Smallholder Palm Oil Financing in Indonesia

Needs and Opportunities for Sustainable Finance Intervention

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Executive Summary

Over the summer of 2015, the Rainforest Alliance researched palm oil financing in Indonesia with the objective to better understand the financing needs of smallholder palm oil producers and to identify opportunities for supporting these producers in accessing short-term and long-term financing.

The primary objectives in undertaking this research are:

1. To better inform the Rainforest Alliance technical assistance packages for smallholder palm oil producers in Indonesia;
2. To engage with stakeholders and financiers on financing opportunities in the smallholder palm oil sector;
3. To facilitate smallholder palm oil producers' access to financing for palm oil renovation, quality and productivity increases, and livelihood improvements.

Throughout our research we identified the following key needs and opportunities for sustainable financing interventions in the Indonesian smallholder palm oil sector:

BEST MANAGEMENT PRACTICES.
Smallholder palm oil producers can significantly improve the quantity and quality of their production by implementing best management practices (BMPs). Our preliminary cost analysis shows annual costs between $113 and $151 per hectare for oil palm tree maintenance using BMPs.

GERMPLASM RENOVATION.
An estimated 10 percent of smallholder palm oil producers need to renovate their farms entirely to increase their production and improve the quality of the fresh fruit bunches (FFB). Our preliminary cost analysis shows an investment need of up to $777 per hectare over the first 5 years of a plantation mainly to pay for good quality seedlings and inputs such as fertilizers.

PROCESSING.
In some instances, producers could capture additional value from palm oil, if given the opportunity to process their own FFB into crude palm oil (CPO) with small-scale mills. When large mills are unavailable or difficult to access, smallholder-owned small-scale mills can fill local infrastructural gaps. However, this requires investment in infrastructure ($90,000- $280,000 depending on the mill size) and in building mill management capacity.

Supporting smallholder palm oil producers through these three approaches in combination with linking them to financing will ultimately lead to productivity, yield, and income improvements while promoting sustainable palm oil production and livelihood improvements.

Rainforest Alliance

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I. Introduction

The Rainforest Alliance is concerned about the destructive impact of expanding oil palm plantations on the rainforests, particularly in countries like Indonesia, where these plantations are one of the major drivers of deforestation.

In addition to supporting the efforts of the Roundtable on Sustainable Palm Oil (RSPO), the Rainforest Alliance has created its own rigorous, complementary certification system for oil palm plantations, based on the Sustainable Agriculture Network (SAN) standard that puts additional emphasis on biodiversity and forest conservation. Rainforest Alliance certification is a powerful tool to address the urgent environmental and social problems posed by the expansion of oil palm plantations—including the displacement of indigenous peoples, competition between large agribusinesses, and local farmers for water and basic resources, and the impact of mass production on food prices and security.

Because the SAN standard works across a wide range of agro-ecosystems and crops, it has to remain flexible and aimed at contextual problem-solving. As the Rainforest Alliance has begun to work with palm oil producers of all scales, it has begun to explore solutions for issues unique to the development and production of this crop.The focus on this paper, smallholder finance, is but one example of the multiple efforts the Rainforest Alliance has begun in support of developing SAN-based responses to the unique challenges of palm oil production.

Beyond certification, the Rainforest Alliance is also implementing capacity-building programs with palm oil companies in Indonesia and other countries to support smallholder palm oil producers with the adoption of BMPs. For example, the Rainforest Alliance is now working to help smallholders achieve SAN certification in both Indonesia and Papua New Guinea by both addressing gaps in practices with the SAN standard and using these opportunities for shared learning and problem solving on scales and technologies appropriate for these producers.

As part of its service offering, the Rainforest Alliance is also exploring opportunities to support smallholder palm-oil producers with sustainable financing interventions, whether it be through financial literacy training programs, where producers would be taught best record keeping or debt management practices; or through the implementation of access to financing or credit programs in partnership with local financial institutions and investors. In the summer of 2015, the Rainforest Alliance's Sustainable Finance team undertook a comprehensive desk research project on palm oil smallholder finance in Indonesia in order to better inform its technical assistance packages, design its sustainable finance interventions and engage with local stakeholders and financiers.

