The FFB prices in Indonesia are set by provincial governments. They are based on CPO and PKO prices, and actual conversion rates reduced by an index based on the various costs for the individual mills, such as transport, processing, marketing, depreciation and administration costs. This index is called the K-index and is determined on the basis of information provided by mills within a certain locality.

**Figure 16:** FFB payment terms per market type

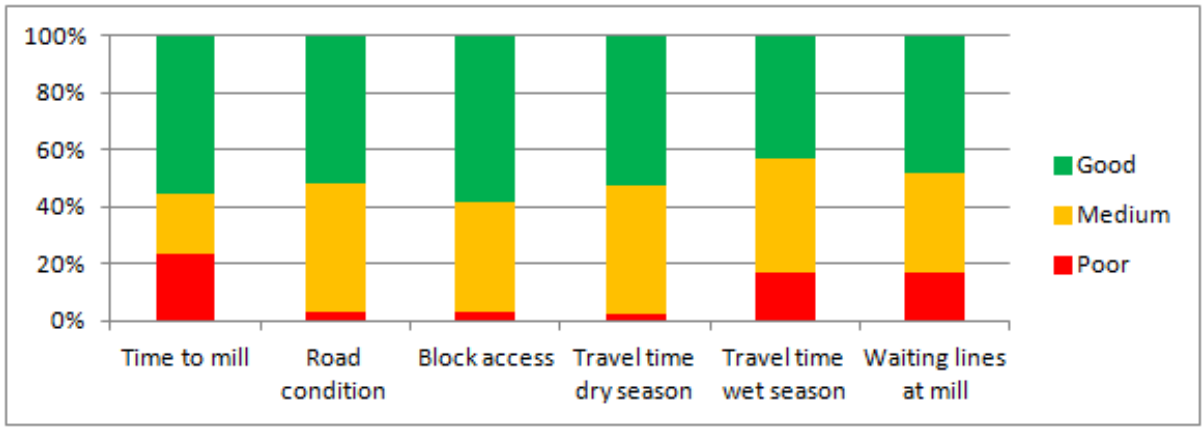



*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

*Transport time to mill is an issue for at least one third of the smallholders, mainly caused by badroad conditions*

Almost one third of the smallholders surveyed had at least occasional difficulty in getting their FFB to a mill within 24 hours after harvesting (half of them had frequent difficulties), while 29 percent did not know whether their FFB reached a mill within 24 hours. Bad road conditions were reported as the primary cause for delays (43 percent) followed by waiting lines at the mill (17 percent) and the lack of available transport (10 percent). The remainder did not know the cause of the delays.

**Figure 17:** Scores on FFB transport issues for smallholders who know the transport situation (note: depending on the variable, 0 to 50 percent did not know the actual situation)




*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

Of all smallholders, 3 percent faced bad road conditions between their block and CPO mills year-round, 45 percent faced seasonal problems and 52 percent had always good road conditions (see Figure 17).As stated previously, almost 40 percent faced seasonal difficulties in accessing their block from the main road, and 3 percent faced difficulties year round, with tied and independent farmers showing similar results. The regression analysis showed a strong positive relationship between block access and yields (see Appendix IV). Seasonal problems with road conditions between FFB collection points and CPO mills negatively influenced transport time. Of all smallholders, 30 percent took 8 hours or more to get their FFB from the FFB collection point to a mill in the wet season, compared to1 percent in the dry season. The risk of FFB quality degradation increases if the travel time is longer than eight hours. Approximately one quarter did not know the road conditions.

Half of the smallholders surveyed did not have any idea how long waiting times were at the CPO mill. For those who did know, on average 17 percent had waiting times of eight hours or more, which is considered poor practice, 34 percent had waiting times between two and eight hours, and 48 percent had waiting times

of less than two hours, which is considered good practice. On average, independent smallholders had slightly shorter waiting times than tied smallholders.

### 2.3.2 Support strategy III: Ensure short lines of communication between smallholders and CPO mills regarding the flows of information (quality and pricing), FFB and payments for FFB

The survey showed that smallholders had various constraints on their access to markets. Most smallholders did not understand the grading process and did not know the quality of their FFB. Communication with the mill on these aspects was generally nonexistent. Independent smallholders generally sold their produce to traders, which can, and in some cases did, result in a significant loss to the farmer. Waiting times at CPO mills were sometimes very long.

Transparent, formal and inclusive business relationships will provide clarity about quality, quantity and price requirements between the parties and provide greater incentives for smallholders to invest. Moreover, efficient fruit handling at the mills can reduce delays in fruit delivery and maintain quality.

The following actions should be taken to avoid market risks:

- Improve communication and socialization of the mills' quality standards, transparency in the calculations of FFB prices, grading process and corresponding financial incentives for quality. This could be done by having regular—perhaps monthly—meetings with smallholders to discuss price and quality issues. The use of photographs and practical descriptions should be encouraged. The smallholders would then gradually become more interested in the price they could potentially receive compared to the price they currently receive, and through improved knowledge would begin to improve the quality of their fruit. This could also create incentives for replacement of non-hybrid palms.
- Ensure prompt payment for FFB by CPO mills (daily or weekly instead of monthly), to prevent smallholders selling to traders for immediate cash. One option could be to make internet transfers to designated bank accounts, which provide proof of the transfer at time of purchase without the need for cash transfer. Another benefit of this option is that the smallholder would see what deductions are being made for poor quality fruit and would then strive to improve quality.
- Organize harvesting cycles more efficiently across the fruit supply base to avoid queuing at the mill. A systematic transport rotation could be set up, e.g. by a cooperative, to ensure that all blocks within the cooperative are visited every two weeks. This will improve delivery times, reduce transport costs and spread the flow of fruit to the mill. Improved coordination of harvesting and transport would almost certainly reduce losses due to rotting fruit.
- Ensure optimal utilization of milling capacity and improved planning at the mills so they can accept fruit directly from independent smallholders.
- Encourage voluntary long-term delivery contracts based on transparent pricing and reciprocal benefits.

Improving market access does not necessarily mean that the traders are left out of the value chain. They can play an important role in communicating mill standards and organizing FFB transport efficiently between smallholders and CPO mills. However, this requires increased transparency on their part regarding quantity, quality, and pricing as well as improved logistical planning.

## 2.4 Access to finance

Sustainable production practices require investments at the farm level and in the enabling environment. The first part of this section describes how smallholders generally lack adequate access to mid-term finance and have less need for additional short-term finance. The second part identifies which financers could play a role to enable the investments at the farm level and in the enabling environment.

### 2.4.1 Smallholders lack access to finance, especially mid-term and long-term finance

The regression analysis showed a significant positive relationship between yields and access to finance for independent smallholders, but a negative relationship for tied smallholders (see Appendix IV).Overall,

smallholders with good access to finance scored better in terms of fertilizer use, the use of hybrid planting material and had a higher yield. This could indicate that access to finance promotes intensification. Smallholders with better access to finance also had larger total landholdings, which may indicate that access to finance also promotes expansion.

*Independent farmers rarely have adequate loans for plantation establishment or replanting*

Of all smallholders surveyed, 55 percent had a loan at the time of the survey. These were loans at the household level and not necessarily related to oil palm cultivation. Loans related to oil palm cultivation were usually related to the initial plantation development and fertilizer use. Of the independent smallholders, 16 percent received a loan for plantation development. These smallholders scored considerably better on plantation establishment practices than those who did not receive a loan. Only 44 percent of the tied smallholders reported receiving a loan for plantation development. This is surprising as most plasma schemes are based upon a loan agreement between a plantation company—or a cooperative—and a smallholder. A possible explanation is that farmers were only involved in the scheme when the plantation was established and therefore had a different perception of the purpose of their loans.

For tied smallholder who reported receiving a loan for plantation development, the main sources of credit were the plantation company, banks and credit unions (see Table 12). For independent smallholders, the three main sources of credit for plantation development were banks, credit unions and cooperatives.

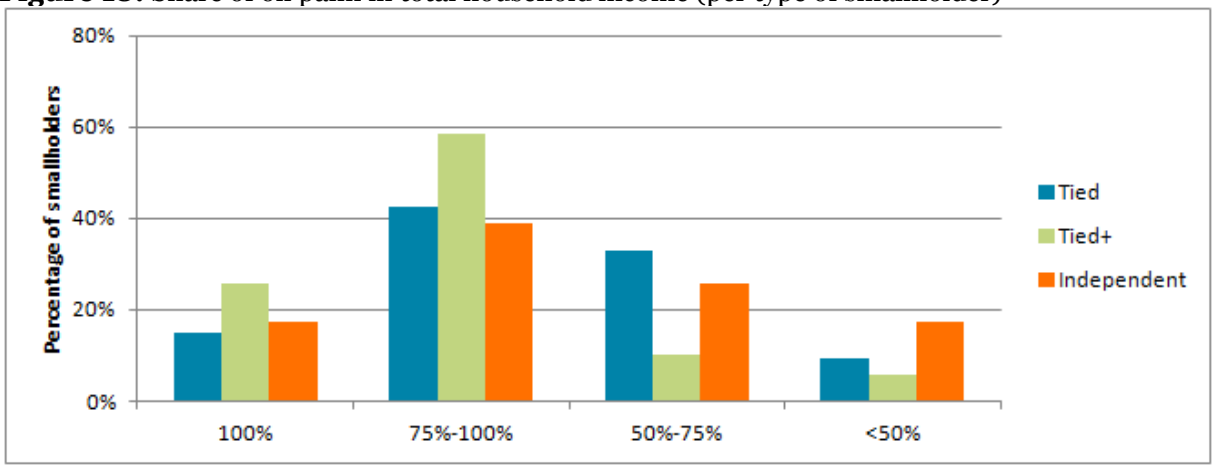
**Table 12:** Source of credit for plantation establishment (per type of smallholder)

| Tied | Independent |
|---|---|
| Plantation company (55 %) | Banks (60 %) |
| Bank (21%) | Credit Union (13 %) |
| Credit union (12 %) | Cooperative (9 %) |

*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

Loans from plantation companies for plantation establishment had to be repaid on average within seven years. Loans from other sources had an average repayment term of 3 years. Of the smallholders who received a loan for plantation development, 50 percent had repaid their loan. Approximately 22 percent of the smallholders (mostly tied smallholders) faced difficulties in repaying their loan, mainly due to price fluctuations for FFB.

**Figure 18:** Share of oil palm in total household income (per type of smallholder)




*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

Regarding replanting, despite the money saved for this purpose by the majority of both tied and independent smallholders, the majority expressed the need for additional credit for replanting. Whether

smallholders need a loan for the initial investments and/or to compensate income in the early years of replanting may partly depend on how important palm oil is for the household income; this also determines the use of alternative strategies such as phased replanting or intercropping (see 2.2). For 18 percent of the smallholders, palm oil was the only source of cash income, for 69 percent it represented at least half their income and for 14 percent less than half. Tied+ farmers depended more on oil palm cultivation than the other types (see Figure 18). Loans from plantation companies for plantation establishment had to be repaid on average within seven years. Loans from other sources had an average repayment term of 3 years. Of the smallholders who received a loan for plantation development, 50 percent had repaid their loan. Approximately 22 percent of the smallholders (mostly tied smallholders) faced difficulties in repaying their loan, mainly due to price fluctuations for FFB.

*The majority of smallholders need to buy fertilizers on credit, which is often available*

Almost half of all smallholders saved regularly to buy fertilizers (81 percent of tied and 28 percent of independent smallholders). Almost one third saved occasionally, and 20 percent did not save at all for this purpose. Of all smallholders, 39 percent had a regular need to buy fertilizers on credit, 29 percent had an occasional need and 32 percent had no need. As each case study resulted in some changes to the questionnaire, the question on whether smallholders who needed credit for fertilizers also received this credit was answered by only 40 percent of the total sample. Of these smallholders, 67 percent received the needed credit. Smallholders who could buy fertilizers with their own means performed better in fertilizer application than those who needed credit to finance fertilizer purchases.

In all case studies, smallholders having a need for fertilizers on credit (68 percent) were asked where they could obtain such credit. For tied smallholders, the main sources were the cooperative, credit unions and banks (see Table 13). For independent smallholders, the main sources were cooperatives, traders and banks.

**Table 13:** Source of credit for fertilizers (per type of smallholder)

| Tied | Independent |
|---|---|
| Cooperative (60%) | Cooperative (38 %) |
| Bank (11 %) | Trader (21 %) |
| Credit union (11 %) | Bank (18%) |

*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

*Almost half of the farmers have no bank account or formal land title which could be used as collateral*

Of all smallholders, 53 percent had a bank account (65 percent of tied, 74 percent of tied+ and 42 percent of independent smallholders). Regarding possible collateral for a loan, 57 percent of the smallholders held a legal title to their land and had a copy of the title certificate. A further 39 percent of smallholders had either customary ownership or a legal title, but the ownership certificate was held by another party. Only 4 percent of the smallholders (all independent smallholders) had no title to their oil palm land. Lending against a sales contract could be an alternative to collateral, but only 5 percent of the smallholders had written FFB sales contracts. Although most tied smallholders acknowledged the existence of either a verbal or a written contract, most did not have any proof of this contract. Of the independent smallholders, 83 percent had no contract or agreement for FFB sales.

### 2.4.2 Support strategy IV: Provide smallholders with improved access to external financing for on-farm investments and ensure increased investments in the enabling environment.

To finance smallholder sustainable palm oil production, external financing is necessary, both at the on-farm level and in the enabling environment.

*Investments at the farm level*

The business case for on-farm smallholder investment varies according to circumstances. Under reasonable growing conditions and with good agricultural practices, oil palm cultivation should generate a positive return on investment. Under such conditions, various scenarios support a business case to invest in yield

improvements of underperforming smallholdings, whether by improving agricultural practices or by replacement or replanting.[50]

Sustainable production practices require investments at the farm level. As a priority to improve productivity on existing palm blocks, the smallholder must ensure that all available fruit is harvested and must improve plant nutrition and field maintenance to recommended levels. The introduction of a systematic harvesting and fruit collection routine will ensure maximum crop collection and result in an immediate improvement. The conditions for systematic harvesting and fruit collection must be in place before the improvement of plant nutrition and field maintenance becomes a priority. Improving nutrition without effective harvesting is an uneconomic investment. Fertilizer is the major expenditure in such investments. Once plantations are yielding at good practice levels, fertilizer input becomes more of an operational cost and can be financed more easily through working capital. Rehabilitation with increased fertilizer use and improved field maintenance can take up to two years to be effective (see Table 14). Investment in labor is needed continuously for the upkeep of blocks. Field maintenance should include regular pruning, weeding and the routine maintenance of roads and access paths to allow all-weather access. Investment in infrastructure at the block level is required to build and maintain drainage systems and the harvesting and contour paths for access by wheelbarrow.

Certified land ownership can be important for smallholders to gain access to financing and safeguard the future and the benefits associated with their farms. But obtaining such a certificate in itself requires a substantial investment (approximately USD 300-400) and can be a complex exercise.

**Table 14:** On-farm investments in oil palm cultivation (excluding debt service of plantation establishment costs)

| | | Amount (USD)/ha | Repayment period |
|---|---|---|---|
| Short-term on-farm investments | Fertilizers | 430–500 | 6 months |
| | Labor (field maintenance & harvesting) | 200-260 | < 1 month |
| | FFB transport | 120-350 | < 1 month |
| | Maintenance of on-farm infrastructure | 25–60 | 1 year |
| Mid-termand long-term investments | Land ownership certificate | 300-400 | n/a |
| | Rehabilitation by fertilizer input and improved maintenance | 300–450 | 2 to 3 years |
| | Replacement/replanting (requires up to 30 months, including lost income) | 1200–5000 | 8 to 13 years (including immature phase) |
| | Rehabilitation of on-farm infrastructure | 60–250 | n/a |

*Source: Molenaar et al. (2010) and Dick Veen, personal communication*

The transport infrastructure, such as roads, bridges and drainage systems within plantation areas, also requires regular maintenance. If maintenance has been neglected over a long period, significant investment may be required for rehabilitation. This requires clarity on who is responsible for infrastructural maintenance and who will pay for it; the evidence indicates that this clarity is not always present.

Table 14 shows some of the short-term and long-term investments and their relevance in smallholder oil palm cultivation and specifies the repayment period. Hiring labor for harvesting or purchasing fertilizers for regular application can be considered short-term investments (measured in months).Replanting, however, requires a substantial investment and deprives the farmer of income for three to five years. Infrastructure improvements may have an immediate benefit in terms of access and therefore improved fruit harvesting, but repayment periods are likely to be longer. Prioritization of investments is very important, and improvements need to be made on a step-by-step basis. The timeframe of some of the investments is probably daunting for many smallholders.

[50] Molenaar *et al*. (2010), Aidenvironment (in press)

Access to loans may be an important element in making these on-farm investments, especially during the first years of a yield improvement program and in the case of replacement or replanting. A major constraint on financing appears to be the availability and accessibility of finance. This is particularly the case for the mid-term and long-term investments. Once plantations are yielding at good practice levels, operational costs can be financed more easily through working capital.

Formal financial institutions often fall short in providing financial services to informal and small entrepreneurs such as smallholders. Smallholders are often too small for commercial banks and too large for micro-finance schemes. Banks are generally not interested in financing these actors, not only because they are small, but also because they have no credit history, cannot supply reliable management information or are unable to offer "hard value" collateral. Micro-finance schemes may have less strict requirements on these aspects. Other potential investors are the suppliers of inputs, such as fertilizer, and the buyer(s) of the FFB, such as FFB traders or a CPO mill. These financiers may be willing to pre-finance the revenue of the end product or postpone repayments of loans for products and/or services delivered. This requires not only transparency in the arrangements, but also a system which ensures that FFB is supplied to the buyer who provides such services.

To increase access to on-farm investments, the following measures could be considered:

- banks should accept a more flexible range of collateral and repayment terms to account for smallholder needs;
- new mechanisms in banking that allow commodity buyers to lend against crops in the ground;
- dedicated credit lines to support plantation rehabilitation (to close the yield gap);
- micro-finance institutions should be created with dedicated products aimed at servicing smallholders;
- organizing the financing for fertilizers, infrastructure maintenance and replanting through cooperatives or CPO mills and assuring payments by imposing a levy on FFB sales (this works only if smallholders actually sell their FFB to the cooperative or mill that is providing this support. In the current Indonesian context, the risk of smallholders not paying back their loans because they sell FFB to another buyer is substantial);
- organizing the financing of operational costs by commercial service providers or input suppliers (preferably in combination with the provision of adequate training).

*Investments in the enabling environment*

The benefits of investments at the farm-level also depend on whether smallholders operate in an enabling environment; it may not be worth investing in fertilizers or certification if smallholders cannot access a mill to process their FFB within a reasonable period. Alternatively, investments in fertilizers or hybrid planting material are only possible if these inputs are available. Investments at the farmlevel must therefore sometimes be complemented by investments in the enabling environment. Likewise, investments in the enabling environment, such as a new distribution point for fertilizers or a credit facility, may spur farmer investments in GAPs. The most important of such investments are the following:

- investments in technical assistance (agronomic practices and basic business skills, farmer organization, access to finance, inputs and other important resources, as well as business skills);
- investments in off-plantation transport infrastructure (roads);
- investments to meet ISPO and RSPO standards and gain access to markets;
- investments in the production and distribution of inputs (planting material, fertilizers, and chemicals).

The estimated costs for technical assistance, i.e. organizing small-scale training sessions and site visits, are between USD 10 and USD 20 per ha per year. Off-plantation infrastructure development and maintenance can be expensive and have a long repayment period. RSPO certification entails other additional costs. A recent report showed that costs for RSPO certification of tied smallholders, i.e. training and monitoring costs, vary between USD 1.19 and USD 34.66 per ha, depending on the group size.[51] Based on figures

[51] WWF (2012)

obtained from plantation companies, the costs for initial certification of a plantation, including staffing costs, range between USD 2.13 and USD 9.26 per ha. Costs for corrective actions typically range between USD 3.74 and USD 10.99 per ha, but are as high as USD 38.32 per ha. Ongoing certification and maintenance costs range between USD 2.43 and USD 13.03 per ha. The costs for certification of independent smallholders are expected to be higher, as they may entail additional expenses for organizing farmers and setting up an internal control system. Without a formal group structure, including group management, RSPO certification is impossible for independent smallholders. A comparison by the research team of ongoing projects that assist independent smallholders to improve yields and obtain RSPO certification showed average costs per smallholder between USD 80 and 300 USD spread over at least two years.