This report summarizes the main findings and takeaways of this desktop research and lays out next steps for developing and implementing sustainable finance interventions for smallholder palm-oil producers in Indonesia. Section II recapitulates the objectives and the methodology underlying this research paper. Sections III, IV, and V provide an overview of the palm oil sector in Indonesia and the challenges and opportunities faced by smallholder producers in moving toward sustainable palm oil production. Section VI highlights findings from the cost structure analysis conducted by the Rainforest Alliance. Finally, Section VII provides insight on next steps for continuing this work.

II. Objectives and Methodology

a. Objectives

The primary objectives for the Rainforest Alliance in undertaking this study are:

1. To better understand the capacity-building needs of smallholder palm-oil producers in Indonesia and inform the development of appropriate technical assistance packages, including training on best agricultural practices, farm renovation, climate adaptation, financial literacy, business management, and access to financing;
2. To understand the financial needs and capacity of smallholders palm-oil producers and to engage with industry stakeholders as well as investors, social lenders, and financial institutions on financing opportunities and challenges in the smallholder palm oil sector;

3. To facilitate financial innovation and – when appropriate—smallholder palm oil producers access to financing for palm oil renovation, quality and productivity increases, and livelihood improvements.

Guided by these objectives, this study aimed to answer the following three questions related to independent smallholder palm-oil production in Indonesia:

1. What are the main challenges and opportunities for smallholder palm oil producers in Indonesia?
2. What are the investments required and key financing needs for smallholder producers to grow sustainable palm oil in Indonesia?
3. What are the next steps for the Rainforest Alliance to develop its technical assistance package in Indonesia and to foster smallholder palm oil producers' access to the financing they need to grow sustainable palm oil and improve their livelihood?

b. Methodology

The study consisted of three phases of research:

- A literature review of 44 publications from research institutes, technical assistance providers, consulting companies, and industry parties operating in Indonesia.
- Interviews with 11 organizations from the palm oil sector in Indonesia (see acknowledgments).
- Financial modeling and economic and cost-benefit analysis based on data collected through the literature review and expert interviews.

III. Palm Oil in Indonesia: A Controversial yet Important and Complex Sector

a. Indonesia's Top Commodity

Oil palms are grown in the world's major tropical rainforests along the equator (Poku, 2002). Originally a West African crop, oil palm was first introduced to Indonesia's Sumatra region by the Dutch in the colonial-era 1850s (Setiadi, 2015). Sumatra now accounts for 65 percent of Indonesia's palm oil production (Rianto, 2010) (see Figure 1).

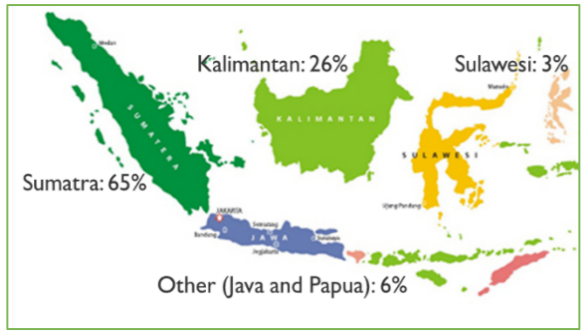

Figure 1: Palm Oil Production in Indonesia. *(Rianto, 2010)*

As of 2007, Indonesia has surpassed Malaysia as the world's largest palm oil producer (USDA Foreign Agricultural Service, 2007), thanks to its ideal growing conditions, abundant land, and cheap labor (IFC, 2013). The country now produces an average 28.5 million tons of palm oil per year—which amounts to more than 50 percent of the world's supply (AidEnvironment, 2014). Its total production has tripled[1] since 2005, growing at an annual rate of 6.7 percent[2] (AidEnvironment, 2014).

Palm oil is one of Indonesia's main commodities, topped only by coal and petroleum (UN Comtrade, 2015). The crop alone generates 6 to 7 percent of Indonesia's GDP[3] (Roundtable on Sustainable Palm Oil, 2011) and is its most significant export crop, accounting for 8.3 percent of Indonesia's total exports[4] (Observatory of Economic Complexity, 2015).

The palm oil industry also mobilizes a substantial portion of the Indonesian labor force and involve an estimated 3.7 million people (Roundtable on Sustainable Palm Oil, 2011), including 1.4 million[5] smallholder producers who each cultivate less than three hectares of land (AidEnvironment, 2015). Indonesia's smallholder oil palm farmers represent 7.5 percent of the labor force in Indonesia's agriculture sector (Schuster Institute for

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[1] In 2005 Indonesia produced 10 million tons (AidEnvironment, 2014)

[2] Average annual growth 2010-2013; based on ISTA Mielke GmbH (2013). Forecasts for 2013.

[3] Based on GDP in 2010.

[4] Based on a total export value of $17.617 million (AidEnvironment, 2015).

[5] AidEnvironment et al. 2013, calculation using total area managed by smallholders and average size of their plantations.

Investigative Journalism at Brandeis University, 2014)[6].

b. A Complex Value Chain

Indonesia's palm oil industry is dominated by large and often vertically integrated plantation companies that manage 58 percent of Indonesia's oil palm plantation area (AidEnvironment, 2015). However, Indonesian law requires that plantation companies allocate 20 percent of their plantation development to smallholder farmers (Hanu, 2015). In addition to corporate plantations, smallholders also cultivate approximately 40 percent of the land not managed by plantation companies, either in cooperation with companies or independently (AidEnvironment, 2015).

The official Indonesian representation of a smallholder farmer is one that does not require the acquisition of a business license (*Izin Usaha Perkebunan untuk Budidaya* or "IUP-B"), which by law is required on holdings of 25 hectares and above. Most oil palm growers with limited access to capital and with labor limited to a family unit; under these conditions, they grow oil palms on much smaller land holdings. For the purpose of this report, we consider smallholder[7] oil palm producers to be those who hold or cultivate less than 3 ha of oil palms. We chose this unit to describe smallholders as primarily producers without ready access to the capital required to support expanded production. This land unit represents the typical production unit for a family-based labor force, with larger land areas requiring the use of hired labor.

Smallholders can be broadly classified as either "independent" or organized in "*plasma-inti schemes*"[8] (where "*plasma"* refers to the smallholders, and "*inti"* to the plantation/mill center) around large mills operated by plantation companies.

Though plasma scheme set-ups may vary, plasma scheme smallholders usually receive land (or have their own land developed by the company), technical support, and financing for agronomic inputs in return for the obligation to sell their harvested fresh fruit bunches (FFB) to the company mill at a discounted price.

On the other hand, independent smallholder farmers sell their FFB to local traders, who then deliver the FFB to local mills for processing. These middlemen have delivery contracts with local mills to bring in a pre-arranged volume of FFB.

Of the 15 million hectares of land allocated to palm oil cultivation in Indonesia, 25 percent is managed by smallholders in plasma schemes, and 17 percent by independent smallholders (AidEnvironment, 2015) (See Figure 3).

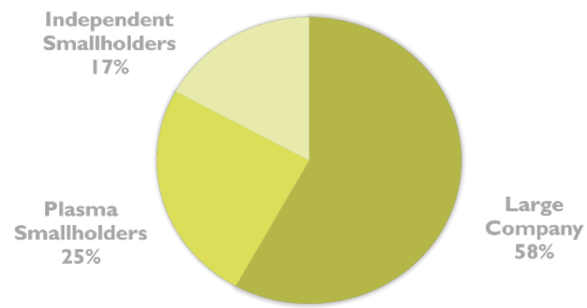

Figure 2: Plantation Ownership in Indonesia (data from AidEnvironment, 2015)

Oil palm is a popular cash crop among smallholders because of its 25 – 30 year economic lifespan, relatively low labor requirement, and substantial contribution to rural incomes: the average net income of oil palm smallholders is seven times that of farmers growing subsistence food crops (World Growth, 2011). Its yearlong and consistent harvest cycle (AidEnvironment, 2014), where FFB is harvested every 10 – 14 days (IFC, 2013), also attracts smallholder farmers who desire a consistent source of income.