**Table 15:** Overview of potential financiers per type of investments in sustainable smallholder oil palm production

| Financier | Financed investment | Source of funding |
|---|---|---|
| Smallholders | Farm inputs (mainly fertilizers), replanting, harvest and transport costs, training and certification costs | Savings |
| Farmer organizations | Farm inputs, harvest and transport costs, training and certification costs, infrastructure maintenance, plantation rehabilitation/replanting | Levy on FFB sales<br>Reserve for replanting (including reserve to bridge income gaps of smallholders during the first years) |
| Supplier | Farm inputs (mainly fertilizers) | Deferred payments |
| Service provider | Training | Deferred payments |
| Middlemen | Harvest and transport costs | Levy on FFB sales |
| Mill | Farm inputs, harvest and transport costs, training and certification costs | Levy on FFB sales |
| CPO buyers | Training and certification costs | Grants, matching funds, levy on CPO sales |
| Banks and micro-credit institutions | Plantation establishment, farm inputs, harvest and transport costs, infrastructure maintenance, rehabilitation/replanting | Loans with different time horizons<br>Micro-credit products<br>Savings products |
| Governments & Donors | Training, certification costs, infrastructure | Grants, matching funds, first loss cover, guarantees |

*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

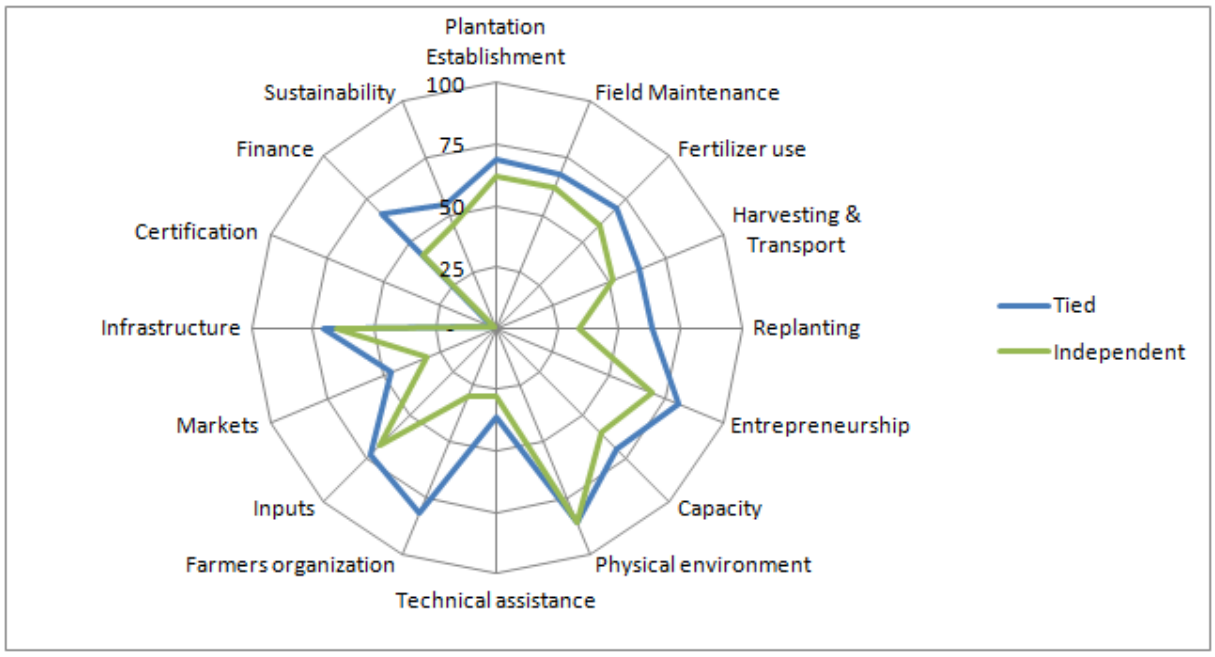
In order to fill the existing finance gap, different financers with different instruments can play a role (see Table 15).Some of these investments can eventually be paid by smallholders. For example, the costs of technical assistance and additional efforts to comply with ISPO or RSPO could be provided on a commercial basis by a CPO mill or external service provider, although they may need to be pre-financed. Other investments such as improvements in roads or input distribution networks are likely to be funded by other financers. Because investments in the enabling environment do not generate a cash flow directly, it is more difficult to find private financiers willing to make such investments. However, some financiers may consider funding these investments if they acknowledge their indirect benefits for the social landscape. An example is a micro-finance bank that finances technical assistance to ensure that its borrowers stay in business (providing business development support). However, many of the required investments in the

enabling environment may need to come from the Indonesian public sector or international donors.[52] The Government of Indonesia (GOI) already finances technical assistance (although its extension services generally do not focus on oil palm) and off-farm infrastructure. International donors and the RSPO already invest in technical assistance and RSPO certification of independent smallholders. However, the currently available resources and delivery mechanisms appear to be inadequate to scale up the necessary investments (both on farm and in the enabling environment).

## 2.5 Tailor-made support programs should be prioritized over "one size fits all" solutions

The above-mentioned support strategies are relevant to upgrade smallholder performance in the Indonesian oil palm context. However, the relevance of each strategy may differ per smallholder type. Figure 19 clearly shows that tied smallholders have superior agricultural practices and a better enabling environment than independent smallholders. It also shows that important gaps exist on all aspects and that improvements can be made, both for tied and independent smallholders.

**Figure 19:** Relative score of each aspect compared to the optimal situation per type of smallholder

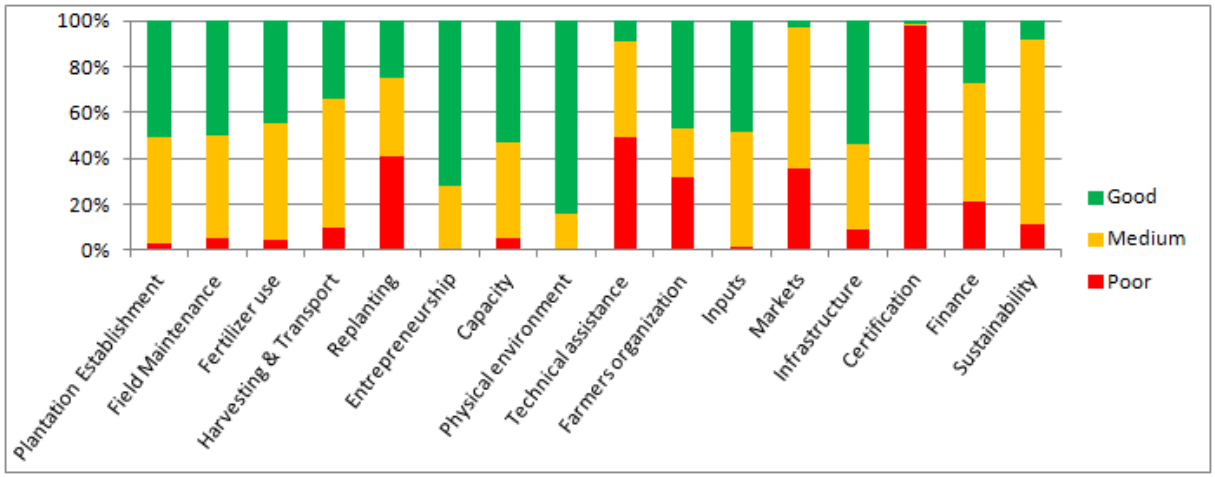



*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

Important differences may also exist between regions and even within regions. Indonesian oil palm smallholders are not a homogenous group regarding their practices and the context in which they operate. Figure 20 shows the distribution of smallholders' scores on the various criteria (variables).

[52] This line of reasoning is consistent with the Bottom of the Pyramid (BOP) approach, where donors or governments contribute to the establishment of the institutional underpinnings which enable the private sector to effectively grow the market.

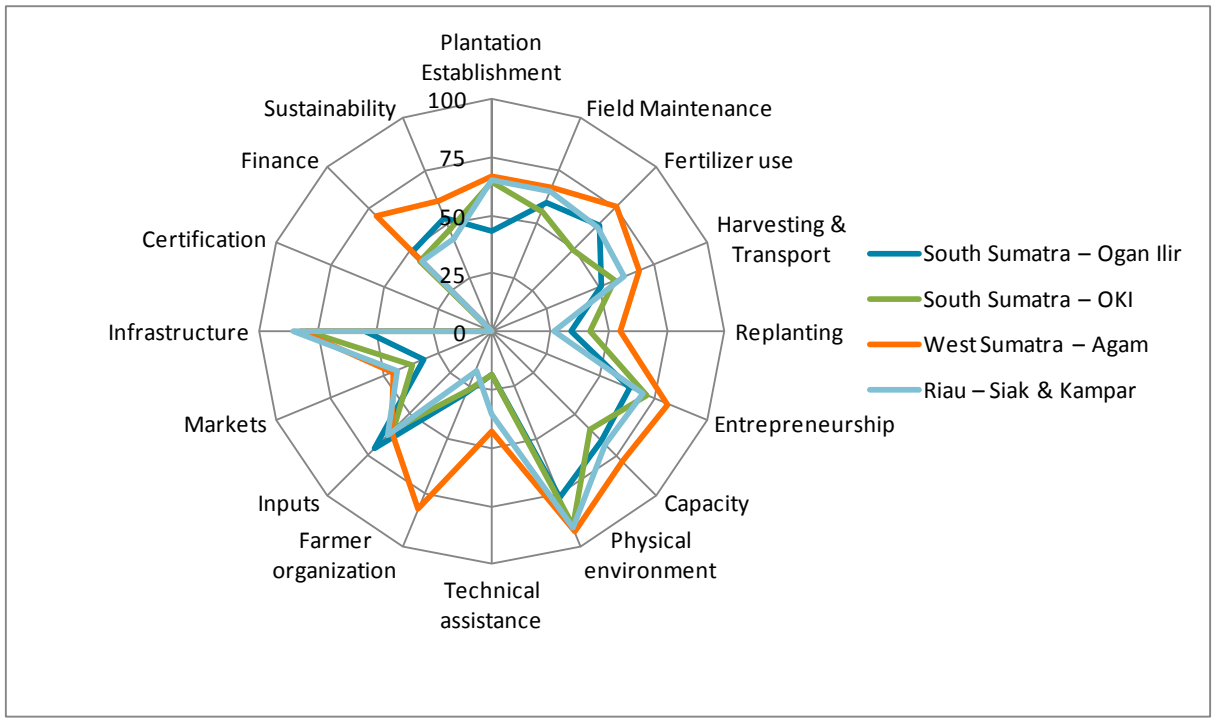
**Figure 20:** Distribution of smallholder performance per variable




*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

The survey also revealed quite some variability between regions (see Figure 21 on the results of the first four cases on Sumatra). More detailed data analysis revealed that the within-district variability may even be higher.

**Figure 21**: Relative score on each aspect compared to the optimal situation per type of smallholder




*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013, results of the Smallholder Diagnostic Survey*

Consequently, to improve smallholder performance, tailor-made design of the above-mentioned support strategies for each context is required. The impact of a single investment model is likely to be limited, because specific constraints may exist in each context, requiring specific solutions. In addition, the survey revealed that not all farmers are willing to invest in their farms, even if the conditions for making such investments become more favorable. This shows the importance of a good initial assessment of farmers' performance, needs, willingness to invest and the enabling environment in which they operate, before a support program should be established.

# 3. CONCLUSIONS

This study shows that oil palm cultivation has become a livelihood strategy for an increasing number of smallholders in Indonesia. Since 2000, the area of smallholder oil palm cultivation has more than tripled, to 3.6 million ha in 2011. In that year smallholders were responsible for 38 percent of Indonesia's palm oil production, with 8.6 million tonnes of smallholder-based CPO production. Although oil palm cultivation can improve the livelihoods of many smallholders, the expansion of oil palm cultivation has also led to increased concerns about deforestation, loss of biodiversity, increased greenhouse gas emissions and land rights conflicts. Consequently, the need for sustainable production practices, intended to result in higher yields, better prices, and reduced social and environmental damage, has become more apparent and has gained increasing attention.

In order to promote the transformation to more sustainable smallholder oil palm production, investments are needed. To define these investments, this study contributes to the understanding of smallholder performance and needs. This report is based on the first in-depth qualitative and quantitative analysis of a multi-site approach encompassing 1,069 smallholder oil palm farmers in Indonesia.

The results have confirmed the image derived from previous research that smallholders underperform in terms of yields. Relative to a good practice scenario for smallholders, the yields per hectare of tied plots are 6 percent lower and independent plots 40 percent lower; relative to the GAP plantation scenario, the respective yields are 46 percent and 116 percent lower. A particularly wide yield gap has been identified in the early years of cultivation, with smallholder yields not catching up until about year 16, by which time the most productive phase of the palms has passed. In addition, most smallholders under perform regarding sustainable production practices when measured against a selection of RSPO criteria. Smallholders who perform well on these criteria have 25 percent higher yields than those who perform poorly. Although cautious interpretation is required, there seems to be no trade-off between sustainability and productivity, but rather a positive relationship.

To determine the causes of these differences in smallholder performance, the research team developed and used the Smallholder Diagnostic Survey Instrument, which includes a set questions on agronomic practices, smallholder characteristics, physical circumstances and the enabling environment in which smallholders operate. This Instrument provides a suitable tool for such an assessment. It identifies not only the gaps in smallholder production systems relative to good practice, but also the constraints and the opportunities to close those gaps. Based on the outcomes of the Smallholder Diagnostic Survey Instrument, we identified four key strategies to upgrade smallholder performance:

I. Train smallholders in sustainable intensification of their existing plantations

II. Support replacement and replanting efforts in cases of high proportions of non-hybrid *Dura* and *Pisifera* palms or aging palms

III. Ensure short lines of communication between smallholders and CPO mills regarding the flows of information (quality and pricing), FFB and payments for FFB

IV. Provide smallholders with improved access to finance for on-farm investments and ensure increased investments in the enabling environment

In this report we have supported and outlined each of these strategies; if implemented, they could improve smallholder performance considerably. In broader terms, we conclude that technical assistance should be the foundation of any strategy to change smallholder behavior to a more entrepreneurial mode. Strategies should be underpinned with clear business models for yield improvement, including a cost/benefit analysis. This will show smallholders the benefits of the various investments strategies highlighted in this report.

Furthermore, due to the variability in performance and in the constraints on and opportunities for sustainable palm oil production, these strategies should be tailored to regional conditions and the various smallholder types. Before a support program is established, it is therefore crucial to make a good initial assessment of the smallholders' performance, needs, willingness to invest and the enabling environment in which they operate.

The Smallholder Diagnostic Survey Instrument not only enables such an assessment, but it can also help to identify target groups and provide baseline data, which can then be used as a reference point to monitor changes over time. As such, it can serve potential financers and supporters of oil palm smallholders—including palm oil companies, cooperatives, financial institutions, governmental bodies and donors—in the design of their strategies, programs or products. The Smallholder Diagnostic Survey Instrument complements other tools, such as in-depth problem analysis or cost-benefit analysis.

If applied more frequently and consistently, the Smallholder Diagnostic Survey Instrument could ultimately help to create a comprehensive oil palm smallholder database at the regional, national and/or international level. Adoption of the instrument as a universal tool will make this database more valuable over time. More specifically, because it has been developed specifically for the Indonesian context, this database can improve public knowledge on Indonesian oil palm smallholders and can provide input to public policy developments. This requires a central governing base that promotes data collection, manages the database and upgrades the instrument according to new insights.

This study has revealed an important potential to improve smallholder performance in the Indonesian oil palm sector. It will require investments in the smallholder's agronomic capacity, access to inputs, market relationships and access to finance. Each investment may require the involvement of different actors, specific finance mechanisms and different types of financiers. These efforts should in turn enable considerable gains to be made in smallholder productivity by promoting sustainable production systems, resulting in enhanced rural livelihoods and reduced and social and environmental impacts.

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# APPENDICES

## Appendix I: Smallholder Diagnostic Survey Instrument (SDSI)

*Introduction*

Sustainable oil palm cultivation can be a beneficial livelihood strategy for smallholders in Indonesia. However, the Indonesian smallholder sector is characterized by under-investment, which is a serious constraint on reaching its full potential in terms of yields, profitability and the improvement of social and environmental impact of smallholder practices. Catalyzing investments in smallholder oil palm production requires a thorough understanding of smallholder production systems and their enabling environment. The Smallholder Diagnostic Survey Instrument (SDSI) helps to acquire such understanding and to identify investments needs. It was developed by Aidenvironment, Global Sustainability Associates (GSA) and Triodos Facet in conjunction with the IFC. During this development it was tested in 6 field cases comprising 1069 smallholders located on the islands of Sumatra and Kalimantan in Indonesia.

*Purpose of the SDSI*

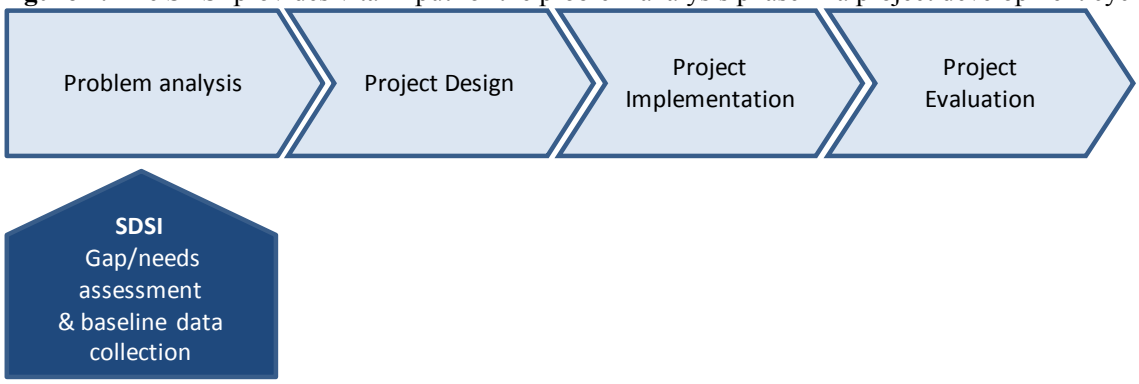
The purpose of the SDSI is threefold:

- to provide insight into the *yield gaps* of case-specific smallholder production systems compared to good agricultural practices;
- to identify *constraints and opportunities* in sustainable smallholder production at the farm level and in the enabling environment;
- to provide *baseline data* which can be used to monitor the progress of investment programs.

The SDSI can be used by:

- *Smallholder support organizations*: For smallholder support organizations it provides input for designing intervention strategies to promote and support sustainable smallholder production. Furthermore, SDSI contributes to the identification of target groups for intervention strategies on the basis of needs, and provides key performance indicators for monitoring changes over time.
- *Palm oil companies and CPO mills*: Palm oil companies or CPO mills can use the SDSI to determine investment strategies to improve smallholder performance and quality in the existing supply base or to include new suppliers in its supply base.
- *Financial institutions* Financial institutions could use the instrument to test the relevance of financing or investment proposals from third parties in the local context[53]or to determine the scope as a first step in the development tailor-made financial products within a specific region.
- *Public sector*: The public sector can use the SDSI to incrementally add data to improve public knowledge on Indonesian oil palm smallholders, which can provide input for public policy.

**Figure 1:** The SDSI provides vital input for the problem analysis phase in a project development cycle




*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013*

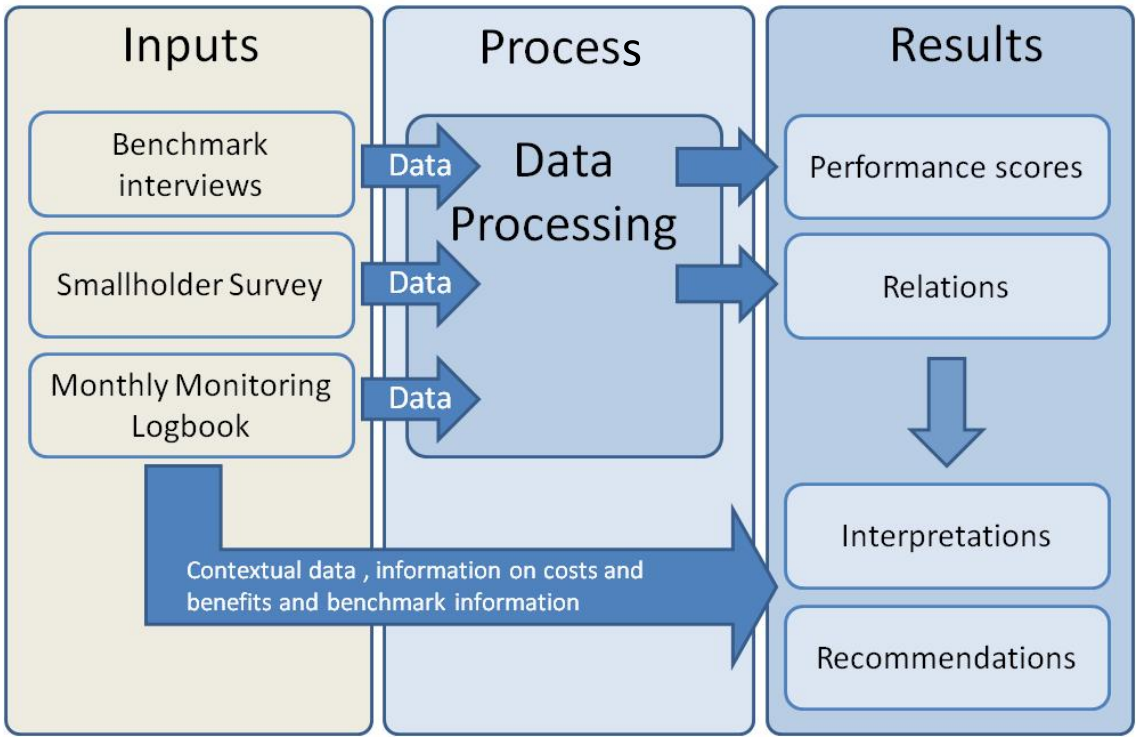
[53] Note that that assessment of the social, environmental and financial sustainability of particular projects requires a more thorough Due Diligence process. The SDSI can help to identify which issues should be addressed in such a process.