Beyond the extension of estates, smallholder palm oil production has been a key factor in the expansion of the palm oil industry in Indonesia. Smallholder oil palm cultivation areas have more than tripled since 2000. Meanwhile, production has increased by 560 percent, reaching 26.9 million tons of CPO in 2011 (AidEnvironment, 2015).

[6] Rainforest Alliance, estimation using palm oil labor force and total labor force of agriculture sector.

[7] The government of Indonesia, however, qualify as "small-holding" any producer not required to get a business license for the rights to use state lands

[8] There are now two main types of plasma-inti schemes in palm, the older Perkebunan Inti Rakyat (PIR) and the newer Pola Kemitraan Melalui Pemanfaatan Kredit Kepada Koperasi Primer untuk Anggotanya (KKPA).

"Smallholder": The government of Indonesia defines any producer not required to get a business license for the rights to use state lands as a smallholder farmer. For the purpose of our work we qualify as smallholder a producer holding less than 3 ha of land.

Average FFB produced per year: 13 tons/ha

Potential FFB produced per year: 22 tons/ha

Percentage percent of national export value: 8.3 percent

Challenges: Lack of quality seedlings, improper use of fertilizer, lack of technical agronomic understanding and financing for inputs; lack of understanding of pricing policies for FFB at farm gate (AidEnvironment, 2015)

Annual Returns:
$960/ha for low yield independent
$2340/ha for high yield independent
(World Growth, 2011)

Figure 3: Profile of Indonesian Palm Oil Smallholders

c. An Industry under Scrutiny

Indonesia's palm oil industry is often criticized for its negative impact on the environment, including deforestation, biodiversity loss, greenhouse gas emissions, and land degradation, in addition to cases of negative social impact on rural communities and exploitive treatment of smallholder farmers.

Deforestation

Indonesia's absolute rate of deforestation is considered among the highest on the planet (Gunarso, Hartoyo, Agus, & Killeen, 2013) with palm oil production being one of the largest drivers along with pulp and paper (Greenpeace International, 2013). In the West Kalimantan region, 75 percent of total deforestation from 2009 to 2011 was attributed to the rapid expansion of logging and palm oil plantations (Greenpeace International, 2013). Between 2000 and 2012, Indonesia lost more than 6 million hectares of its forest, representing 6 percent of its total land area: an area half the size of England (World Resources Institute, 2014).

This deforestation is driven by the growing prevalence of palm oil in the food, chemical, cosmetics, and biofuel industries (AidEnvironment, 2014): its high productivity per hectare[9] and relatively low production costs makes it cheaper than other vegetable oils (Obidzinski, Lee, Ghazoul, & Koh, 2013). As a result of an 11.6 percent global increase in population and a 5 percent increase in per capita consumption, demand is expected to grow by an additional 28 million tons by 2020 (The World Bank Group, 2011), putting more pressure on native forests.

Biodiversity loss & land degradation

Conversion of forest to oil palm plantations endangers the vibrant biodiversity supported by tropical rainforests threatening forest-dependent species (such as orangutans, tigers, elephants, sun bears, etc.), plant species diversity and the economic benefits generated from tropical forests and ecosystem services (carbon retention and regulation of water) (Scientists, 2014*)* Deforestation also contributes to soil erosion and chemical run-off pollution, particularly if farmers do not have the technical capacity to properly manage pesticides and herbicides (Anderson, 2006).

Greenhouse gas emissions

Deforestation due to the conversion of peatlands has made Indonesia the third-largest source of greenhouse gas emissions by some estimates (World Bank, 2007), tailing only behing the US and China. Carbon-rich peatland swamps (where as much as 80 percent or more of the carbon is held below-ground in ancient peat and transformational coal deposits) are critical to water regulation and biodiversity preservation.

Exploitative treatment of smallholder farmers

Finally, the dominance of oil palm plantation companies and mills often results in inequitable benefit-sharing with smallholder communities. In setting up inti-plasma partnerships with communities, palm oil plantation companies may monopolize the most productive land. When developing the plasma estates for smallholders, many palm estates have been accused of delaying their implementation while first prioritizing their

[9] Palm oil produces nearly 10x as much oil as other vegetable oil crops, including soya bean, rapeseed, etc. (CITATION).

own inti estate plantings. Many mills and traders use non-transparent pricing formulas to discount prices paid to farmers for their FFB. In some studies, as few as 10 percent of smallholders are reported to fully understand the quality grading and penalty process at the mill (IFC, 2013).

A lack of clarity regarding land development and pricing reduces trust between farmers, plantations, and mills. Since many smallholders either receive land from the plantation companies or make arrangements to allow the plantation companies to develop their lands in exchange for a share in the form of plasma, this results in less cooperation and less smallholder investment in the long-term productivity of their farm—further complicating the challenges already faced by smallholder farmers.

IV. Production Challenges in Smallholder Palm Oil Farming

Indonesia's smallholder palm oil farms suffer from a self-perpetuating cycle of lack of financing, underinvestment, low yields, and low income. The challenges that ultimately drive down smallholder yield and income include: 1) high plantation establishment and upfront investment cost; 2) poor understanding of good agricultural practices; 3) smallholders' lack of usage of high-quality seedlings; and 4) dependency on external processing capacity.

a. High up-front costs for plantation establishment causes underinvestment in future farm productivity

Underinvestment in Indonesia's smallholder palm oil industry is driven by the high cost of plantation establishment. This includes costs such as clearing land without the use of fire, and in learning about and investing in BMPs, including maintaining legume cover crops to prevent weed growth and soil management to promote optimum oil palm growth.

With limited funds and a lack of access to knowledge of BMPs and appropriate technologies (AT), many farmers are unable to implement best practices. The access to technology and information represents a minor disjunction, considering that farmers have already invested in the high cost of necessary land clearing and seedling purchases. Yet without knowledge of BMPs and AT management opportunities, farmers are likely setting themselves up for low yields for the entirety of their palm plantation's rotation of 25 to 30 years.

Oil palm trees typically require 3-4 years to mature before they are able to yield fruits and provide farmers with financial returns. This challenges smallholders who must sustain the plantation establishment cost and maintain the farm with proper amounts and application of agronomic inputs. It is noteworthy that the first few years are crucial to the oil palm's future productivity. Use of BMPs and AT may significantly reduce this non-income period. Some studies show that proper management of soil and weed competition, when combined with optimum planting materials, can reduce the time needed for production to commence by at least a year , and more quickly reach optimum levels (Orrell 2015).

b. Poor understanding of BMPs results in low FFB productivity of oil palm trees

Indonesian smallholder farmers overall produce on average 40 percent fewer tons of FFB per hectare compared to company plantations (IFC, 2013). Because palm oil is a lucrative industry, it has attracted many smallholders who are new to the crop and have limited knowledge of proper palm oil cultivation techniques. One result of the many resource-limited newcomers to palm cultivation is that their lack of a more nuanced understanding of oil palm agronomics and optimum production systems results in less-than optimum results.

As with any other crops, the optimal usage of agronomic inputs such as fertilizers and pesticides is critical to developing the most efficient economic and biological potentials of oil palm plantations (Indonesian Palm Oil Smallholders Union (SPKS), 2013). Without fully understanding the importance of these inputs, the means of monitoring their use, the best application methods, and other associated tasks related to stewardship and good business practices, many smallholder farmers are unable to fully capitalize in their investments.

For example, many farmers may use less of and/or the wrong formulations of fertilizer in the crucial first few years of oil palm development. This has been shown to have carry-on effects, leading to low yields through the tree's lifetime (Orrell 2015).