The tool is applicable for any group of smallholders, such as the supply base of a particular mill or smallholders located in a specific geographical area, as long as smallholders have a considerable degree of power to make decisions on the management of their plots.

*Design of the tool*

The SDSI consists of a set of four tools to collect, process, and analyze field data: a benchmark questionnaire, a smallholder survey, a smallholder monthly monitoring logbook and an analysis tool, as shown in Figure 2. Collectively, these tools manage the flow from input to results and recommendations. Each tool is briefly described below.

**Figure 2:** Schematic illustration of Diagnostic Smallholder Survey Instrument (SDSI).




*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013*

The SDSI essentially consists of four components/tools:

- Smallholder survey: a structured farmer questionnaire with open and multiple-choice question which includes a checklist for field observations on the smallholder's oil palm plantation.
- Benchmark questionnaire: a questionnaire for plasma managers, mill managers, cooperatives and other resource persons, to provide benchmarking information and to cross-check answers from the smallholder survey.
- A monthly monitoring logbook administered by a sub-selection of the smallholder sample to obtain more accurate data on yields, costs and benefits for smallholders.
- Analysis tool: the analysis tool is built in Microsoft Excel™ and converts collected data into results about the performance of a group of smallholders and their enabling environment.

*Methodology*

Data collection by means of the Smallholder Survey is conducted in a specific population of smallholders (e.g. mill supply base or district), from which a sample is taken according to the stratified sampling method by differentiating between tied and independent smallholders.

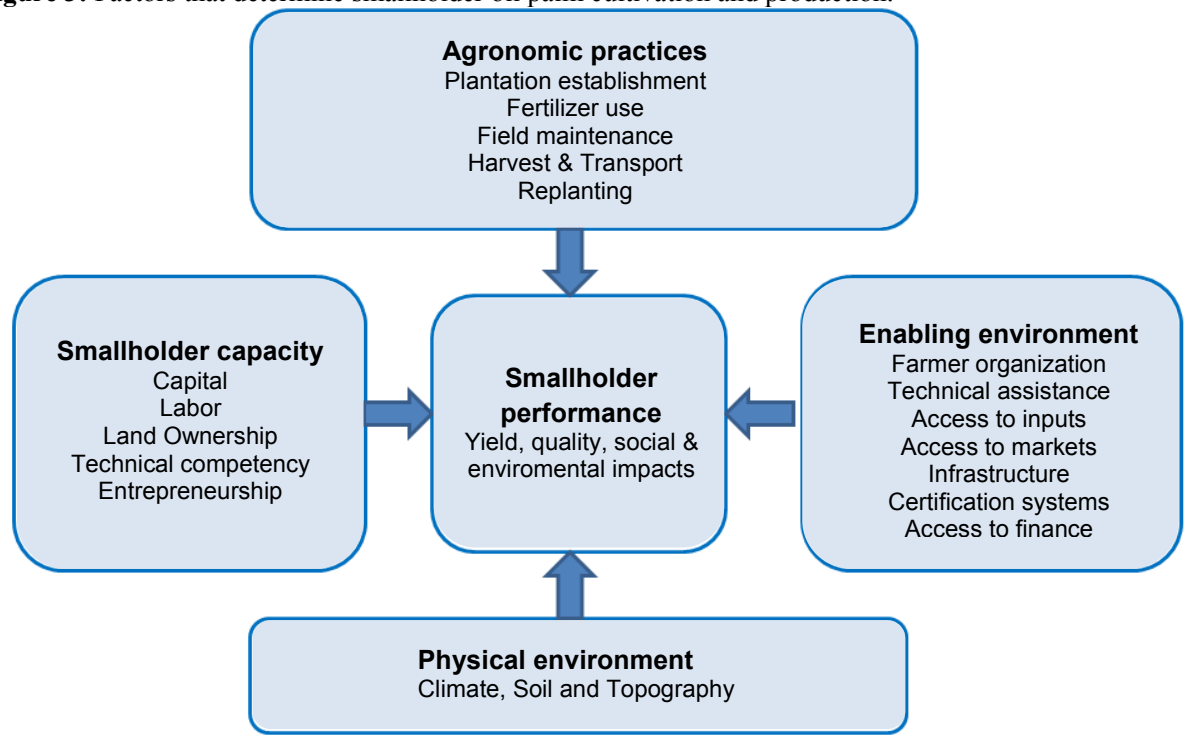
The recommended sampling methodology is the following formula:[54]

$$N = \left(0.8 * \sqrt{(populationsize)}\right) * z$$

The stratified sampling method is applied by differentiating between tied and independent smallholders. Tied + smallholders were included in the sample of tied smallholders. The multiplier $z$ was defined by the expected variability in the sample size. Consequently, the multiplier for tied/tied+ smallholders has been set at 1.4. The variability of independent smallholders was expected to be higher than the variability of tied/tied+ smallholders and was therefore set at 1.8, resulting in a larger sample for this category.

The research framework of the Analysis Tool is based on the various factors that determine smallholder performance in oil palm cultivation in Indonesia. These include agronomic practices and smallholder characteristics as well as the physical and enabling environment in which smallholders operate. The questionnaires allow data to be collected on these factors, and the SDSI Analysis Tool allows individual smallholders or (sub)groups of smallholders to be scored on specific questions or themes.

**Figure 3:** Factors that determine smallholder oil palm cultivation and production.




*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013*

Both the Smallholder Survey and the Analysis Tool use a "traffic light" classification system based on good, medium and poor practice, which are defined as follows:

- Good practice: optimizing may still be possible, but the potential impact of additional investments is expected to be limited.
- Medium practice: medium-sized gap relative to good practice; investments are expected to have a medium impact on smallholder performance.
- Poor practice: large gap relative to good practice and much room for improvement; investments may result in major improvements of smallholder performance.

[54] This formula is based on the sample size calculation formula that the RSPO uses for the internal assessment of certified oil palm smallholder groups. The RSPO uses the following classification of z: low risk = multiplier of 1, medium risk = multiplier of 1.2, high risk = multiplier of 1.4 (source: RSPO standard for Group Certification, July 2010). We used a larger multiplier because we expected to have a more diverse population that generally surpasses group level.

The scores of individual farmers on various questions can be aggregated at different levels (aspects and clusters). The Analysis Tool also allows scores to be generated for groups of farmers on individual questions, aspects and clusters. The results from the Analysis Tool are presented in various ways and with various levels of detail:

- tables with counts, totals and averages of individual questions;
- tables and graphs with scores per Question, Aspect or Cluster of the total population;
- tables with aspect scores per type of smallholder, sub-district, yield performance or field case;
- pivot tables (referred to as dynamic tables). With dynamic tables the user is able to get detailed information about the relationship between parameters (e.g. yield performance and level of training). The Excel tool has preformatted tables (worksheet with "specific dynamic tables") that relate specific parameters, but also includes a pivot table that can be customized according to the user's interests.

**Figure 4:** Examples representation of results

Tables with counts, totals and averages

| Demographics | | | | |
|---|---|---|---|---|
| | | Tied | Tied + | Independent |
| Age | Younger than 40 years | 101 | 44 | 223 |
| | Between 40 and 55 years | 175 | 74 | 268 |
| | Older than 55 years | 50 | 19 | 115 |
| Gender | Male | 299 | 123 | 533 |
| | Female | 27 | 14 | 73 |
| Household size | | 4,21 | 4,46 | 4,31 |

Tables with scores per Question, Aspect or Cluster

| Cluster | | | | Distribution of farmers per question | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Aspect | | | PERCENTAGE | | | COUNT | | |
| | | Question | Score | POOR | MEDIUM | GOOD | Total | POOR | MEDIUM |
| **Agronomic Practices** | | | **59** | **1** | **68** | **30** | **1069** | **15** | **729** |
| 1 | **Plantation Establishment** | | **65** | **3** | **46** | **51** | **1069** | **29** | **496** |
| | | Did you use hybrid seed | 16 | 78 | 13 | 9 | 1069 | 838 | 140 |
| | | Drainage | 93 | 7 | 0 | 93 | 1069 | 75 | 0 |
| | | Access to palms | 65 | 10 | 53 | 38 | 1069 | 103 | 564 |
| | | Missing palms | 89 | 2 | 21 | 78 | 1069 | 17 | 222 |
| | | Erosion control | 37 | 40 | 46 | 14 | 1069 | 427 | 497 |
| | | Planting material used | 73 | 15 | 24 | 61 | 1069 | 159 | 260 |

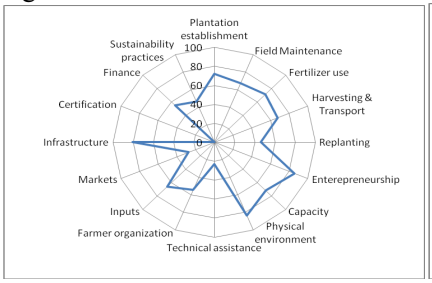
Tables with aspect scores per type of smallholder, sub-district

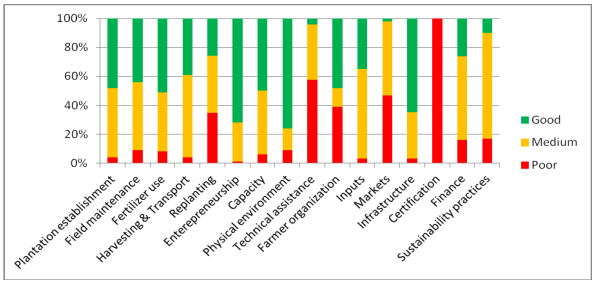
| | | Plantation Establish | Field Mainten | Fertilizer use | Harvesting & | Replanting | Entrepreneur | Capacity | Physical envir |
|---|---|---|---|---|---|---|---|---|---|
| | **TOTAL SAMPLE** | 65 | 65 | 64 | 57 | 45 | 74 | 66 | 86 |
| | Tied smallholder | 69 | 68 | 69 | 63 | 63 | 80 | 69 | 86 |
| | Tied + smallholder | 72 | 71 | 72 | 66 | 54 | 79 | 81 | 90 |
| | Independent smallholder | 62 | 62 | 59 | 52 | 33 | 69 | 60 | 86 |

Pivot table

| Acces To Finance and Bank Account | | | | | |
|---|---|---|---|---|---|
| | *Columns* | Acces to Finance | | | |
| *Rows* | **Count of TXTA17._a2_finance** | **Column Labels** | | | |
| | **Row Labels** | **poor** | **medium** | **good** | **Grand Total** |
| Bank Account | No | 171 | 239 | 91 | 501 |
| | Yes | 55 | 312 | 201 | 568 |
| | **Grand Total** | **226** | **551** | **292** | **1069** |

Figures



# Appendix II: History of smallholder development in Indonesia

Since the introduction of palm oil in Indonesia in the late 1970s, various public policies and programs have shaped Indonesia's palm oil sector. They resulted in the establishment of different models of large-scale public and private plantation schemes that engaged with smallholders in different ways. In addition, since the late 90s an increasing number of farmers started to grow oil palm independently, not linked to a plantation scheme. This historical development resulted in different types of smallholders in terms of how they relate to the production and marketing of FFB. This appendix presents in more detail this historical development taking as a starting point the most commonly used distinction between tied smallholders who are part of a plantation scheme (alternatively called plasma, scheme, dependent or affiliated smallholders) and independent smallholders who are not part of a plantation scheme. It should be noted that a growing group of smallholders are both tied to a plantation scheme and have their own holdings independent of any plantation. In this report, this latter category is called tied+ smallholders.

### *Tied smallholders*

The Indonesian government has promoted oil palm cultivation as a major vehicle for rural socio-economic improvement. This has been done largely through outgrower or contracting schemes, where farmers transfer a portion of their land to an oil palm company for inclusion in an estate plantation (referred to as 'nucleus estate' or '*inti*'). The farmers' remaining land is also planted by the company, but is retained as individual smallholdings by the farmers (referred to as 'plasma').[55] Tied smallholders supply their produce to the plantation company's palm oil mill based on a contract, while the plantation company retains responsibility for technical assistance and marketing. Over time, various models of the outgrower schemes have been applied in Indonesia. An overview of these systems is presented in Figure 7 and Table 2.

### *1977 Introduction NES Projects by the Government of Indonesia*

Since the 1960s the World Bank, other donors and the Government of Indonesia have promoted certain modes of smallholder engagement involving nuclear estate and outgrower schemes.[56] In 1977, a more structured approach to smallholder promotion was introduced with the Nucleus Estate and Smallholder projects, better known as NES or *PIR Berbantuan*.[57] The NES projects consisted of collaboration between the Indonesian government and foreign donors.[58] The objective of the first NES project was to "*mobilize the expertise of state-owned estate companies to help establish smallholdings for landless and poor settlers on unexploited land suitable for rubber planting.*"[59] The state-owned estate companies referred to this approach as the PT Perkebunan Nusantara (PTPN). Although the focus was on rubber, the project also included coconut and oil palm production. The first NES projects were located in the provinces of Aceh, Riau, Jambi, South Sumatra, Lampung and West Java. The role of oil palm became more predominant in subsequent NES projects. The NES projects introduced the concept of settlement development, where most of the settlers come from areas surrounding the project.

[55] Rist *et al*. (2010)

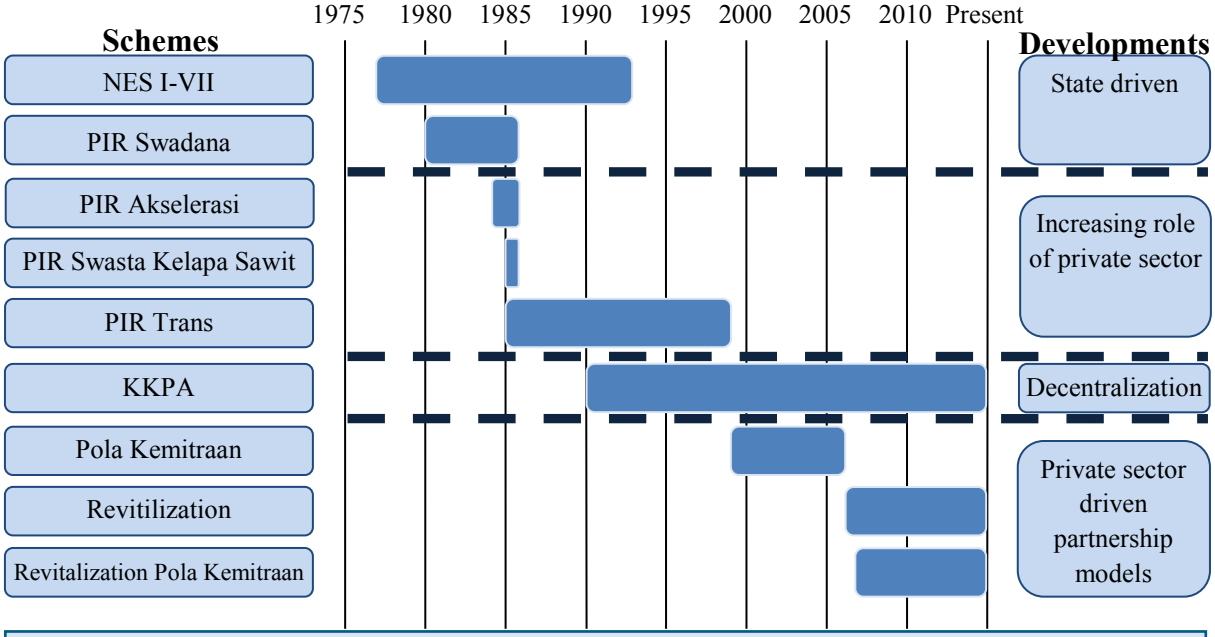
[56] McCarthy & Cramb (2008)

[57] The name Nucleus Estate Program (NES) is translated into Indonesian as *Perusahaan Inti Rakyat* (PIR) .The concept of PIR already existed in the Indonesian tea and rubber sectors. In relation to oil palm, the name PIR was first introduced in official regulations in 1980, when the NES program was officially called *PIR Berbantuan* but was popularly known as*PIR BUN* (which can be translated as "PIR programs supported by foreign donors").

[58] Mainly the World Bank and Asian Development Bank, but also supported by KfW and IFAD.

[59] World Bank (1989)

**Figure 1:** Overview of major smallholder schemes




***Smallholder schemes***

The first state led schemes in Indonesia were introduced in the late-1970s. In the mid-1980s, the governmental role in these schemes decreased and private partners (plantation companies/mills) were encouraged to become more involved. The KKPA program in the 1990s introduced a new decentralized governance system, in which farmer organizations became engaged in the coordination of smallholder plantations. In 1999 *Pola Kemitraan* introduced new partnership models, including shareholder models, which could result in a reduced autonomy of smallholders regarding plantation management. The most recent models have a private sector focus and include replanting efforts.

***NES programs, the framework***

All settlers were allocated an area of:
- palm oil (~2 ha),
- food crop (0.8 – 1.9 ha),
- garden area (0.2 – 0.5 ha)

The project provided full-time employment for new settlers as estate laborers for about three years after settlement. The company remained responsible for the maintenance of infrastructure and continued to supervise participating smallholders.

In NES projects the development costs were to be converted by Bank Rakyat Indonesia (BRI) into standardized individual smallholder loans. These costs included tree planting costs, housing, a portion of the infrastructure costs of the settlement and food crop development through the first three years, as well as the estimated further costs to bring the tree crop to maturity. These smallholder loans had fixed interest rates and generally a two or three-year grace period. Under NES II, smallholders with new plantings would repay over 19 years by delivering 25 percent of their production to the estate mill. Settlers were free to sell the remainder of their crops wherever they wished, but it was expected that prices offered by the nucleus estate would be sufficiently above those of local traders to attract the whole crop and benefit the settlers accordingly. Under NES IV, the loan was expected to be repaid after 17 years, but the proportion of oil palm allocated for debt service would vary according to price and would not exceed 30 percent of annual oil palm production. After three years each smallholder would, if his performance was judged to be satisfactory by the plantation, receive land title for the whole allocated area. These titles would be retained by BRI until the loan obligations of each smallholder had been fulfilled.

The ratio between nucleus plantations and plasma plantations differed per project. For example, the NES I & II projects realized a 25:75 ratio, but in NES projects financed by the Asian Development Bank this ratio

varied between 35:65 and 25:75.[60] Between 1977 and 1994, all NES projects together involved over 36,229 smallholder households with 72,200 hectares of planted oil palm.[61]

**Table 1:** Overview of major Indonesian smallholder scheme

| Scheme name | Period | Nucleus | Beneficiary | Conditions |
|---|---|---|---|---|
| NES or PIR-Berbantuan | 1977 - 1994 | State-owned | Local | Smallholder receives technical and marketing support from nucleus company. |
| PIR-Swadana (PIR Lokal &PIR Khusus) | 1980 – 1986 | State-owned | PIR Lokal – local PIR Khusus- transmigrant | Smallholder receives technical and marketing support from nucleus company. |
| PIR-Akselerasi | 1984 – 1986 | Private and state-owned | Local and transmigrant | Smallholder receives technical and marketing support from nucleus company. |
| PIR Swasta Kelapa Sawit | 1985-1986 | Private and state-owned | Local and transmigrant | Smallholder receives technical and marketing support from nucleus company. |
| PIR-Trans (and PIR KTI for Eastern Indonesia) | 1986 - 1999 | Private and state-owned | Local and transmigrant | Smallholder receives technical and marketing support from nucleus company. |
| KKPA | 1990 - Present | Private and cooperatives | Local and transmigrant | Increased role and responsibilities for smallholder cooperatives. KUD manage smallholder plots collectively |
| Pola Kemitraan | 1999 – 2006 | Private | Local and transmigrant | Profit sharing model (management by company), and transfer of plantations after 15 years to smallholders |
| Revitalization | 2006 – present | Private, state-owned and cooperatives | Local and transmigrant | Smallholder receives technical and marketing support from nucleus company and profit sharing model |
| Revision of Pola Kemitraan in 1999 (Plantation Business Permit Guidelines) | 2007 – present | Private, state-owned and cooperatives | Local and transmigrant | Profit sharing model, grants (such as transfer of plantations after 15 years to smallholders) and negotiated credit arrangements |

*Source: various sources*

### *1980 - Development of more NES Projects; introduction of the private sector*

Since the first NES project was approved by World Bank in 1977, a number of smallholder schemes have been introduced with predominantly Indonesian funding, which all followed the nucleus-estate model. For example, in 1980 the Indonesian government introduced the *PIR Swadana*, which consisted of *PIR Lokal* (with smallholders from neighboring communities) and *PIR Khusus* (with migrants from Java). Between 1980 and 1986 the *PIR Swadana* has benefited over 39,251 smallholder households with 75,265 hectares of planted oil palm.[62]

Whereas the original NES projects were designed to accommodate local communities surrounding state-owned oil palm plantations, the newer schemes were increasingly linked to the objective of resettling people from the more densely populated areas, notably Java, to the outer islands. Another development was that from the mid-1980s, multilateral donors widely criticized state-led smallholder development and transmigrant schemes. Policy approaches began to favor market-based approaches, with much less state involvement. As a result, the state adjusted its policies, gradually withdrawing from direct support of

[60] Asian Development Bank (1995)

[61] Calculation based on Lembaga Riset Perkebunan Indonesia, http://www.ipard.com/art_perkebun/tab1_art_wayan.htm, which uses figures provided by the Ministry of Agriculture

[62] Calculation based on Lembaga Riset Perkebunan Indonesia, http://www.ipard.com/art_perkebun/tab1_art_wayan.htm, which uses figures provided by the Ministry of Agriculture

smallholder inclusion.[63] These developments resulted in the introduction of the *PIR Akselerasi* (1984) and *PIR Swasta Kelapa Sawit* (1985), which allowed the private sector to invest in oil palm cultivation alongside the state-owned PTPN.[64] In 1986 this scheme was converted to the *PIR- Transmigrasi* or *PIR Trans.*[65] This scheme was based on joint government and private investments and was linked to transmigration programs; it ended in 1999 (see Text Box 2 for its basic features).

The *PIR Trans* model was very similar to the original NES and *PIR Swadana.* Farmers still received 2 ha of oil palm, but did not have to pay for the housing, and the plot for food production and their garden plot was reduced to 0.5 ha. Since the *PIR Trans* scheme began, the obligation of the participating smallholders to sell to the nucleus estate mills has been emphasized. Additionally, the scheme formally prescribed a ratio between the nucleus estate (*inti)* and plasma of 20:80.[66] Nonetheless, figures between 1986 and 1999 show that the plasma share varied between 40 percent and 80 percent, with an average of 75 percent. Total acreage of oil palm smallholder plasma under *PIR-Trans* scheme in that period reached 476,156 hectares, which roughly corresponds to 238,000 smallholders based on the assumption that each smallholder received 2 ha of oil palm.[67]

### *1990: Decentralization through empowerment of KUDs: the KKPA Scheme*

In 1978, Presidential Instruction Number 2 introduced the Village Unit Cooperative, or *Koperasi Unit Desa* (KUD), as a means to promote agricultural development and rural businesses.[68] It assumed that the KUDs would organize farm credit management, distribution of inputs and assistance, processing and marketing of farm output. KUDs were governed by local village authorities and were therefore considered as very political organizations. Within the NES and PIR schemes, the KUD sometimes did play a role in organizing smallholders, but the general impression at that time was that the government objectives of the KUDs often conflicted with the smallholder interests.[69]In 1990, the KUDs took a central role in oil palm development. In January 1990, Bank Indonesia launched a credit facility for the members of primary cooperatives. This scheme, called KKPA (*Koperasi Kredit Primer Anggota* or Primary Cooperative Credit for Members),[70] was again based on the nucleus-plasma constellation and copied many of the basic parameters of *PIR Trans*. However, it introduced a new element in smallholder management by making the KUD the central institute for managing smallholder business. According to official guidelines, the KUD became the central actor in the disbursement, monitoring and reimbursement of smallholder credit. They also were responsible for infrastructure maintenance and provision of basic needs. The nucleus estate was responsible for the plasma development, technical assistance to the KUD and participating smallholders, and the marketing of the entire smallholder FFB production. The nucleus estate was expected to guarantee the cooperative's loans until these had been repaid. In contrast to the NES and PIR schemes, the KKPA provided no area for food crops and no housing to smallholders. The KKPA scheme also allowed KUD to hold shares in the plantation company.[71] Furthermore, for the first time it allowed cooperatives, which have a different legal status than KUD, to develop oil palm plantations and to mill the product themselves.[72]

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[63] McCarthy *et al*. (2011)

[64] Minister of Agriculture decree no. 469/Kpts/KB.510/6/1985

[65] Presidential Instruction no. 1/1986 and Joint decree by the Minister of Finance and Head of Bappenas no. 591a/kmk.011/1986 & nr. KEP.052/KET/7/1986, later this scheme also included a special program called PIR Trans KTI which specifically targeted the East Indonesia region

[66] Ministry of Agriculture Decree no. 333/Kpts/KB.510/6/1986

[67] Forest Watch Indonesia (2001), based on data from the Ministry of Forestry and Plantation viewed on http://fwi.or.id/data_hutan/proyek_pemerintah/Perkembangan%20Realisasi%20Luas%20Areal%20Kelapa%20Sawit%20dan%20Kelapa%20Hibrida%20PIR%20Trans%2098-99.htm

[68] Cooperatives have existed in Indonesia since the 1920s.

[69] World Bank (1989), Suradisastra (2006) and Jelsma *et al*. (2009)

[70] Surat Keputusan Direksi Bank Indonesia nomor: 22/81/KEP/DIR, 29 Januari 1990, tentang Penyempurnaan Sistem Perkreditan & Surat Edaran Bank Indonesia nomor: 22/3/UKK, 29 January 1990, tentang Kredit Kepada Koperasi

[71] Joint Decree by Minister of Agriculture and Ministry of Cooperatives: No. 73/Kpts/OT.210/2/98 and No. 01/SKB/M/II/1998

[72] These cooperatives are called: *Koperasi yang melakukan kegiatan usaha dibidang perkebunan* (or cooperatives that conduct business activities in the field of plantation). We are not aware of any situation in which this has been realized.

***Basic set up of the nucleus company and smallholders scheme for transmigrants (PIR-Trans) based upon the Presidential instruction nr 1 year 1986***

Instructions to eight Ministries, Governor of Bank Indonesia and head of Investment Coordinating Board to support and to execute PIR-Trans scheme. Among instructions to different ministers can be found in the table below:

| Ministry | Responsibility |
|---|---|
| National development planning/ head of BAPPENAS | To coordinate and harmonize relevant planning with PIR-Trans |
| Agriculture | To implement and increase plantation activities via PIR-Trans |
| Transmigrants | To provide and prepare participants of transmigrants program together with land and settlement development |
| Home affairs | To provide guide and instruction to Governor and head of district on implementation of PIR-Trans |
| Finance | To provide funds and to stipulate specific regulation related to financial support for PIR-Trans with state budget as the source |
| Forestry | To manage process of forestland release for PIR-Trans scheme as required by law |
| Cooperative | To encourage PIR-Trans smallholders to establish cooperative in order to manage their smallholder estate |
| Governor of Bank Indonesia | To provide funds and to stipulate specific regulation related to financial support for PIR-Trans with bank's loan as the source of fund. |
| Investment Coordinating Board | To accelerate permit process and other investment facilities as required for implementation of PIR Trans development |

The package of PIR-Trans program consisted of:

- Development of nucleus estate (20 percent of total area)
- Development of smallholder estate (80 percent of total area)
- Development of transmigrant settlement/housing
- Supporting public facilities/infrastructure

Financial support for smallholder estate development in terms of credit provided by:

- Bank of Indonesia (55 percent from total investment)
- Approved Banks by Bank Indonesia (45 percent from total investment). The most recent approved Bank by Bank Indonesia are: BRI, BNI and Bank Mandiri.

Smallholder eligible for PIR-Trans smallholders scheme:

- Transmigrants as stipulated by Minister of transmigration
- Local communities as stipulated by local government
- Shifting cultivation farmers surrounding forestland areas for PIR-Trans smallholders scheme as stipulated by local government

Smallholder responsibilities:

- To reimburse the cost of smallholder estate development
- To cultivate smallholder estate based on company's guidance
- To sell FFB to company with mutual benefit price

Company eligible for PIR-Trans program:

- Both private and company state who is designated by Government based on their financial and human resource and management capabilities

Company responsibilities:

- To develop nucleus estate and mill for processing of nucleus and smallholder's FFB.
- To develop smallholder plasma based on operational guidance and standards from Agriculture Department
- To provide and develop smallholder's settlement based on technical guide from Agriculture Department and financial support from Transmigration Department
- To provide technical assistance for smallholders to manage their smallholder estate
- To purchase smallholder's FFB with price according to the standard of the Agricultural Department
- To facilitate the process of smallholders' credit disbursement\

*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013*

According to the KKPA scheme, smallholders were considered to be responsible for the management of their plasma plot once they completed loan repayment. However, the KUD could also remain responsible for the management of the smallholder plots after loans had been repaid.[73] Consequently, various KKPA schemes currently found in Indonesia have a system where the KUD – often managed by the nucleus company – plants, manages and harvests the crop of the smallholder plasma. The smallholders themselves do not work on the land but are paid a percentage of the harvest revenue after deduction of plantation establishment and management costs.[74] Additionally, smallholders had the opportunity to become employed at the KUD to work on the plasma or nucleus estate.

Within the KKPA, the ratio between nucleus and plasma plantation was determined for each project separately.[75] Approximately 60 to 70 percent of the total scheme was smallholder plasma and 30 percent to 40 percent nucleus estate. The total smallholder acreage established under KKPA is 150,781 ha,[76] which would involve approximately 75,000 smallholders. Over time, various NES and PIR schemes were converted to the KKPA scheme.

*1999: Introduction of partnership models: Pola Kemitraan*

In 1999, The Ministry of Agriculture set out a new policy and introduced a number of different "partnership models" (*Pola Kemitraan*):[77]

- management operator (Pola KUP). A plantation company is given the mandate to operate the cooperative plantations on a fee basis;
- 35:65 equity ownership (Pola Pat K-I). Cooperatives buy a 35 percent stake of the plantation owner's equity. The government is expected to provide the funds through the social safety net fund;
- 20:80 equity ownership (Pola Pat I-K). Instead of injecting funds into plantation companies, cooperatives provide land. In return, they can own a 20 percent stake in a plantation. Thereafter, cooperatives can increase their ownership by one percent per annum, up to 51 percent;
- Build, Operate and Transfer (Pola BOT). Under this scheme, the plantation company fully operates the plantation owned by cooperatives from the tree planting stage and transfers the operation to the cooperatives after 15 years. During these 15 years, the expenses and income are recorded by the plantation company;
- mortgage system (BTN Pattern). This allows cooperatives to borrow money from banks to finance the acquisition of plantations from developers. The principal along with the interest is paid over several years.

While the Government of Indonesia continued to finance credit schemes through some of the above mentioned models, its overall share in financing oil palm development schemes involving smallholders continued to diminish. Nonetheless, the basic concepts underlying the nucleus estate model remained in the *kemitraan* schemes.[78] As in the past, oil palm companies continued to have access to land and a farming workforce for their estates, while small landowners provided areas of land to the nucleus estate in return for access to productive oil palm plots, markets, technology and high quality agricultural inputs in smallholder 'plasma' areas under plantation tutelage. As districts gained significant discretionary powers under decentralization, the *kemitraan* policy left space for a wide variety of initiatives. Consequently, the shape, significance and application of *kemitraan* policies varied widely, depending on the conditions and policies of particular districts.[79]

[73] Joint Decree by Minister of Agriculture and Ministry of Cooperatives: NO. 73/Kpts/OT.210/2/98 and No. 01/SKB/M/II/1998

[74] Jelsma *et al*. (2009) and Feintrenie et al. (2011)

[75] Joint Decree by Minister of Agriculture and Ministry of Cooperatives: No. 73/Kpts/OT.210/2/98 and No. 01/SKB/M/II/1998

[76] Badrun (2010)

[77] From the Plantation Use Permit Regulation, 107/Kpts-II/1999 cited in Casson (1999)

[78] McCarthy & Cramb (2008)

[79] Zen *et al*. (2008)

A big change compared the previous schemes was that under the *kemitraan* framework, the nucleus company was required to develop at least 20 percent of its total development area for participating smallholders. This created much more flexibility regarding how smallholders might access the benefits from their landholdings.[80] The size of the plots per smallholder also became more flexible and was not bound to a minimum of 1.5 or 2 ha. The schemes provided many more possibilities for a company to manage the smallholder plasma via the KUD or by themselves, without the actual physical participation of the landowners. According to a case study in Buol (Central Sulawesi), the nucleus estate received 80 percent of a concession, while 20 percent of the land was allocated to transmigrants. However, these transmigrants might never know which physical patch of land was theirs, as it was placed immediately under company management through a dividend scheme.[81] As a result, the participating landowners were no longer farming physically, but became shareholders entitled to a certain fee based on the amount of land they had granted to the nucleus estate.

The *kemitraan* scheme has changed several times since its inception. In 2007, the Ministry of Agriculture introduced the Plantation Business Permit Guidelines, which established the basic requirements for a plantation business. The impetus for this regulation was the desire of plantations to increase access to land and provide legal certainty for their business. After the economic crisis, most plantations were only willing to pay for plantation licenses if they required control over the majority of the land.[82] As such, the guidelines allowed for a continuation of the *kemitraan* or partnership models, as well as credit arrangements in which the transfer of the plantation to smallholders and the credit payment mechanism are based on negotiated agreements between the plantation company and smallholders. However, the legislation fails to clarify how a *kemitraan* partnership functions between a plantation company and a community. It stipulates that the plantation is principally responsible to negotiate directly and explain the plantation to local landowners. However, without clear guidance on what a plantation is expected to provide the community in terms of employment, health and education, arrangements often creates results to the disadvantage of smallholders.[83]

The Regulation No26/2007 stipulates that palm oil mills with a capacity of 5 tonnes FFB/hour and above must have a Processing Business Permit, or IUP-P. This permit requires processing mills to source at least 20 percent of their raw material (FFB) from their own plantations. It also stipulates that any plantation company with more than 25 ha must have a Plantation Business Permit (IUP or IUP-B), which requires the company to provide surrounding communities with a minimum of 20 percent of the total area cultivated by the company. In other words, plasma should be at least 20 percent of the total plantation area. Provision of plantation area for the surrounding community can take place through credit, grant or profit-sharing models, among others.[84]This has indirect implications for the definition of a smallholder, as it may set a maximum of 25 ha of planted area to qualify as a smallholder.

### *2006: Accelerated development: Revitalization programs*

In 2006, the Indonesian government launched the Plantations Revitalization Program[85] to accelerate the development of community plantations by means of expansion, rejuvenation and rehabilitation. It allowed farmers to participate with a maximum of four ha. In the oil palm sector, private enterprises, state enterprises and cooperatives having a plantation business license were responsible for the development or rehabilitation of the smallholder plantations. Under this program, when the trees reach productive age, they are transferred to the cooperative or individual smallholder. At that time, the smallholder signs a credit agreement with the bank, which keeps the land certificate as collateral until the loan has been repaid. The Plantations Revitalization Program also encourages the partnership model, which allows farmers to own

[80] Zen *et al*. (2008)
[81] Li (2011)
[82] Gillespie (2011)
[83] Gillespie (2011)
[84] Minister of Agriculture Decree No. 26/Permentan/OT.140/2/2007 downloaded at http://ditjenbun.deptan.go.id/images/stories/PDF/2009/iup.pdf
[85] Minister of Agriculture Decree No. 33/Permentan/OT.140/7/2006, dated July 26, 2006

shares in the company.[86] As of October 2011, the Revitalization Program had realized 164,834 ha of oil palm smallholders;[87] it aims to support the development of 587,000 ha between 2011 and 2014.[88]

Over time, the above mentioned schemes have developed many variations. While detailed legislative processes govern the location of oil palm development in Indonesia, the means by which this occurs, i.e. the particular deals offered to communities, vary significantly.[89] For example, the ratio between nucleus and plasma can range from 20:80 in the NES/PIR system to 80:20 in more recent schemes, while even cases of 90:10 exist.[90] Over time, the private sector has increased its direct control over the supply of FFB production considerably. This can be explained by that FFB production consists of a significant part of the value added of a CPO mill (44 percent for a 'best practice' plantation and CPO mill).[91] Furthermore, plantations can maximize profits by reducing their reliance on poorer quality FFB from smallholders.[92]

Moreover, there can be variations in land tenure arrangements, involvement of transmigrants, services offered by the plantation company, plantation management responsibilities, degree of involvement of individual smallholders in cooperatives, initial debt, interest rates and conditions for repayment.[93] Other factors that can influence the outcome of a scheme can be the district Regent's (*Bupati*) philosophy concerning oil palm for rural development, the role of the village or *adat*[94] leader, the role of producer organizations and access to alternative sources of income.[95]

*Subsequent programs demonstrate changing role of the tied smallholder*

The variety in schemes has also resulted in various relationships between plantation companies and smallholders. The following archetypes can be identified:

- *Smallholder as outgrower*
  The company, either directly or via the cooperative, provides inputs, technical assistance and finance, while the smallholders cultivate their land and are obliged to sell their FFB to the company. The degree and quality of services may vary from nearly absent to highly professional. As long as the smallholders have not repaid their loan for plantation establishment, the formal ownership of this land remains in the hands of the company. Sometimes each smallholder works individually on his or her holding on one block. Smallholders receive income according to the weight of their individual plot or a share in the total FFB sales of the entire block.[96]

- *Smallholder as worker*
  The company arranges for laborers to work the land, while providing inputs and monitoring the quality of production. Through this system, tied smallholders may have the option to work on the nucleus or plasma plantation as a worker, either directly hired by the estate company or via the cooperative. Plantation workers may also come from outside the scheme;

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[86] Regulation of the Minister of Agriculture No. 33/Permentan/OT.140/7/2006 on guidelines for the development of plantations by means of Plantations Revitalization Program, published in Business News Nos. 7454, 12 December 2006, pp. 2A-6A. Downloaded at http://faolex.fao.org/docs/pdf/ins69860.pdf

[87] Oleh Sepudin Zuhri, Revitalisasi perkebunan baru terealisasi 6,2 percent in Bisnis Indonesia, 15 November 2011, viewed at http://www.bisnis.com/articles/revitalisasi-perkebunan-baru-terealisasi-6-2-percent

[88] Ministry of Agriculture, Directorate of Plantations, Permetuan Koordinasi Pelaksanan dan Rencana Program; Revitalisasi perkebunan, December 2009, viewed in December 2011 at http://ditjenbun.deptan.go.id/budtanan/index.php?option=com_content&view=article&id=41:pertemuan-koordinasi-&catid=15:home

[89] Rist *et al*. (2010)

[90] Jelsma *et al*. (2009)

[91] IPOC cited in Gillespie (2011

[92] Gillespie (2011)

[93] Feintrenie and Levang (2009)

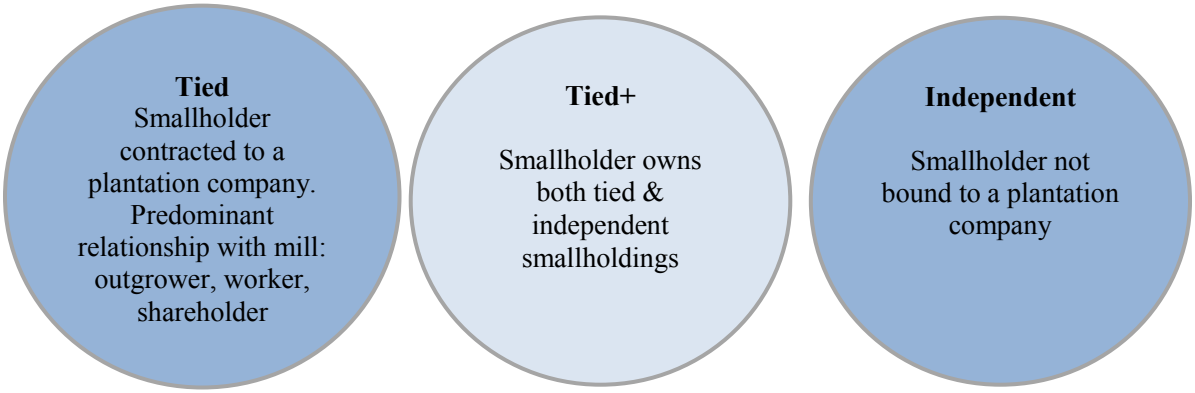
[94] Adat leader is a village leader or leader of an ethnic group

[95] Gillespie (2011)

[96] Jelsma *et al*. (2009)

- *Smallholder as shareholder*
  The company, either directly or via the cooperative, is fully responsible for the management of the smallholder blocks. The planters' rationale is efficiency casting doubt on the ability of smallholders to reliably apply fertilizer at the recommended rate, or to manage their own holdings in a uniform and 'professional' manner.[97] The smallholders play no role at all in farm management, but collect their income once per month based on their "share" of two or more hectares, for which they may or may not have the formal land certificate. Such an arrangement resembles a lease contract between the company and smallholder.