Conversely, using optimum fertilizer formulations, volumes, and appropriate application methods and timing could increase production by 1.5 tons of FFB/ha, an increase of nearly 150 percent (IFC, 2013). Palm farmers, like other adaptors of innovations, are heavily weighted towards late-adapting, risk-averse groups. Studies have shown that smallholder plantations do not catch up to good practice scenarios on average until year 16, after most of the productive phase in a oil palm's life cycle has passed (IFC, 2013).

Farmers overall tend to be risk-averse and resistant to innovations as their overall wealth and access to capital lessens (Rogers 2003). Palm smallholders are also likely to be risk averse because of a lack of sound, comprehensive information, and because of the lack the financial means and access to credit to purchase the agronomic inputs necessary to maximize FFB production. These financial and agronomic understanding gaps hurt smallholder FFB productivity and CPO yield.

c. Lack of usage of high-quality seedlings leads to low quality and yield of CPO

High-quality hybrid seeds are one of the biggest up-front, carried-over costs for smallholders when establishing a plantation. Moreover, they are an investment that directly impacts future fruit productivity and CPO quality and yield more dramatically than any other single factor (Orrell 2015).

Oil palm fruits are classified into in two or more sub-species. In breeding programs, the varieties, *Dura* and *Pisifera* are the two most important types. The recommended planting germplasm, produced in a number of plant breeding programs, is a hybrid of the two varieties generically referred to as *Tenera*, which produces larger-fleshed fruit with a resulting higher CPO oil yields. Many farmers are unable to access or pay for high-quality *Tenera* seedlings from certified nurseries, research institutes, and oil palm plantation companies that supply quality seeds, substituting open-pollinated seedlings of unknown provenance (IFC, 2013). IFC found that 78 percent of smallholders are unaware of the origin of their seeds (IFC, 2013). Often, a farmer will believe he is paying for a hybrid seedling, only to find out a few years later once the oil palm tree has started producing that CPO yields are low because the seeds were low-quality non-hybrid varieties (IFC, 2013).

The lack of usage of high-quality hybrid seedlings remains a major issue among smallholders in Indonesia. Studies show that at least 20 percent of independent smallholder farmers are not using the high-yield hybrid seeds (IFC, 2013); some studies show higher use of inferior open-pollinated seedlings with estimates that up to 60 percent of smallholder farms are contaminated with non-hybrid seeds (Arif, 2014). The reasons cited for this non-usage of superior germplasm of lack of transparency from seed suppliers who falsify seed sources, and general limited access to a certified seedling supply.

Because mill gate prices paid for FFB are calculated based on weight and quality of fresh fruit bunches, mills will typically penalize fruit of the low CPO yield varieties by discounting prices from the government-mandated base price paid to farmers for these fruits. Traders reflect these discounts into the farm gate prices paid to farmers. This limits farmer revenue and income, and lessens farmer ability to reinvest in their farms.

d. Dependency on external processing capacity develops unfair relationships within the supply chain

Another issue that complicates preserving CPO quality and yield is that palm oil fruits are highly perishable. Ideally, the FFB must be processed at a mill within 24-48 hours of harvest before it over-ripens. Overripe FFBs build up free fatty acids that reduce the quality of the processed CPO.

Immediate processing needs raise supply chain challenges, especially in underdeveloped palm oil production areas such as the Riau, Kalimantan, Jambi, and West and South Sumatera regions (Indonesian Palm Oil Smallholders Union (SPKS), 2013), where there is often supply asymmetry between fruit production volume and nearby processing capacity. Generally, a farm must be within 50 kilometers in order to reach a mill in time for processing, but smallholder farmers in more remote areas must ship FFB up to 100 km to reach the nearest mill.

Poor road infrastructures and long lines at the mill gates can cause further delays in fruit delivery.

According to the IFC, 30 percent of all smallholders' FFB take 8 hours or more to reach a mill in the wet season (International Finance Corporation, 2013).

This is an issue for one in three smallholders, especially independent smallholders who do not have connections to mills (IFC, 2013). Independent smallholders are typically dependent on traders to buy their FFB and deliver it to a mill before the fruit over-ripens. There are normally limited number of traders involved in the business of purchasing FFB from independent farmers, and traders often operate territorially, leading to a de-facto monopoly. Traders thus hold supply chain information over farmers desperate to offload their fruit and receive immediate payment before spoilage occurs (IFC, 2013). Smallholders generally have no clear idea of the selling price for their FFB: average prices per case can be between 5 percent to 36 percent lower than the K-index price calculation[10] (IFC, 2013; Maryadi, 2004).