**Figure 2:** Segmentation of smallholders according to the relationship to a plantation company




*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013*

The basic distinction between the smallholder as farmer and the smallholder as worker or shareholder in the context of Indonesian oil palm cultivation is that the former takes risks and invests in his or her land, while the latter two are paid a salary or fee. In practice, however, the distinction between these segments is not always clear, as many intermediate forms exist and the degree of interdependency with the plantation company has changed over time.

### *Independent smallholders (and tied+)*

The profitability of FFB production also motivates smallholders to invest in creating their own plantation. A distinction can be made between tied+ and independent smallholders.

### *Tied+ smallholders*

Tied+ smallholders are tied smallholders with additional independent plantings. Certain smallholders that participated in the NES and PIR schemes were able to save money from their original block of two ha or obtain a loan, and have used this capital to expand their plantation area. Tied+ smallholders operate as both tied and independent smallholders. As such, they can benefit from access to inputs, technical assistance and experience and a guaranteed buyer for their FFB, as well as the possibility to sell the FFB from their independent plots to other mills that pay potentially higher prices.

### *Independent smallholders*

Independent smallholders are not tied to an estate or CPO mill and are free to sell to any buyer. They sell either directly to a mill or to local traders (middlemen). If they do not have their own means of transport, they may rely exclusively on one particular middleman or the closest mill. This is because the fruit must be processed within 48 hours after harvesting.[98] Nevertheless, with fair partnerships between smallholders and companies, oil palm can become a smallholder-friendly crop. It can be highly competitive with rubber cultivation and is much more profitable than rice production.[99] Independent smallholders can be organized

[97] Li (2011)
[98] Papenfus (2000)
[99] Belcher *et al.* (2004) and Feintrenie (2010)

into farmer groups or cooperative structures, or can act individually. However, independent smallholders generally have little access to external support.[100]

Participants in the earlier schemes had acquired oil palm technology and the ability to use their titled landholdings to borrow from banks to expand production. Many entrepreneurial smallholders and rural elites responded to the booming oil palm market and invested in new oil palm developments. This development was facilitated by the emergence of independent mills[101] which offered new market channels outside the tied arrangements that had formerly bound smallholders to estate mills.[102]The government of Indonesia also provided incentives to local governments to initiate and finance their own programs to support independent smallholders via *Swadaya Berbantuan* projects (e.g. Plantation Development Project Special Region (P2WK).[103]

[100] Vermeulen and Goad (2006)

[101] Some of these mills can be considered illegal, as regulations stipulate that mills with a capacity 5 t FFB/hour or more should have their own plantation, see Minister of Agriculture Decree No. 26/Permentan/OT.140/2/2007

[102] McCarthy *et al*. (2011)

[103] Bappenas (no date)

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# Appendix III: Defining sustainable smallholder production

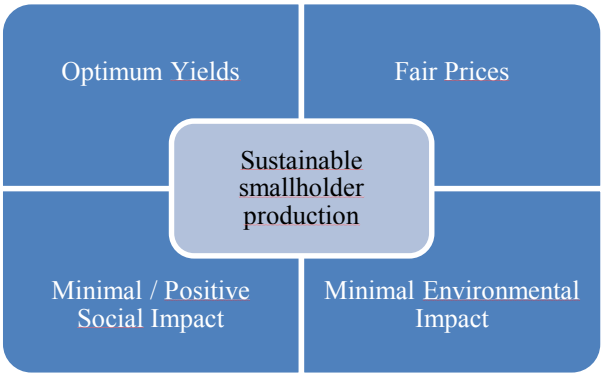
This appendix lays down the basis for developing a smallholder diagnostic instrument by addressing the concept of sustainable oil palm production and the various factors that determine sustainable smallholder production in the oil palm sector.

The World Commission on Environment and Development (1987) defined sustainable development as "…development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The delegates to the Earth Summit in Rio de Janeiro (1992) refined this definition by linking economic growth (profit), environmental protection (planet) and social equity (people) in a blue print for sustainability in the 21st century. The UN 2005 World Summit noted that the concept of sustainability requires the reconciliation of environmental, social and economic components.[104] This definition has various implications for oil palm cultivation. First of all, oil palm cultivation can only be considered sustainable if it takes place in an environmentally and socially responsible way. As such the 'do-no-harm' principle applies, in the sense that negative impacts should be avoided. Oil palm cultivation can also contribute to social and economic development, and as such should reinforce 'do-more-good' principles. It can create rural employment and income opportunities for farmers, and as such may contribute to more resilient rural communities.

### *Definition sustainable smallholder production*

Sustainable smallholder production can be defined according to the framework shown in Figure 9.

**Figure 1:** Key element of sustainable smallholder production




*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013*

In this study sustainable smallholder production is defined as:

- long-term economic and financial viability by optimizing yields and obtaining fair prices;
- responsible consideration of employees and of individuals and communities affected by smallholders;
- environmental responsibility and conservation of natural resources and biodiversity.

### *Optimization of yield could reduce need for land*

Yield should be an important consideration in defining sustainability in oil palm cultivation. Oil palm already has the highest oil yield per hectare compared to other feedstock (soybean, rapeseed and sunflower) for oil, producing between five and ten times more than its nearest rivals and as such requires far less land area than other crops to produce the same amount of oil.[105] However demand is increasing and projections for Indonesia alone show that additional land requirements for future palm oil production expansion range between 5 and 20 Mha.[106] Such expansion increases the risks that high conservation value forests may be

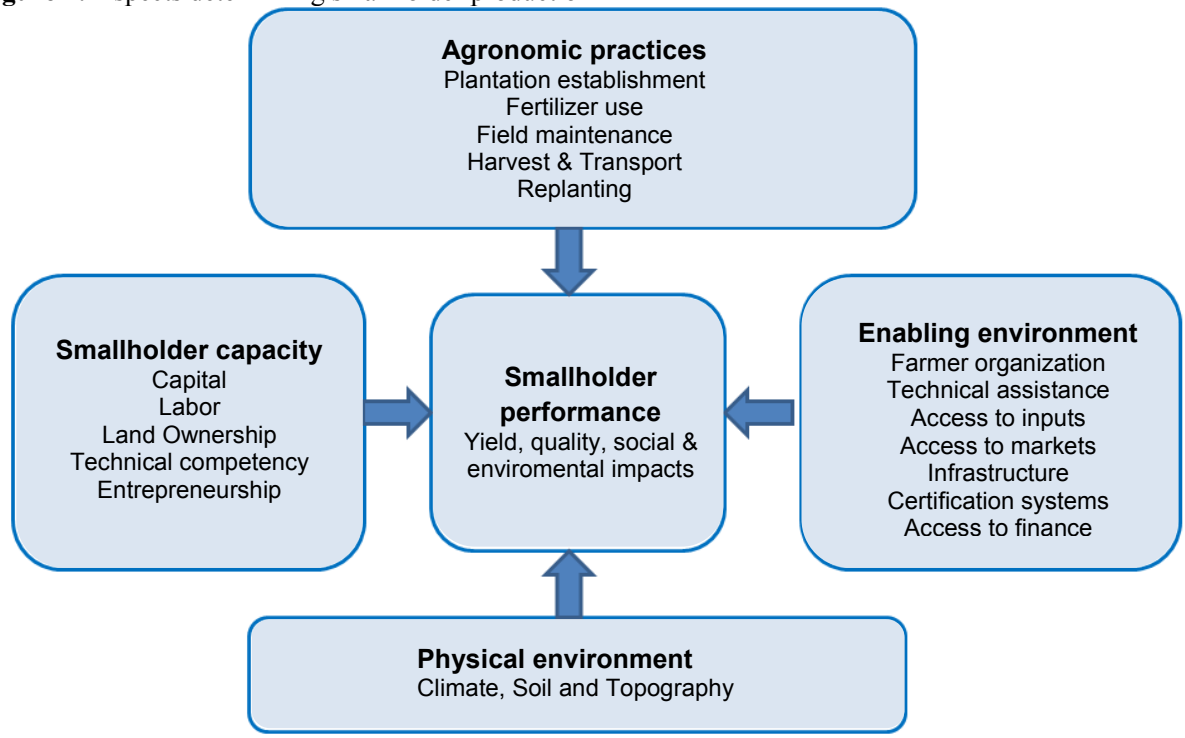
[104] UN (2005)
[105] Ista Mielke (2010)
[106] Wicke *et al*. ( 2008)

converted directly or indirectly, threatening the rich biodiversity in these ecosystems and/or giving rise to social conflicts between indigenous communities and growers. Taking these aspects into account, optimization of the yield on a given hectare of land is therefore an important element of sustainable farming. However, if profits from oil palm cultivation rise and financing is made available, a stimulus to farmers in Indonesia could occur whereby they seek out additional land which may be located in areas of high conservation or of high carbon stock. The assumption that higher yields will reduce pressure on land can only be made if at the same time adequate land use planning policies and practices are in place.

### *Factors determining smallholder production*

To operate their oil palm plantations, smallholders have to take many aspects into account. Their practices depend on a variety of factors including physical conditions, the personal capacity and character of the smallholder, production processes and agronomic practices, and enabling environment. An overview of all relevant aspects is shown in Figure 10.

**Figure 2:** Aspects determining smallholder production




*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013*

All these aspects combined determine the constraints and opportunities of sustainable smallholder production. They are explained briefly in the following sections by summarizing the current state of knowledge on these aspects, sometimes enriched with assumptions on the Indonesian context derived from desk study.

### *Physical environment*

The physical environment sets the limits of optimal oil palm production. The main variables are climate, topography and soil.

### *Climate*

The oil palm – *Elaeis guineensis*– grows optimally with day temperatures of 30-35°C and night temperatures usually not falling below 20°C (cold-tolerant hybrids can withstand 12°C). In all months of the year it requires at least five hours per day of strong sunlight and only thin clouds at other times (2000 hours of sunlight per year). Relative humidity should be higher than 75 percent in commercial production areas. For optimal growth, at least 150 mm of rain each month of the year is required, falling mostly at

night. Winds should be gentle and without tropical storms. Consequently, oil palm cultivation is essentially limited to equatorial regions – between 10°N and 10°S latitude.

*Topography and soil*

The optimum altitude is less than 300 m and although sub optimum growth is possible above this 500-700 m are considered the upper limit. The soil matrix should provide enough structure to hold the palm upright and act as a temporary reservoir for nutrients and water, yet enable roots to penetrate. Deep, well-drained soils are ideal. The best terrain is flat or very gently undulated.[107] Planting on sub-optimum land (hilly or swampy areas) negatively impacts productivity and requires appropriate measures to mitigate the adverse effects, such as terracing or drainage. Such measures are expensive and add to land preparation costs.[108]Planting on heath land and peat land also requires additional ongoing maintenance costs. Together these elements can serious limit the options to continue oil palm cultivation into the next 25 year cycle.

*Agronomic practices*

Whether a farmer can obtain the optimal yield from a specific parcel of land depends on the agronomic practices or production process applied to the land. The most important practices are:

- plantation establishment
- fertilizer input
- field maintenance
- harvest and transport
- replanting

**Figure 3:** Oil palm production process


*Source: Aidenvironment, Global Sustainability Associates and Triodos Facet, 2013*

*Plantation establishment*

Good agricultural practices positively influence the potential yield of oil palm blocks and define the sustainability of the land whilst good management practices aim to minimize wastage. The starting point for both is selection of the site and ensuring that the oil palm seedlings are spaced out correctly and firmly planted to the correct depth. Sowing of leguminous cover crops at the time of planting reduces erosion when the land is at its most vulnerable, at and just after land clearing. The cover crop supports a closed nutrient cycle and adds organic nitrogen to the soil as well as increasing organic matter through leaf litter. Terracing or platforms to level out larger or smaller areas, respectively, on slopes and properly constructed drainage systems for waterlogged areas are also considered good planting practice. During the immature phase of oil palm cultivation (0-3 years), diseased or damaged palms should be replaced to maintain a full stand of palms; fertilizer application during the immature phase is crucial to help ensure early yield.[109]

*Palm oil plantation without cover crop and showing bare earth. Such sites would be prone to erosion.*

The performance of planting material determines the upper limit of oil yield and palm productivity. Obtaining the best

[107] http://ecoport.org

[108] Molenaar *et al*. (2010)

[109] Unilever (n.d.) Sustainable Palm Oil: Good Agricultural Practices Guidelines & OPIC et al (n.d.)

planting material is therefore paramount to establishing a good block. Planting material consists of seedlings, which generally need at least 3 years to start producing FFB. Newer planting materials are more precious and need only 2 years.[110] The planting material can be obtained from the mill, a cooperative or from individuals. The quality of planting material can vary significantly.

There are three main varieties of oil palm planting material (Figure 7): *Dura* (D), *Pisifera* (P) and a hybrid of these two varieties, called *Tenera* (DxP). They are distinguished by their fruit characteristics: kernel size, thickness of the kernel shell, and mesocarp (the oil-containing pulp surrounding the kernel). Dura fruits have thick shells, a thin mesocarp, a large kernel and varying oil content. *Pisifera* fruit have a small kernel, are shell-less and have higher oil content. The *Tenera* palms are bred using *Dura* and *Pisifera* sources of known pedigree to give superior quality seeds. These parents are selected based on characteristics such as oil and kernel extraction rates, height increment of the palm, productive age and amount of yield.[111]The *Tenera* fruits are planted in estates across the world, and increasingly productive varieties are being developed.[112] Smallholders are often tempted to save seed from field planted palms in the belief that their offspring will be as good as the parent. Such practice is a false economy, as 50 percent of the seed sown in this way will not be hybrid and will have poor yield. Given the gains made in recent decades in certified breeding programs, the use of such farm-saved seed in replanting is especially ill-advised. Not only is 50 percent of the seed unlikely to be true to the original, but even in the best case the potential oil production will be no better that the initial planting material from 20 to 25 years ago.[113]

### *The main oil palm varieties*

*Dura fruit with thin layer of orange pulp and the thick kernel shell*

*Pisifera fruit with no kernel and shell*

*Tenera fruit with thick layer of orange pulp and the thin shell to the kernel*

### *Fertilizer use*

Fertilizer use is an important variable in post-planting smallholder productivity. The most important elements needed by the palms are Potassium (K), Magnesium (Mg), Nitrogen (N) and Phosphate (P). The type and amount of fertilizer to be applied is normally determined by annual tissue sampling of palms. Precision fertilization is supported by periodic soil samples, which indicate the reservoir of nutrients in the soil. Tissue sampling to determine nutrient levels in the palms themselves may be costly for smallholders working individually, but can be acceptable for organized groups of smallholders. Realistically, only larger companies and well-organized cooperatives can employ this method. But without tissue sampling it is impossible to determine what nutrients the palm actually needs. Blanket fertilizer applications may lead to insufficient or excessive fertilizer use, resulting in suboptimal yield or wastage. Defining suitable levels of fertilizer application without tissue sampling is possible, but less precise. For instance, existing data from surrounding estates could be analyzed to provide a "district norm".[114]

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[110] Personal communication S. Lord

[111] Dumortier *et al*. (2006)

[112] Sumatra Bioscience (2008)

[113] Personal communication S. Lord

[114] OPIC *et al*. (n.d.)

Returning empty fruit bunches (EFB) to the soil as organic mulch is also beneficial and can a supplement or even substitute inorganic, chemical fertilizers. Although the distribution costs can be equal to or higher than the costs of buying the potassium nutrients it replaces, it offers additional benefits by returning organic matter to the soil and conserving soil moisture.[115]

For plantations located on reasonably good soils, but with low yields, fertilizer application (full, timely and appropriate) should be prioritized in any effort to rehabilitate the plantation and improve smallholder income. Of course, this must be in combination with good field maintenance. Upgraded existing plantations take up to three years to start producing full yields.

### *Field maintenance*

Besides regular application of the correct types and quantities of fertilizer, other practices are needed to maintain a plantation, such as weeding and integrated pest management to minimize effects on vegetation. Other good practices involve regular pruning to maintain the leaf area and photosynthetic ability of the palm, while allowing clear views of ripe bunches for optimal harvesting with minimal loss of loose fruit (fruit that falls out of the bunches). Clearing palm circles of weeds and debris to a radius of 1.5 meters enables harvesters to position themselves correctly and to see and collect loose fruit. Complete weeding and full herbicide application causes soil erosion and fertilizer run-off. Drainage of waterlogged areas is important to avoid negative impacts on the trees and to facilitate accessibility.[116]

### *Harvesting and transport*

Harvesting practices have a large impact on oil yield performance. The OER of FFB depends on the palm variety, harvesting frequency and the time between harvesting and milling. If not processed promptly, oil content and quality decline significantly. Harvesting requires good access to the block and individual palms. Regular and complete harvesting of all ripe bunches and loose fruit is essential if high yields are to be achieved. The optimum cycle is to harvest the fruit bunches (which are produced all year round) every 10 days, but no more than every 14 days. Under certain conditions, the maximum period can be extended. Loose fruit should also be gathered systematically; it can contain up to 50 percent oil by weight. Although loose fruit comprise only a small percentage of total harvest, if not gathered this has a big impact on the OER per ha. For example in PNG loose fruit comprises 14 percent of total yield.[117] Losses are exacerbated by longer harvest intervals, because the number of detached fruits increases as the bunch ripens. If harvesting intervals are extended, failure to collect loose fruit may cause oil losses of 20 to 30 percent.

*Pile of ripe FFB according to mill standards*

FFB must be processed by a mill within 48 hours after harvest to maintain the oil content and prevent the buildup of free fatty acids. Consequently, transport practices, although not strictly an agronomic aspect, have an important impact on FFB output and quality. Fruit loss can be considerable due to long transport times or queuing at the mill. This not only reduces overall production of palm oil, but negatively affects smallholders' income; they face combined losses from higher transport costs, lower volume and possibly lower prices paid at the mill gate (reflecting poor fruit quality).

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[115] Unilever (n.d). & OPIC *et al* (n.d.)

[116] OPIC *et al* (n.d.) & personal communication C. Taylor

[117] See for example Koczberksi (2007)

### *Replanting*

The economic life cycle of an oil palm is up to 25 years as eventually the palms become too tall to harvest. Replanting is inevitable to maintain a productive cycle and delayed replanting negatively impacts productivity. In general, oil palms in Indonesia start to produce after three or four years, and reach full productivity in year eleven. Elsewhere productivity starts at two years.[118] Generally after year 16, productivity levels off and then gradually declines. The economic life cycle is considered to be finished after 25 years due to this yield decline and the physical restrictions imposed by harvesting tall palms. Breeding to improve yield is continuous and during the life of a palm breeding improvements will have resulted in newer generations of palms with considerably higher potential yields. Although palms older than 25 years continue to produce failure to replant means a failure to take advantage of the newer and higher yielding varieties.

Many independent smallholders face difficulties in timely replanting. This leads to a considerable loss in potential productivity of the current area under cultivation. In years with high FFB prices, smallholders are reluctant to take older palms out of production to begin replanting. In addition, standard plantation practice is to replant the entire area at once. The disadvantage of such a system, for smallholders is that farmers are confronted with a loss of income until their new plantations start producing after a few years. Without significant other form of income the farmers cash flow is effectively halted for up to 3 years. An alternative strategy – known as enhanced replanting –is to replant a small area progressively over as long a period as possible in order to minimize the effect on production. This phasing of replanting assures a more stable income for the farmers, and also helps to finance replanting activities. Scale however is an important factor and enhanced replanting for smallholders with blocks of two ha or smaller makes sense only if it organized collectively, where the costs of replanting and the revenues from the producing palms are shared by a group.[119] Targeting replanting at the lowest yielding areas first is sensible but requires a good knowledge of the overall average yields of a given area and an accurate field census is a prerequisite.

### *Smallholder capacity*

Smallholders' capacity to perform is determined by multiple factors, the most important being available capital, labor, land ownership, technical competency and entrepreneurship.

### *Capital*

The capacity to invest in or cover operational expenses of oil palm cultivation depends partly on a smallholders' financial situation. The income from the household's economic activities, the level of indebtedness and ability to save money are important variables, which determine the capacity to finance investments and operational costs.

### *Labor*

The lack of available household labor can be an important constraint. Many of the farmers who joined transmigration schemes in the early 1990's are now in their late forties or early fifties. Their palms are almost 20 years old, with heights of 10 to 12 meters. This makes an already strenuous manual task even more difficult and less suitable for men of that age. The income generated by palm oil production has enabled many smallholders to send their children away to further their education (secondary and tertiary), and these younger generations often remain in the cities in industrial occupations rather return to the manual agricultural work that oil palm cultivation requires.

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[118] Personal communication S. Lord

[119] An example has been developed by Dick Veen (personal communication). In Indonesia, farmers are often organized in farmers groups (*kelompok*) of 15 to 25 farmers. These farmers can collectively work their land and collectively sell their FFB. Each group has a head (*kepala kelompok*) who receives money for FFB sales, which is distributed proportionally among the members of the *kelompok*. Replanting will be executed per *kelompok* (e.g. fivepercentper year with a focus on poorly performing palms). The members are responsible for the replanting tasks. In this way, the reduced income of the *kelompok* in total remains limited and is shared by all members.

***Women in oil palm cultivation***

Women often perform different tasks on smallholder plots (both on plasma and independent plots). They can be involved in land clearing, raising seedlings, planting, fertilizing, weeding, harvesting (especially loose fruit) and selling of FFB (Sawit Watch & Women's Solidarity for Human Rights, 2010). In West Sumatra, the matriarchal social system has resulted in many of the independent smallholders being women. However, in other cases women are not necessarily involved in the decision-making processes concerning the management of the plot or spending the revenues. A case study from West Kalimantan shows that the introduction of oil palm through the expanding corporate plantation and contract farming system has undermined the position and livelihoods of indigenous women in the already patriarchal communities. "The shifting of land tenure from the community to the state via the plantation company and the practice of the 'household head' system of smallholder plot registration has narrowed women's tenure access." Furthermore, increases in the area of appropriated land have reduced opportunities for traditional mixed farming, which is especially affecting women. These developments compel women to become plantation laborers or engage in the activity of collecting loose fruit— often without permission of the plantation company (Julia & White, 2011).

*Land ownership*

Besides the physical environment, the type of land ownership and the amount of land greatly influence smallholder behavior. If Indonesian farmers want to obtain a loan from a bank, they usually have to present a land certificate as collateral.[120] Land ownership also provides the incentive to invest in the land, with the assurance that long-term benefits will not be lost but will be leveraged to the family's advantage.[121]

*Technical competency*

Key technical competences are agronomic skills, reading, writing, and bookkeeping. The personal character of the smallholder is also a determinant factor in performance as skills such as forward planning and negotiation are also required.

*Entrepreneurship*

Entrepreneurial behavior is shown by a willingness to invest and to take risks with the expectation of profit in the face of uncertainty. An entrepreneurial farmer is growth-oriented, persistent, proactive, thinks of solutions and opportunities, and is always looking for the best information and deals. The level of commitment and responsibility regarding the oil palm venture makes a big difference. An important characteristics of the Indonesian smallholder is its dual character of being both enterprise and family, both producer and consumer. Therefore an important trade-off exists between different household goals on the consumption side and production side. This trade-off is to a great extent determined by time preferences. Previous field work revealed many stories in which smallholders give a bigger weight to their short-term consumptive needs instead of future consumptive needs.[122] For example, they would rather buy a motorbike or a car on credit than to invest in fertilizers. It is not an exception that credits obtained for productive purposes have been used for consumptive purposes. In this respect, increased social status gives a direct social return. Likewise, the acquisition of new lands may give more status than to invest in the quality of existing holdings. Intra-household or family relationships may also influence smallholder decision making behavior. Priority can be given to help out a family member, even if this is at the cost of the farm. Likewise, within a household, resources are pooled, income is shared, and the adult may members make decisions

[120] Some banks also may accept vehicle property papers, gold or evidence of income as collateral (USAID, 2008). Some credit programs linked to plantation schemes also accept projected crop production as collateral.

[121] Molenaar *et al*. (2010). Land titling schemes may also have perverse effect on current users of this land. See for examples from South East Asia: Hirsh P. (2011)

[122] Molenaar *et al*. (2010).

jointly. Gender relationships are particularly important in this sense. Conflicts and issues concerning distribution of revenue and payment for labor input (at a family and extended family level) are important factors that determine the boundaries of a entrepreneurial approach to oil palm cultivation.

### *Enabling environment*

The above sections addressed the physical and agronomical factors for which the smallholder typically is responsible. It showed that yield improvements can be obtained through better agricultural practices, good inputs, improved logistics and cultivation on good soils. However, local production networks are shaped by policy models, regime interests, agribusiness strategies and community responses of the schemes outlined in the first section.[123] These aspects establish the enabling context for sustainable production practices. This study has identified seven key aspects in the enabling environment that determine the incentives and disincentives for smallholders to increase yields and use sustainable practices. These aspects are:

1. access to farmers organizations: Horizontal grouping of farmers;
2. access to technical assistance: Training programs, advice and awareness campaigns;
3. access to inputs: Planting material, fertilizers, herbicides and pesticides;
4. access to markets: Pricing, contracts with mills, demand for RSPO certified CPO;
5. quality of infrastructure: Roads, bridges, drainage systems;
6. access to finance: Investments and working capital;
7. access to certification: Adapted practices, training programs, mill access.

These aspects may vary widely for tied, tied+ and independent smallholders. Where applicable, we have made a distinction between these groups of smallholders. However, making generalizations per group is risky as the diversity in Indonesia within these groups is very high.

### *Aspect 1: Access to farmer organization*

Farmers are individuals and as such unique therefore standards can vary widely between individual farms. This can result in issues in terms of quality and predictability of crop from a given area but also lead to serious problems if sanitation is neglected or ignored. . If one farmer neglects to control a pest or disease, it may spread and affect production on neighboring farms. Group cohesion plays a critical role. Indonesian smallholders can be organized into groups at various levels. The lowest level of organization is often the more informal self-help groups. Working in such a group can have several benefits:[124]

- coordinated and timely harvest, resulting in complete crop recovery and high yields;
- uniform standards of plantation management;
- efficient and effective FFB transport;
- effective and coordinated control of pests and diseases;
- effective and coordinated maintenance of roads;
- effective administration and aggregation of data collection;
- very low incidence of individual farmer failure and high sense of solidarity among farmers within individual farmer groups;
- very low incidence of theft of FFB by smallholders and strong group control;
- enhanced replanting.

While some tasks can be organized and controlled at the farmer group level, other tasks are more effectively managed at a higher organizational level. In Indonesian an example of such an organization is the KUD which itself is a cooperative. Indonesia's Cooperative Act no. 25/1992 defines a cooperative as a business entity formed of individual members or other legal cooperatives, with activities based on the principle of cooperation as well as a tool for economic progress based on family values. A primary cooperative is a cooperative founded by and composed of at least twenty individual members. A secondary

[123] McCarthy *et al*. (2011), Jelsma et al. (2009) and Zen *et al*. (2008)

[124] Jelsma *et al*. (2009)

cooperative is founded by and composed of at least three cooperative members. Membership is based on shared economic interests. The Act also explains the functions of a cooperative. The possible role played by cooperatives has been defined:[125]

- management of farmer payment system;
- distribution of fertilizer;
- organization of harvesting (sequence of harvest within and between groups);
- FFB quality control;
- pest and disease control;
- effective group administration and aggregation of data collection;
- road maintenance;
- representation of all farmers to outside organizations (including the mill);
- provision of technical assistance.

*Aspect 2- Access to technical assistance*

Technical assistance for smallholders is useful at all stages and in all aspects of oil palm cultivation. It can

- increase awareness about using high-quality planting material;
- promote standards for field planting;
- contribute to a greater awareness of the benefits of fertilizers;
- help determine which fertilizers are to be used and when;
- promote good agricultural practices in pruning, weeding and the use of EFB;
- assist smallholders to improve harvesting practices;
- enhance understand of the importance of replanting.

In order to accomplish such improvements, smallholders need to receive at least some basic training and feedback on their production practices. In the smallholder sector in Malaysia, it has been estimated that adequate extension services could increase average yields from of 15.0 t/ha FFB to 20 t/ha and increase OER from 18.84 percent to 20 percent within two or three years (an oil yield improvement of 40 percent).[126]

Technical assistance may also be crucial in organizational issues. It can strengthen groups, helping them to set up the basic administration needed to monitor plantations, create fertilizer distribution schemes, create more uniform harvesting cycles and promote cooperative-based credit and saving schemes. Technical assistance is also a key factor for smallholders to gain access to the Round Table for Sustainable Palm Oil (RSPO) and Indonesian Sustainable Palm Oil System (ISPO) certification, as it may help farmers to reach and maintain compliance with the Principles and Criteria.

In summary, reliable and accessible technical extension services are crucial and the Malaysian example shows a potential 40 percent CPO yield increase. They can also create an environment that lowers the barriers for certification.

*Aspect 3 - Access to inputs*

Key inputs for oil palm cultivation are planting material, chemical and organic fertilizers, pesticides and herbicides. Good seeds and seedlings can be acquired from seed suppliers, including various research institutes (e.g. Marihat seeds from Indonesian Oil Palm Research Institute (IOPRI)) and oil palm plantation companies. Smallholders can obtain these through the Plantation Office at the district level, through their cooperative or in the case of Tied smallholders through the company they are in partnership with. In each instance a permit is needed to obtain seeds or seedlings. Each parcel of planting material if obtained in this way is always accompanied by a certificate of origin. Some plantation companies distribute from their own nurseries; others may facilitate access to good planting material from both national and international sources. In the absence of nearby distribution points of certified planting material, or in response to the

[125] Jelsma *et al*. (2009), Fairhurst (2009)

[126] Jalani *et al*. (2002)

price of such material (real or perceived), farmers may search for alternative and non certified sources. Within Indonesia, many informal nurseries exist, which offer seedlings at half the price of certified seedlings. Much of this material is of dubious origin and likely to be contaminated with Dura origin material and therefore lower potentials yields. The situation is further exacerbated by the use of counterfeit seeds.

Smallholders can obtain chemical fertilizers either directly from local fertilizer distributors or middlemen (FFB traders) or through cooperatives, who can order from either the plantation company (valid for tied smallholders) or from fertilizer distributors. Some plantation companies facilitate access to fertilizers for their tied smallholders.

A full fertilization program for mature palms accounts for 75 percent of field costs on average, amounting to approximately US$430 per hectare per year at 2010 prices. To smallholders, fertilizer costs may be a burden, especially for those who enter into an organized planting program as part of a wider company/smallholder scheme without full fertilizer application at establishment and suffer low yields and loss of potential income as a result. Balanced fertilizer application is required to obtain high yields. Without access to credit, smallholders tend to buy less than the recommended quantity of fertilizers, select only one type of fertilizer or use only the cheapest form, such as urea, which may not be the optimum fertilizer for the physical conditions on their plantation.

Field work in Riau and West Kalimantan in 2010 showed that some mills may return EFB to smallholders' blocks while others offer it for free at the mill. Transportation costs can be an important constraint in EFB application, as can the labor required to spread it on the field. Many companies realize the commercial benefits of EFB as a mulch within their own estates and give this priority. In addition the use of EFB as compost or fuel biomass, and there is a risk that this will further reduce smallholders' access to EFB.[127]

Herbicides and pesticides are widely available in most parts of Indonesia and constitute only a minor part of the total costs of oil palm farm inputs.

Some planting material and fertilizers are available at subsidized prices in Indonesia. Although this does increase the affordability of these inputs, these subsidized prices have some adverse effects. The availability of subsidized fertilizers has caused some smallholders to believe that the unsubsidized fertilizer prices are artificially inflated and provide an unacceptable rate of return. Fertilizers are now generally perceived as very expensive and smallholders have become accustomed to always having access to subsidized fertilizer. This represents an additional risk, because long waiting times (up to several months) for delivery of subsidized fertilizers, together with the uncertain amount delivered, favor suboptimal fertilizer application at the smallholder level. In addition, smallholders tend to avoid purchasing non-subsidized fertilizers. Perversely, the availability of subsidized fertilizers seems to send the wrong message to smallholders and may even discourage them from making the necessary investments in better fertilizer use. It may also create a bias towards subsidized types of fertilizer, while the non-subsidized types are neglected. Fertilizer subsidies are sometimes subjected to time-consuming bureaucracy, resulting in an overall negative impact on the price and availability of fertilizers all along the supply chain.

*Aspect 4 - Access to markets*

FFB has to be processed at a mill. Most mills in Indonesia are owned and operated by plantation companies with associated lands.[128]

The actual price received for FFB, independent of quality, is an important incentive for productivity. If agronomic inputs are driven by cash flow, and FFB prices are the only means of finance, it is important for farmers to receive fair prices. A cyclic relationship exists in that better prices may result in more effective

[127] Molenaar *et al*. (2010)

[128] Ministry of Agriculture Decree Nr 26/Permentan/OT.140/2/2007. Mills with a capacity of 5 ton FFB/hour or more without its own plantation which supplies at least 20 percent of its raw material (FFB) can be considered illegal.

harvesting, which in turn leads to increased income. The FFB prices in Indonesia are set by provincial governments. They are based on CPO and PKO prices and actual conversion rates reduced by an index based on the various costs for the individual mills, such as transport, processing, marketing, depreciation and administration costs. This index is called the K-index and is determined on the basis of information provided by mills within a certain locality. Smallholders have no or limited influence on the determination of the K-index.[129] This system permits palm oil companies to charge all *plasma* related operating costs back to smallholders. It gives also room to charge a range of costs to smallholders, which may have a less direct relationship with plasma costs, such as mill depreciation costs, CPO transportation costs to a harbor, CPO products spillage along the way to the harbor, the company's own interest rates, and bank transfer costs. Such a system makes the calculation of the K-index complex to understand for smallholders. Unless there is effective oversight or a cooperative that fully understands the pricing systems, smallholders may remain unaware of the costs that reduce their monthly income.[130]

One of the government's rationales to introduce the K-index was to create a minimum floor price for the FFB produced by smallholders and to avoid smallholder price variability between mills in the same district. It was also intended to avoid the 'unhealthy competition' that may lead to smallholders selling their fruit to mills other than their partnering mill.[131] However, a consequence of such lack of competition is that the mill has no incentive to pay above K-index.

FFB delivered to the mill is accepted on the basis of weight and quality. FFB entering a mill is weighed on a weighbridge and graded in a formal process known as *sortasi*, which is based on government regulations regarding the pricing of FFB.[132]The *sortasi* sets legal standards for the quality of the FFB delivered to the mill (e.g. minimum weight, length of the stalks, and ripeness) and has corresponding price penalties for fruit that does not meet these standards. The *sortasi* process may lead to various incentives to increase the quality of delivered fruit. In line with government regulations, mills do not accept FFB less than three kg, pay lower prices for unripe FFB, and reject overripe FFB with most oil-containing seeds fallen off or those with long stalks. Other mills impose a penalty on the FFB price if a certain amount of loose fruit is not included in every truckload. It is general practice that mills provide a written detailed description of the results of the *sortasi* to cooperatives, but not all smallholders trust the mills and the rigor of their *sortasi* process or understand the penalties on lower-quality FFB.

Tied smallholders have an exclusive contract with the mill that ensures they can sell their fruit to the mill. The prices they receive are generally the K-index minus several deductions (based primarily on quality, but also on interest and debt service, or other services provided by the mill). Independent smallholders may have more difficulty obtaining direct mill access. They may be confronted with long waiting lines before a mill can accept their fruit, particularly in peak crop periods. Moreover, in many cases the FFB of the Nucleus plantation is given priority access to mills over FFB from both tied and independent smallholders. Mills may exercise several incentives or disincentives to attract or refuse smallholders' FFB for reasons other than limited capacity and the *sortasi* process. Some mills have reportedly refused to buy at all from independent smallholders.[133] If a mill does not accept FFB from smallholders, the smallholders may be compelled to sell to middlemen. Middlemen are often better at negotiating mill access than smallholders, but their prices are considerably lower than those paid at the mill. In some cases, price differentials for middlemen are very transparent. In other cases, not all of this reduction can be explained by transport costs, wastage and a share in the risk. Middlemen, not surprisingly, leverage their market access, trading information and capital advantage to the full extent, potentially attaining a monopsonist position. There is often mistrust between smallholders and the middlemen. Some farmers anticipate loss attributing it to fraud

[129] Maryadi and Mulyani (2004)

[130] Gillespie (2011)

[131] Ministry of Agriculture Decree No. 395/Kpts/OT.140/11/2005 Tentang Pedoman Penetapan Harga Pembelian Tandan Buah Segar (TBS) Kelapa Sawit Produksi Pekebun (http://perundangan.deptan.go.id/admin/p_mentan/Permentan-395-05.pdf) cited in Gillespie (2011)

[132] Regulation 395/Kpts/OT.140/11/2005 concerning purchasing guidelines for pricing of oil palm smallholders' FFB pricing

[133] Molenaar *et al*. (2010)

by middlemen and so in turn develop their own methods to deceive the middlemen by adulterating the produce.[134]

*Aspect 5 - Access to infrastructure*

Physical access to a mill can have a significant influence on quality, and therefore on prices received by smallholders. Long transport distances to a mill and bad road conditions reduce the quality and quantity of the fruit and thus negatively impact the prices paid to the smallholder. Current road conditions are considered an important constraint on income by smallholders. Most smallholders interviewed have experienced missed or late fruit collection due to unavailability of trucks. This is particularly noticeable in the rainy season. Once a transportation route is disrupted, smallholders have little opportunity to adapt, and the opportunity to sell that crop passes. Bad infrastructure may also hinder the access to fields for farmers themselves, especially if smallholders' plots are located far from the villages. The additional travel time may discourage a smallholder from being present in his field for regular maintenance and harvesting, or to apply fertilizer. Bad infrastructure within the plantation, such as roads, bridges and drainage, may further aggravate this constraint by placing additional demands on transport.

*Aspect 6 - Access to certification*

Certification of FFB or CPO to a recognized sustainability standard (e.g. RSPO and ISPO) may offer the potential of a direct premium for their produce and more secure market access, or indirectly by providing support to realize better practices which in turn improve yields and so increase income. In order to comply with sustainability standards, changes in farming practices and additional investments may be needed. Access to technical assistance and additional finance is often a condition to realize this. In both RSPO and ISPO, the main unit of certification is the mill. Consequently, farmers need reliable mill access to become certified. Tied smallholders may have many more advantages in this respect than independent smallholders, although the RSPO also allows groups of independent smallholders to become certified independently.

*Aspect 7 - Access to finance*

Access to finance is a key constraint for smallholders in establishing a plantation or in replanting. Tied smallholders are generally financed through the company, which administers bank finance and makes the initial investments for establishing the plantation. Smallholders are supposed to start repayment of the principal when the palms are transferred to them at "maturity" (this may be between four and seven years from planting). With good management practices, smallholders should be able to repay their loans within five to ten years. However, some smallholders remain in debt to the company for much longer. A slow start in the establishment of a plantation may delay and reduce yields considerably in the early years, while it prevents tied smallholders from repaying their loans and making full fertilizer applications. Poor initial palm growth significantly reduces future yields and profitability, and may result in long-term indebtedness.

A similar situation exists with independent smallholders. The costs of plantation establishment for independent smallholders are estimated to be lower than for tied smallholders, as they have no overhead and use their own labor.[135] However, they have fewer options to obtain credit for the full package of investments needed to set up a well performing plantation. With restricted credit, smallholders often find that once they have cleared the land and planted the trees, there is no money left for proper fertilizer application. Again, such a slow start in production undermines the business case of yield maximization, because the income from the early years is insufficient to finance full fertilizer application and necessary operations, and so the negative cycle continues and returns diminish. A lack of initial investment capital may also result in the selection of cheaper planting material, rather than certified seedlings, and so the negative cycle can persist for the next 25 years.

Once the plantation has been established, fertilizers and infrastructure maintenance remain the largest operational costs. Under reasonable growing conditions and with good agricultural practices, oil palm

[134] Molenaar *et al*. (2010)

[135] Some claim that the advantages of the availability of own labor are partly lost by lower labor productivity and the fact that smallholders tend to pay their workers more than the minimum wage paid at companies, due to the social relations with the workers.

cultivation should generate sufficient working capital – once the palms become productive – to finance these operations. However, this also requires basic business skills, and many smallholders face difficulties in managing cash flows and in maintaining the liquidity necessary to buy fertilizers. Changes in FFB prices may influence this both positively and negatively and moreover, without access to credit, farmers may be unable to rehabilitate their plantations.

In many regions, smallholders have difficulty in obtaining bank credit, both for investments and working capital. Banks have the perception that these sectors do not have reliable, bankable collateral. This limits the ability of smallholder farmers to apply for a loan. Physical access to banks and the required paperwork and documentation are also determining factors in prospective recipients applying for loans.[136] Banks may have little experience in dealing with smallholders or in agricultural production, which causes additional reluctance to lend. A key requirement to obtain credit is the ability to provide collateral. For most smallholders, land certificates are essentially the only valid collateral. However, most smallholders do not have land certificates. They may get access to credit from banks if they can convince the plantation company or other intermediary to provide the collateral on their behalf, but not all plantation companies are willing to do this. Some tied smallholders receive fertilizers from the plantation company, which deducts costs from FFB payments. Alternative sources of credit are middlemen, credit unions and family or other acquaintances.

### *Social and environmental aspects*

The Indonesian Ministry of Agriculture developed the Indonesian Sustainable Palm Oil System (ISPO), to improve the competitiveness of Indonesian palm oil in world markets, meet the President of the Republic of Indonesia's commitment to reduce greenhouse gases and provide attention to environmental problems.[137] The current standard is applicable to the *inti* plantation and tied smallholders. Various ISPO criteria are specific for these smallholders, such as the obligation of having land certificates, a contract between the mill and smallholder, and the obligation of plantation companies to train tied smallholders in good agricultural practices. Topographic selection is outlined, for instance cultivation is not allowed on slopes above 40 percent and, whereas the preparation of drainage systems, terracing, planting of cover crops is compulsory. For each smallholder block, records on the origin of seedlings and pesticide use are to be maintained.[138] The exact requirements for independent smallholders have yet to be developed. Once available, mills should then encourage the independent smallholders they buy from to comply with the ISPO standard.[139]

The RSPO has also developed specific smallholder criteria, building on the Principles and Criteria for estates but putting them into the smallholder context. In Indonesia both tied and independent smallholders have specific national interpretations which outline RSPO Principle & Criteria in great detail. Smallholders can become certified if they are organized in a group.[140]

In general the RSPO P&C include criteria on legal compliance, such as the need for evidence of legal ownership of the land and land-use rights, which should not be legitimately contested by local communities with demonstrable rights. The use of fire to clear land in plantation establishment or replanting is forbidden. New plantings are not allowed on primary forest or areas with high conservation values (HCV) and smallholders should be able to list protected flora and fauna in their local areas.[141]

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[136] USAID (2008)

[137] http://www.ispo-org.or.id

[138] Draft of ISPO requirements. ISPO Team, January 2011

[139] 19/Permentan/OT.140/3/2011, 29 Maret 2011

[140] See for a full overview of the RSPO smallholder criteria valid for Indonesian smallholders the National Interpretation documents on http://www.rspo.org

[141] RSPO (2009) & RSPO (2010)

The RSPO has several criteria which apply to appropriate best practices and include keeping records of the type and volume of fertilizer and pesticide use. Records of training programs provided by scheme managers or smallholder organizations on various agronomic practices and occupational health and safety guidelines have to be maintained. Disposal of hazardous chemical and pesticides containers have to be in accordance with instruction labels as stated by the manufacturer. With regards to the social dimension, work by children is acceptable on family farms, under adult supervision, when not interfering with education programs and when children are not exposed to hazardous working conditions. If smallholders hire labor externally, the RSPO has different criteria, such as paying minimum wages and respecting the reproductive rights of their workers.

Standards are only one tool to enhance sustainability on oil palm production. Destruction of rainforest is rarely confined to a single actor but often the result of incremental addition of individual actors. It is this multiplier that negative effects the environmental and social landscape. Consequently, at any level of defined smallholders (schemed, tied+ or independent) a measure of spatial planning is required if the wider landscape and eco-system services are not to be negatively impacted. Such planning cannot be left to smallholders or indeed to private companies and quite rightly is the prerogative of governments whether at Federal or Provincial level. Lack of investment in enabling environment for responsible new plantings is a further challenge to sustainable development of smallholders.

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## Appendix IV: Regression tables

The following tables show the regression tables based upon the results from the Smallholder Diagnostic Survey. More background information on the variables used can be found in the background documentation on the Smallholder Diagnostic Survey Instrument (notably the questionnaire and Guidance Analysis Tool).

*Regression table I: FFB yield per ha (dependent variable) and aspects (independent variables) for tied plots and independent managed plots*

| | FULL SAMPLE | TIED PLOTS | INDEP PLOTS |
|---|---|---|---|
| | FFB yield/ ha | FFB yield/ ha | FFB yield/ ha |
| VARIABLES | | | |
| | | | |
| Age palms | 0.529*** | 0.404*** | 0.510*** |
| Plot area | -0.359*** | -2.251*** | -0.348*** |
| Plantation establishment practices | -0.122 | -4.640** | 1.033 |
| Field maintenance practices | -0.449 | 1.704 | -1.509 |
| Fertilizer use practices | 3.287*** | 1.691 | 4.085*** |
| Harvesting and transport practices | -0.498 | -2.283 | -0.868 |
| Replanting prepardness | 1.230* | 5.955*** | -1.025 |
| Entrepreneurship | -1.402 | -2.713 | -0.550 |
| Capacity smallholder | -0.618 | -2.529 | 0.507 |
| Physical environment | 2.461** | 4.427** | 2.823** |
| Access to technical assistance | -1.491* | 2.237* | -4.106*** |
| Access to farmer organization | 0.603 | -0.627 | 0.516 |
| Access to inputs | -0.425 | -3.134* | 1.959 |
| Access to markets | 3.723*** | 8.187*** | 2.494 |
| Access to infrastructure | -0.782 | -1.681 | -0.460 |
| Access to certification | 0.135 | -0.845 | 0.164 |
| Access to finance | 0.942 | -5.455*** | 2.685*** |
| Sustainbility practices | 3.549** | 0.718 | 4.287** |
| Constant | 2.137 | 16.38*** | -0.884 |
| | | | |
| Observations | 1,510 | 487 | 1,022 |
| R-squared | 0.401 | 0.188 | 0.299 |
| Standard errors in parentheses | | | |
| *** p<0.01, ** p<0.05, * p<0.1 | | | |

*Regression table II: FFB yield/ha (dependent variable) and survey questions and traffic lights (independent variables) per smallholder type and plot type*

| VARIABLES | Full sample | Farmer type: tied | Farmer type: tied+ | Farmer Type: Indep | Plot type: tied | Plot type: Indep |
|---|---|---|---|---|---|---|
| | FFB yield/ ha | FFB yield/ ha | FFB yield/ ha | FFB yield/ ha | FFB yield/ ha | FFB yield/ ha |
| | | | | | | |
| Plot area | -0.0420 | -1.783** | -0.0880 | -3.107** | 0.00569 | -0.0602 |
| Total plot are smallholder | -0.199*** | -0.283** | -0.150* | -0.106 | -0.125 | -0.111 |
| Age palm | 0.538*** | 0.275*** | 0.587*** | 0.234* | 0.562*** | 0.638*** |
| 2.plot_farmer_type | 0.857 | 1.170* | | | | |
| 3.plot_farmer_type | -0.781 | | | | -1.769*** | |
| 4.plot_farmer_type | -0.809 | 0.516 | -0.183 | | | |
| Age smallholder | -0.00106 | 0.000551 | -0.00925 | 0.00152 | -0.0810** | 0.0154 |
| Gender | -0.0724 | 1.961** | -0.741 | 1.295 | 0.290 | -0.877 |
| Education | -0.0385 | -0.0260 | -0.0873 | -0.00854 | -0.495 | -0.343 |
| Experience in oil palm | -0.0182 | 0.0259 | -0.0701 | 0.00628 | -0.127 | -0.0375 |
| Income share of oil palm | 0.0118 | 0.589** | -0.188 | 0.565 | 0.242 | -0.245 |
| Entrepreneurship | -0.297 | -0.801 | -0.256 | 0.201 | 1.508 | 0.586 |
| 2.district | -1.219 | | -1.347 | | | -0.745 |
| 3.district | -2.411** | 2.352 | -1.150 | | -7.134 | -1.053 |
| 4.district | 0.718 | 4.006 | 1.571 | | 4.945 | 2.884** |
| 6.district | -1.600** | -4.817*** | 0.0478 | -2.804 | -2.736 | 1.106 |
| 7.district | -1.179 | | -0.878 | | | 0.0240 |
| 8.district | -0.878 | -0.690 | 0.102 | 1.228 | 0.743 | 3.924*** |
| 9.district | -1.127 | 4.820* | -1.209 | | 2.622 | -1.408 |
| 10.district | 0.465 | | 3.004** | | | 5.045*** |
| 11.district | -2.216 | 0.265 | -5.164 | | -2.997 | |
| Topography | -0.0548 | -0.376 | 0.506 | -0.580 | -0.157 | 0.144 |
| Soil quality | 1.022*** | 1.212*** | 0.673* | 0.822 | 2.372*** | 0.595 |
| Access to training | -0.0174 | 0.106* | -0.161*** | 0.166** | -0.101 | -0.254*** |
| Understanding grading process | 0.347 | 0.665** | -0.118 | 0.847** | 0.487 | -0.0943 |
| Group membership | -0.0430 | 0.826 | 0.876 | 3.765 | -2.941 | 1.354 |
| Group delivers input | -0.0779 | -0.282 | 0.463 | -0.642 | 1.262** | 0.534 |
| Group delivers credit | 0.698*** | 2.087*** | -0.149 | 2.264*** | 1.713** | -0.815** |
| Group delivers FFB transport | -0.651*** | -0.710** | -0.794** | -0.657 | -0.0727 | -1.063*** |
| Availability of hybrid seedlings | -0.156 | 0.395 | -0.317 | 0.665* | 0.430 | -0.503* |
| Availability of labor | 0.104 | 0.368 | 0.0475 | 0.708 | 0.391 | -0.0376 |
| Availability of pesticides | -0.692* | -0.441 | -0.861* | -1.247 | 2.755** | -1.073* |
| Availability of subsidized fertilizers | 0.308 | 0.0686 | -0.0209 | 0.140 | -0.0296 | 0.361 |
| Availability of non-subsidized fertilizers | 0.324 | -0.751* | 0.644** | -0.640 | -2.211*** | 0.904*** |
| Communication with mill | 1.111* | -1.656 | 3.100*** | -1.601 | 1.824 | 2.118** |
| FFB market channel | 0.671 | 1.815 | 0.193 | 2.563* | 1.001 | -0.465 |
| FFB payment term | 0.127 | -1.331*** | 0.635* | - | 1.225 | -0.153 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | 1.327*** | | |
| Knowledge on FFB price | -0.302 | 0.224 | -0.189 | 0.455 | -0.545 | 0.284 |
| Access to block | 1.122*** | 0.960* | 1.380*** | 0.569 | 1.894** | 1.423*** |
| Road condition | -0.532 | -0.383 | -0.673 | 0.285 | -2.028** | -0.330 |
| Transport in dry season | -0.870*** | -0.0958 | -0.471 | -0.528 | 1.180 | -0.779 |
| Transport in wet season | 0.0762 | 0.323 | -0.476 | 0.394 | -1.456** | -0.312 |
| Transport to mill within 24 hours | 0.116 | 0.338 | 0.0515 | 0.354 | 0.540 | -0.0345 |
| Availability of transport | 0.440* | 0.00424 | 0.867*** | -0.722 | 0.153 | 1.074*** |
| Waiting lines at mill | 0.496** | 0.507* | 0.254 | 0.884** | 0.414 | 0.184 |
| Bank account | 0.325** | 0.0849 | 0.411** | 0.103 | -0.208 | 0.426* |
| Plantation loan | -0.0715 | -0.107 | -0.141 | 0.190 | -0.217 | -0.195 |
| Outstanding household loans | 0.124 | -0.208 | 0.254 | -0.0401 | -0.229 | 0.315 |
| Land title | 0.237 | -0.226 | 0.450 | -1.092 | -0.278 | 1.195*** |
| Land dispute | -0.166 | 0.164 | -0.00868 | 1.609* | -0.252 | -0.643 |
| Administration | -0.350 | -0.220 | -0.310 | 0.00825 | -1.162** | 0.0774 |
| Fertilizer use (types and quantity) | 0.742*** | 0.308 | 0.914** | -0.783 | 2.318*** | 0.776** |
| Fertilizer application frequency | 0.328 | 2.309 | -0.0493 | 2.991 | -3.440 | -0.165 |
| Pesticides/herbicides use | -0.104 | -0.404 | 0.128 | -0.975 | -0.680 | -0.0563 |
| Hybrid seedling use | 0.188 | 1.069 | 0.279 | 0.469 | 2.472*** | -0.356 |
| Harvesting frequency | 0.896** | 1.572*** | 0.488 | 1.256* | 0.313 | 0.379 |
| Erosion control | -0.101 | -0.828** | 0.347 | -1.087** | 0.154 | 0.489 |
| Drainage | 0.824** | 0.427 | 1.313** | 0.780 | 3.629** | 1.318** |
| Labor input | 0.0977 | -0.179 | 0.409* | -0.133 | -0.675 | 0.698*** |
| Weeding | 0.127 | 1.001*** | -0.279 | 1.432*** | -0.947** | -0.231 |
| Pruning | 0.324 | 0.270 | 0.0235 | -0.0816 | 1.496*** | -0.119 |
| Access to palms | -0.836*** | -0.884* | -0.612* | -0.902 | -0.227 | -0.733* |
| Constant | 4.869 | 0.814 | 18.08 | -1.406 | 154.6** | -30.22 |
| | | | | | | |
| Observations | 1,337 | 487 | 850 | 345 | 309 | 683 |
| R-squared | 0.450 | 0.397 | 0.359 | 0.500 | 0.507 | 0.362 |
| Standard errors in parentheses | | | | | | |
| *** p<0.01, ** p<0.05, * p<0.1 | | | | | | |

*Regression table III: Agricultural practices (dependent variables) and survey questions and traffic lights (independent variables) for full sample size (part 1)*

| VARIABLES | Fertilizer use | Chemical use | Hybrid use | Harvest frequency | Erosion |
|---|---|---|---|---|---|
| | | | | | |
| Plot area | -0.0203 | 0.0134 | 0.00698 | 0.00984 | -0.0171 |
| Total plot are smallholder | 0.0167** | -0.0143** | -0.0101 | 0.00107 | 0.00425 |
| Age smallholder | -0.000466 | 0.000335 | -2.35e-05 | -0.000595 | -0.00039 |
| Gender | 0.0479 | 0.137*** | -0.120** | -0.0467 | -0.0173 |
| Education | 0.0165 | 0.0457** | 0.0186 | -0.0494*** | -0.00244 |
| Experience in oil palm | 0.00234 | -0.00441 | 0.00263 | -0.00801*** | -0.00673 |
| Income share of oil palm | -0.0154 | -0.0321** | 0.0259 | 0.00960 | -0.0163 |
| Entrepreneurship | 0.874*** | 0.437*** | 0.591*** | 0.215** | 0.458*** |
| 2.district | -0.141 | 0.0797 | 0.0399 | -0.0146 | -0.164 |
| 3.district | 0.661*** | 0.526*** | -0.0557 | 0.318*** | 0.325** |
| 4.district | 0.224** | 0.587*** | 0.109 | 0.0499 | -0.0620 |
| 6.district | 0.435*** | 0.373*** | 0.00523 | 0.0896 | 0.00286 |
| 7.district | -0.0270 | 0.1000 | -0.0762 | 0.121 | -0.172 |
| 8.district | 0.199** | 0.431*** | -0.0224 | 0.138** | -0.501*** |
| 9.district | 0.764*** | 0.648*** | -0.0850 | 0.580*** | -0.0912 |
| 10.district | 0.131 | 0.583*** | -0.170* | 0.184** | 0.231* |
| 11.district | 0.110 | 0.317 | 0.299 | 0.128 | -0.127 |
| Topography | 0.0660** | -0.00284 | 0.0773** | -0.0889*** | -0.170*** |
| Soil quality | -0.0275 | -0.00272 | -0.0635** | 0.0341 | -0.00343 |
| Access to training | 0.0109*** | 0.00650* | 0.00699* | 0.00697** | 0.0175*** |
| Understanding grading process | 0.0649*** | -0.0397** | -0.0149 | -0.0262 | 0.0625** |
| Group membership | 0.180*** | 0.00668 | 0.284*** | 0.0601 | 0.219*** |
| Group delivers input | 0.00333 | 0.0336* | -0.0265 | 0.0320* | -0.0939*** |
| Group delivers credit | -9.60e-05 | -0.0231 | -0.00561 | 0.0886*** | 0.000756 |
| Group delivers FFB transport | -0.0227 | 0.000777 | 0.0935*** | -0.0516*** | 0.00634 |
| Availability of hybrid seedlings | -0.0496** | -0.0290* | 0.00891 | -0.0492*** | -0.0590** |
| Availability of labor | 0.00935 | 0.0255 | -0.00948 | -0.0466*** | 0.00407 |
| Availability of pesticides | 0.111*** | 0.227*** | 0.0438 | -0.0272 | -0.0120 |
| Availability of subsidized fertilizers | -0.0409* | -0.00956 | 0.00109 | -0.0331* | -0.0474 |
| Availability of non-subsidized fertilizers | 0.0312 | -0.00913 | 0.0838*** | -0.0317 | 0.0165 |
| Communication with mill | 0.0287 | 0.0250 | -0.0110 | 0.00770 | -0.0914 |
| FFB market channel | 0.00436 | 0.0807* | 0.320*** | 0.128*** | 0.167*** |
| FFB payment term | -0.0334 | 0.0373* | -0.109*** | 0.0514*** | 0.0905*** |
| Knowledge on FFB price | 0.00630 | -0.00992 | -0.0472* | -0.0263 | -0.0184 |
| Access to Block | -0.0306 | 0.0245 | -0.0184 | 0.0834*** | 0.0497 |
| Road condition | 0.00997 | -0.0492 | 0.00820 | -0.0249 | -0.0368 |
| Transport in dry season | -0.0519 | -0.0528* | -0.0704** | -0.00966 | -0.0438 |
| Transport in wet season | 0.0270 | 0.0585** | 0.0386 | -0.0334 | 0.0513 |
| Transport to mill within 24 hours | -0.0205 | -0.0157 | -0.0630*** | 0.0226 | -0.0619** |
| Availability of transport | -0.0565** | 0.0867*** | -0.000204 | -0.0432** | -0.0264 |
| Waiting lines at mill | 0.00123 | 0.0264 | -0.0221 | 0.0658*** | 0.00776 |

| | | | | | |
|---|---|---|---|---|---|
| Bank account | 0.0163 | -0.00789 | 0.0432*** | 0.0183 | 0.00860 |
| Plantation loan | 0.00904 | 0.0119 | 0.0189 | 0.00407 | -0.0220 |
| Outstanding household loans | 0.0108 | -0.00683 | -0.0170 | 0.0332*** | 0.00756 |
| Land title | 0.0902*** | 0.0631** | 0.00189 | -0.0990*** | -0.0277 |
| Land dispute | 0.0821* | 0.0332 | 0.0374 | -0.00875 | 0.0238 |
| Administration | 0.0176 | 0.0203 | 0.0337 | 0.0532*** | 0.0268 |
| Access to palms | 0.0318 | 0.0172 | 0.0239 | -0.0589*** | -0.000513 |
| Constant | 0.503 | -0.382 | 0.652 | 2.238*** | 1.561 |
| | | | | | |
| Observations | 1,361 | 1,361 | 1,361 | 1,361 | 1,361 |
| R-squared | 0.325 | 0.233 | 0.488 | 0.274 | 0.240 |
| Standard errors in parentheses | | | | | |
| *** p<0.01, ** p<0.05, * p<0.1 | | | | | |

*Regression table IV: Agricultural practices (dependent variables) and survey questions and traffic lights (independent variables) for full sample size (part 2)*

| VARIABLES | Drainage | Labor input | Weeding | Pruning | Combinedagricultural practices |
|---|---|---|---|---|---|
| | | | | | |
| Plot area | -3.49e-05 | -0.0146 | 0.0366* | 0.0161 | 0.0308 |
| Total plot are smallholder | -0.00214 | -0.00451 | -0.0269*** | 0.000112 | -0.0358 |
| Age smallholder | -0.000139 | 0.000495 | 0.000604 | 0.000571 | 0.000391 |
| Gender | -0.0490 | 0.00423 | -0.0273 | -0.0394 | -0.110 |
| Education | 0.00365 | 0.0360 | -0.0873*** | -0.0316 | -0.0503 |
| Experience in oil palm | -0.00227 | 0.000814 | -0.00315 | 0.00219 | -0.0166 |
| Income share of oil palm | -0.0190 | -0.0829*** | -0.0199 | -0.0555*** | -0.206*** |
| Entrepreneurship | 0.226** | -0.145 | 0.896*** | 0.371*** | 3.924*** |
| 2.district | 0.130* | 0.185 | 0.239* | -0.0298 | 0.323 |
| 3.district | 0.167* | 0.178 | 0.483*** | 0.375*** | 2.976*** |
| 4.district | 0.143* | 0.468*** | 0.358** | 0.211* | 2.087*** |
| 6.district | 0.140*** | 0.179* | 0.586*** | 0.0249 | 1.837*** |
| 7.district | 0.0927 | -0.102 | 0.127 | 0.170 | 0.234 |
| 8.district | -0.0834 | 0.0193 | 0.301** | 0.0142 | 0.495* |
| 9.district | 0.119 | -0.0411 | 0.231 | 0.135 | 2.260*** |
| 10.district | -0.0116 | 0.0993 | 0.553*** | 0.0871 | 1.687*** |
| 11.district | 0.214 | 0.0368 | -0.775 | -0.214 | -0.0113 |
| Topography | -0.0941*** | 0.0244 | -0.0559 | -0.0806** | -0.324*** |
| Soil quality | 0.222*** | 0.0495 | 0.196*** | 0.143*** | 0.547*** |
| Access to training | 0.00248 | -0.00728 | -0.0110* | 0.00111 | 0.0343** |
| Understanding grading process | -0.00550 | -0.0757** | -0.00910 | 0.0188 | -0.0248 |
| Group membership | -0.0275 | -0.129 | 0.0150 | 0.254*** | 0.863*** |
| Group delivers input | -0.0255 | -0.0419 | 0.0362 | -0.0328 | -0.115 |
| Group delivers credit | -0.00804 | 0.0745** | -0.0772** | 0.00364 | 0.0535 |
| Group delivers FFB transport | 0.0548*** | 0.0227 | 0.0633* | 0.00926 | 0.176** |
| Availability of hybrid seedlings | 0.00915 | -0.0118 | 0.0192 | -0.0296 | -0.191** |
| Availability of labor | -0.0346** | -0.00105 | 0.0307 | 0.00436 | -0.0176 |
| Availability of pesticides | 0.0651** | 0.0503 | -0.0486 | -0.0911* | 0.318** |
| Availability of subsidized fertilizers | 0.0117 | 0.0229 | 0.0206 | -0.0435 | -0.118 |
| Availability of non-subsidized fertilizers | 0.0192 | 0.0653* | -0.0895** | -0.0157 | 0.0699 |
| Communication with mill | 0.0362 | 0.276*** | -0.0561 | -0.224*** | -0.00861 |
| FFB market | 0.0547 | 0.127* | 0.292*** | 0.0533 | 1.227*** |

| | | | | | |
|---|---|---|---|---|---|
| channel | | | | | |
| FFB payment term | 0.0581*** | 0.0673* | 0.161*** | -0.00337 | 0.320*** |
| Knowledge on FFB price | 0.00285 | 0.0246 | 0.00268 | 0.0577* | -0.00772 |
| Access to Block | 0.0319 | -0.177*** | 0.0128 | -0.0134 | -0.0374 |
| Road condition | -0.0163 | 0.166*** | 0.0668 | 0.0697 | 0.193 |
| Transport in dry season | 0.0229 | -0.0163 | -0.0686 | -0.00143 | -0.292** |
| Transport in wet season | 0.0203 | -0.0385 | 0.121** | 0.0436 | 0.289** |
| Transport to mill within 24 hours | -0.0390** | 0.0228 | -0.00221 | 0.0564** | -0.101 |
| Availability of transport | -0.0361* | -0.0268 | 0.0501 | 0.0471 | -0.00535 |
| Waiting lines at mill | -0.00320 | -0.00732 | -0.0534* | -0.0120 | 0.00311 |
| Bank account | 0.00963 | -0.000364 | 0.0580** | 0.0158 | 0.161*** |
| Plantation loan | -0.00116 | -0.0233 | -0.00236 | 0.0248 | 0.0198 |
| Outstanding household loans | -0.00332 | 0.0306 | -0.0203 | 0.00234 | 0.0370 |
| Land title | -0.0292 | -0.0762 | 0.00215 | 0.0627* | -0.0122 |
| Land dispute | 0.0161 | -0.0669 | 0.0245 | 0.00537 | 0.147 |
| Administration | -0.0318* | -0.0695** | -0.00242 | 0.0193 | 0.0672 |
| Access to palms | 0.0110 | -0.0625 | 0.141*** | 0.122*** | 0.225** |
| Constant | 1.660** | 0.0371 | -1.899 | -0.727 | 3.644 |
| | | | | | |
| Observations | 1,361 | 1,361 | 1,361 | 1,361 | 1,361 |
| R-squared | 0.193 | 0.072 | 0.161 | 0.150 | 0.395 |
| Standard errors in parentheses | | | | | |
| *** p<0.01, ** p<0.05, * p<0.1 | | | | | |

## Appendix V: Overview of survey questions and answers

The following tables show the answers (in percentage) to those questions that have been taken into account for the aspect score. These tables do represent the majority of the questions of the farmer survey, but not all. The survey has been conducted at 1069 smallholders in 6 locations on Sumatra and Kalimantan.

The answers are categorized into poor, medium and good practice. For example with regards to erosion control, poor erosion control is defined as having no erosion control measures, medium is having one measure, and good erosion control is having two or more measures.

| Plantation Establishment | Poor (in %) | Medium (in %) | Good (in %) |
|---|---|---|---|
| Did you use hybrid seeds? | No, don't know | Yes, without certificate | Yes, with certificate |
| | 78 | 13 | 9 |
| Drainage | No drainage, many waterlogged palms | | No drainage needed / drained where necessary |
| | 7 | 0 | 93 |
| Access to palms | Less than 75 % of the FFB and/or palms can be harvested | Between 75 % and 90 % of all the FFB and palms can be harvested | Virtually all palms can be harvested |
| | 10 | 53 | 38 |
| Missing palms | Many missing in blocks | Missing in singles | Less than two missing in singles |
| | 2 | 21 | 78 |
| Erosion control | No measures being taken to control erosion | One measure being taken to control erosion | Two or more measures being taken to control erosion |
| | 40 | 46 | 14 |
| Planting material used | Mainly non-hybrid (dura or pisifera) | Mixed hybrid and non-hybrid | Mainly tenera hybrid |
| | 15 | 24 | 61 |
| **Field Maintenance** | **Poor (in %)** | **Medium (in %)** | **Good (in %)** |
| On average, how many days per month do you or hired laborers spend on maintenance for each ha? | Less than one day per month on average | One to three days per month on average | More than three days per month on average |
| | 23 | 46 | 31 |
| Do you use agricultural chemicals, such as pesticides and herbicides? | No | - | Yes |
| | 9 | 0 | 91 |
| Weeding | Many weeds or uneven or no slashing of tall and bushy weeds before weeding | No weeds; everything has been sprayed, soil is bare | Cleared circle around the palms |
| | 33 | 34 | 32 |
| Pruning | Unpruned or very badly pruned | Underpruned or overpruned | Correctly pruned |
| | 7 | 51 | 42 |
| Access to palms | Less than 75% of the FFB and/or palms can be harvested | Between 75% and 90 % of all the FFB and palms can be harvested | Virtually all palms can be harvested |

| | | | |
|---|---|---|---|
| | 10 | 53 | 38 |
| **Fertilizer use** | **Poor (in %)** | **Medium (in %)** | **Good (in %)** |
| On average, how often did you apply fertilizer the last two years? | Less than one per year | Once per year | More than once per year |
| | 3 | 7 | 90 |
| Did you apply Nitrogen last year? | No | Yes, less than 1 kg per palm | Yes, more than 1 kg per palm |
| | 3 | 35 | 63 |
| Did you apply Phosphate last year? | No | Yes, less than 1 kg per palm | Yes, more than 1 kg per palm |
| | 13 | 46 | 42 |
| Did you apply Potassium last year? | No | Yes, less than 2 kg per palm | Yes, more than 2 kg per palm |
| | 14 | 69 | 18 |
| Did you apply Magnesium last year? | No | Yes, less than 1 kg per palm | Yes, more than 1 kg per palm |
| | 52 | 29 | 20 |
| Over the last 5 years (5x12 months), has this amount of fertilizer decreased or increased? | Decreased | Stayed the same, has not really changed | Increased |
| | 11 | 45 | 44 |
| Fertilizer: general condition of the palms and deficiency symptoms | Most palms showing a range of deficiency symptoms | Most palms showing few deficiency symptoms | Few palms showing a deficiency symptom |
| | 10 | 36 | 54 |
| Are empty fruit bunches returned to the field? | No | - | Yes |
| | 89 | 0 | 11 |
| **Harvesting & Transport** | **Poor (in %)** | **Medium (in %)** | **Good (in %)** |
| How often do you harvest? | Every 20 days or more | Every two weeks or twice a month | Every 10 days or less |
| | 11 | 82 | 7 |
| Do you get your FFB to the mill within 24 hours? | Never / Don't know | Half the time | Usually |
| | 46 | 15 | 39 |
| What was the availability of transportation the last year? | Not or rarely available. Very difficult. / don't know | Sometimes have to wait due to repairs, maintenance etc. | Readily available |
| | 19 | 7 | 75 |
| What proportion of your FFB is on average rejected at the mill? | Larger than 20%/ Don't know | Between 5%and 20% | Smaller than 5% |
| | 74 | 7 | 19 |
| Rotten FFB | Yes, much | Yes, some | No |
| | 2 | 40 | 58 |
| Harvesting platform | Messy (loose fruit lying around, weeds) AND improper stacking of FFB | Messy (loose fruit lying around, weeds) OR improper stacking of FFB | Clean and compacted soil. Proper stacking of FFB |
| | 23 | 12 | 65 |

| | | | |
|---|---|---|---|
| Condition FFB at harvesting platform | Unripe or overripe. Old and dried out from lying there too long | Mainly ripe FFB, but long stalks | Ripe FFB according to mill standards |
| | 0 | 39 | 61 |
| Loose fruit around the palms | Much loose fruit lying around the palms | Some loose fruit lying around the palms | Virtually no loose fruit lying around the palms |
| | 5 | 34 | 61 |
| **Replanting** | **Poor (in %)** | **Medium (in %)** | **Good (in %)** |
| Do you budget for replanting | No | Occasionally I put money aside | Yes, I save regularly |
| | 37 | 28 | 35 |
| Are certified hybrid seedlings available for planting? | No | Sometimes I have to wait / Don't know | Always |
| | 44 | 29 | 27 |
| **Entrepreneurship** | **Poor (in %)** | **Medium (in %)** | **Good (in %)** |
| Would you like more information, training or scientific knowledge on oil palm cultivation? And if you do, would you be willing to pay for it? | No, not really interested | Yes, if it is free | Yes, I would pay for it |
| | 5 | 64 | 32 |
| Do you apply fertilizer if it is not subsidized? | No | Yes, but less | Yes, same amount |
| | 13 | 42 | 45 |
| Do you budget for fertilizer input? | No | Occasionally, will save some money when I can miss it | Yes, I save regularly |
| | 20 | 30 | 49 |
| Do you budget for replanting | No | Occasionally I put money aside | Yes, I save regularly |
| | 37 | 28 | 35 |
| According to you, who is responsible for the maintenance of the roads within and around your plantation block? | Other | Cooperative | Smallholders themselves |
| | 20 | 27 | 53 |
| Do you think that with changes in plantation management, maintenance and increased inputs, you could increase your production? | No | Perhaps | Yes |
| | 1 | 12 | 88 |
| Are you willing to invest in more fertilizer input? | No, not a priority | Maybe | Yes |
| | 8 | 30 | 63 |
| Have you changed your plantation area in the last three years? | Decreased | Consolidated | Expanded |
| | 1 | 72 | 28 |
| What are your future plans with the oil palm | Stop (sell or convert) | Consolidate | Expand |
| | 5 | 15 | 80 |

| | | | |
|---|---|---|---|
| plantation? | | | |
| Overall impression of smallholder | No motivation to apply GAP to improve yields | Will apply GAP and improve yields in the measures are simple and very low cost | Eager to apply GAP and improve yields |
| | 2 | 43 | 55 |
| **Capacity** | **Poor (in %)** | **Medium (in %)** | **Good (in %)** |
| Age | More than 55 | Between 40 and 55 | Less than 40 |
| | 17 | 48 | 34 |
| Educational level | None or primary school unfinished | Finished primary school | Graduated from secondary school / Pursued studies after secondary school |
| | 13 | 39 | 49 |
| How many years have you been an oil palm smallholder? | Less than 5 | Between 5 and 10 | More than 10 |
| | 11 | 32 | 58 |
| How many Hectare do you have? | Less than 2 | Between 2 and 4 | More than 4 |
| | 20 | 52 | 28 |
| What kind of land title do you have? | None | Customary title / Legal title but the ownership certificate is held by another party | Legal title held by the smallholder |
| | 4 | 39 | 57 |
| **Physical environment** | **Poor (in %)** | **Medium (in %)** | **Good (in %)** |
| Topography | Steep, over 40% slope | Undulating, hilly | Flat or gently sloping |
| | 1 | 26 | 73 |
| Soil | Peat and swamp, very coarse sand, heavy clay, many large rocks | Small patches of swamp, sandy clays | Good: mineral soil or deep, well-drained, loamy soil |
| | 7 | 34 | 59 |
| Altitude | Low suitability (>700m) | Medium suitability (300m - 700 m) | High suitability (<300m) |
| | 0 | 0 | 100 |
| **Access to technical assistance** | **Poor (in %)** | **Medium (in %)** | **Good (in %)** |
| Received technical assistance on Plantation development | None | Advice or recommendation | Training |
| | 55 | 32 | 13 |
| Received technical assistance on Planting material | None | Advice or recommendation | Training |
| | 49 | 39 | 12 |
| Received technical assistance on Fertilizer | None | Advice or recommendation | Training |
| | 31 | 51 | 18 |

| | | | |
|---|---|---|---|
| Received technical assistance on Pesticides | None | Advice or recommendation | Training |
| | 38 | 46 | 16 |
| Received technical assistance on Maintenance | None | Advice or recommendation | Training |
| | 33 | 49 | 18 |
| Received technical assistance on Harvesting | None | Advice or recommendation | Training |
| | 39 | 43 | 17 |
| Received technical assistance on Bookkeeping | None | Advice or recommendation | Training |
| | 78 | 17 | 5 |
| Received technical assistance on RSPO | None | Advice or recommendation | Training |
| | 97 | 1 | 2 |
| Has your wife (husband) ever participated in a training about oil palm? | No | | Yes / Not applicable (if single) |
| | 91 | | 9 |
| Do you allow your wife (husband) to participate in a training about oil palm? | No | | Yes / Not applicable (if single) |
| | 22 | | 78 |
| **Access to farmer organization** | **Poor (in %)** | **Medium (in %)** | **Good (in %)** |
| Are you a member of a growers association or cooperative? | No | | Yes |
| | 32 | | 68 |
| As a member, does it provide you with access to inputs? | No | Sometimes | Yes |
| | 60 | 12 | 28 |
| As a member, does it provide you with access to credits? | No | Sometimes | Yes |
| | 50 | 10 | 40 |
| As a member, does it organize transport to the mill for you? | No | Sometimes | Yes |
| | 54 | 2 | 44 |
| **Access to inputs** | **Poor (in %)** | **Medium (in %)** | **Good (in %)** |
| Are subsidized fertilizers available for purchase? | No | Sometimes I have to wait | Readily available |
| | 13 | 61 | 26 |
| Are non-subsidized fertilizers available for purchase? | No | Sometimes I have to wait | Readily available |
| | 6 | 30 | 65 |
| Are chemical pesticides and herbicides available? | No | Sometimes I have to wait | Readily available |
| | 1 | 10 | 89 |
| Are certified hybrid seedlings available for planting? | No | Sometimes I have to wait / Don't know | Readily available |
| | 44 | 29 | 27 |

| | | | |
|---|---|---|---|
| Is it easy to employ workers? | Difficult to find them (seasonal problem) | Workers are costly or expensive | Yes, it is easy to employ workers at any time |
| | 10 | 19 | 71 |
| **Access to markets** | **Poor (in %)** | **Medium (in %)** | **Good (in %)** |
| In general, who do you sell your FFB to? | Via middlemen | - | Via cooperative or directly to mill |
| | 43 | 0 | 57 |
| To how many mills, cooperatives or middlemen can you sell your FFB? | 1 actor | 2 actors | 3 or more actors |
| | 71 | 12 | 17 |
| Do you have a contract or agreement with each buyer? | No | Yes, verbal or Yes, written, but have no access to a copy of the contract | Yes, written and have a copy of the contract |
| | 55 | 41 | 5 |
| How is the payment system for your FFB? | More than 2 weeks afterwards | Up to 2 weeks afterwards | Advance cash/ immediate cash at transfer |
| | 42 | 7 | 51 |
| Do you know how much you will get paid for your fruit when you sell it? | No, and I do not care / No, but I would like to know | | Yes |
| | 9 | | 91 |
| What has been the average price you have received for your FFB in the last month? | Figure given is lower than market | Figure given which is corresponding to the market | Figure given higher than market price |
| | 79 | 0 | 21 |
| Do you have regular communication with the mill? | No | Indirectly (e.g. via cooperative) | Yes, directly |
| | 54 | 41 | 5 |
| How is your relationship with the oil palm plantation company or mill? | Less harmonic | Neutral or Do not have a relationship at all | Good cooperation |
| | 54 | 41 | 5 |
| Do you get your FFB to the mill within 24 hours? | Never / Don't know | Half the time | Usually |
| | 46 | 15 | 39 |
| On average, how long are waiting lines at the mill? | More than 8 hours / Don't know | 2 to 8 hours | Less than 2 hours |
| | 59 | 17 | 24 |
| Do you understand the sortasi process at the mill? | No | Partly | Yes |
| | 64 | 27 | 10 |
| What proportion of your FFB is on average rejected at the mill? | Larger than 20%/ Don't know | Between 5%and 20% | Less than 5% |
| | 74 | 7 | 19 |

| Access to infrastructure | Poor (in %) | Medium (in %) | Good (in %) |
|---|---|---|---|
| Is your block accessible from the main road all through the year? | No | Seasonal problem | Always |
| | 3 | 39 | 58 |
| How often is the road between your oil palm plantation to the mill in a good condition (easy to reach the mill) to use FFB transport? | In a bad condition year round | In a bad condition in certain seasons (seasonal problem) | In a good condition, year round |
| | 3 | 45 | 52 |
| How long is the travel time to the mill in the dry season | More than 8 hours from the FFB collection point/ Don't know | 2 to 8 hours from the FFB collection point | Less than 2 hours from the FFB collection point |
| | 27 | 23 | 50 |
| How long is the travel time to the mill in the wet season? | More than 8 hours from the FFB collection point/ Don't know | 2 to 8 hours from the FFB collection point | Less than 2 hours from the FFB collection point |
| | 39 | 30 | 31 |
| Access to the plot | Remote location of the plot AND the road to get there is in bad condition | Remote location of the plot OR the road to get there is in bad condition | Easily accessible from village and road |
| | 2 | 26 | 71 |
| **Access to certification** | **Poor (in %)** | **Medium (in %)** | **Good (in %)** |
| Are you RSPO or ISPO certified? | No, or do not know about this | Yes in the process of certification (or in the planning) | Yes, RSPO, ISPO or both certified |
| | 99 | 1 | 1 |
| **Access to finance** | **Poor (in %)** | **Medium (in %)** | **Good (in %)** |
| Do you have a bank account? | No | | Yes |
| | 47 | | 53 |
| Have you ever received a loan for plantation establishment? | No | | Yes |
| | 72 | | 28 |
| Have you already paid off your loan (for those who have a loan)? | No | | Yes |
| | 50 | | 50 |
| Does your household have other unpaid loans? | No | | Yes |
| | 55 | | 45 |
| From which source(s) can you receive financial support to buy fertilizers? | Local trader/ Pawnshop | Plantation company, Input supplier, Family | Bank, Credit Union, Cooperative |
| | 18 | 14 | 69 |
| Do you have a contract or agreement with each buyer? | No | Yes, verbal or Yes, written, but have no access to a copy of the contract | Yes, written and have a copy of the contract |
| | 55 | 41 | 5 |

| | | | |
|---|---|---|---|
| What kind of land title do you have? | None | Customary title / Legal title but the ownership certificate is held by another party | Legal title held by the smallholder |
| | 4 | 39 | 57 |
| If you needed financial support to invest in replanting, from which source(s) can you receive it | Local trader | Plantation company, Input supplier, Family | Bank, Credit Union, Cooperative |
| | 19 | 19 | 62 |
| **Sustainability practices** | **Poor (in %)** | **Medium (in %)** | **Good (in %)** |
| How is your relationship with the plantation company or CPO mill? | Less harmonic | Neutral or Do not have a relationship at all | Good cooperation |
| | 3 | 75 | 23 |
| Did you receive training? | Received training in less than 3 issues | Received training in 3 to5 issues | Received training in at least 6 issues |
| | 56 | 33 | 12 |
| Did your wife/ husband ever participated in a training? | No | - | Yes / Not applicable (if single) |
| | 91 | 9 | 0 |
| What has been the land use before it became an oil palm plantation? | Primary forest / don't know | Secondary forest | Agricultural land / Idle, degraded land |
| | 45 | 35 | 20 |
| What kind of land title do you have? | None | Customary title / Legal title but the ownership certificate is held by another party | Legal title held by the smallholder |
| | 4 | 39 | 57 |
| Is there any land dispute ongoing with regard to land ownership? | Yes | - | No |
| | 16 | 0 | 84 |
| Are agricultural chemicals, like pesticides and herbicides, you use harmful to human health? | Yes / Don't know | Some of them are OR only for children | No |
| | 92 | 5 | 3 |
| Will you use fire when you replant? | Yes | Not sure yet | Definately not |
| | 20 | 30 | 50 |
| How much do you pay your workers? | Below minimum wage | Performance based (per tonnes or Ha) | Above minimum wage |
| | 16 | 0 | 84 |
| Soil | Peat and swamp | - | Other soils |
| | 7 | 0 | 93 |
| Erosion control | No measures being taken to control erosion | One measure being taken to control erosion | Two or more measures being taken to control erosion |
| | 40 | 46 | 14 |

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