Additionally, traders generally enjoy negotiating strength against producers because many independent smallholders rely on traders for input financing. When in need of immediate capital, smallholders will often offload their FFB to these traders despite the sometimes exploitatively low prices offered by traders, resulting in low incomes that restrict future investment capability (IFC, 2013).

Asymmetric value chain relationships are also relevant to plasma smallholders: because their FFB price will be discounted to repay input financing if they sell to a tied mill, plasma smallholders sometimes engage in side-selling (referred to as crop shifted) their FFB to other independent mills. Palm companies also refer to leakages – losses from theft – particularly where their estates border smallholder farms. Such uncooperative activity can strain relationships with the connected plantation companies.

Another asymmetry in the palm oil smallholder farmer and mill/trader relationship is that the plantations often control land distribution to the smallholders. Land ownership sometimes remains inconclusively defined, without contracts and titles, so farmers are not incentivized to invest in the long-term productivity of the land.

The result of these issues shows in the sharp difference between smallholder farmers' yields and the potential productivity of a farm under the full expression of good agricultural practices. Smallholder farmers with low levels of inputs will only reap half of potential yield: smallholders currently only produce a reported average of just 13.1 tons of FFB per hectare cultivated, as compared to potential yields of 22 - 28 tons per hectare under similar site conditions on corporate estates (AidEnvironment, 2015).

As a result of the aforementioned conditions, smallholder farmers remain in a cycle of low productivity, low yields, low income, and low investment, which is further complicated by the smallholders' lack of negotiating power within a complex value chain.

V. Opportunities for Sustainable Smallholder Palm Oil Production

Indonesia's smallholder palm oil sector invites productivity improvements that could transform land-use practices and provide an opportunity to minimize deforestation, conserve biodiversity, and support sustainable livelihoods.

The Rainforest Alliance recognizes three opportunities to respond to the challenges faced by smallholders: 1) implementation of BMPs and AT; 2) where appropriate to the plantation cycle stage and current germplasm, the renovation of farms with hybrid seedlings, and 3) the capture of added value through processing at the smallholder level. Supporting the farmers through these three approaches in combination with linking them to finance will ultimately lead to productivity, yield, and income improvements.

a. Implementing Good Agricultural Practices and Appropriate Technologies

Training smallholder farmers in implementing BMPs could lead to a doubling in FFB productivity

[10] The index, as stated in the ministry decree letter, consists of several components – FOB price of crude palm oil, tax costs, marketing costs, transportation costs to the exporting board, conversion, FFB average price, percentage of selling volume, processing costs, depreciation, FFB value at processor weighting scale, administration costs, and TBS value at manufacturer (Maryadi, 2004).

(AidEnvironment, 2015). Two key areas where farmers often lack agronomic understanding are soil management and integrated pest management approaches.

Proper soil management allows farmers to refine their approach to fertilizer usage and application to ensure that enough of the correct formulation of fertilizer is being applied when fertilizer would be most effective. For smallholders, this often means applying more fertilizer prior to the tree's first year of harvest in order to reach maximum tree productivity. For smallholders who apply too much fertilizer, this refined approach could help them reduce unnecessary costs. The use of nitrogen-fixing groundcovers and of wind-rowing palm leaves would also contribute to overall soil fertility and moisture conservation.

An integrated pest management (IPM) approach could involve benefits from intercropping of a legume cover crop with new oil palm planting in order to prevent weeds from growing, as well as add a source of revenue. This would reduce the amount of chemical herbicides or weeding labor needed to control weed overgrowth on oil palm plantations. Additional use of IPM involves a robust field scouting approach, and the use of inexpensive pheromone traps to both detect and to mass-trap pests such as rhinoceros beetles, thus allowing a more judicious and targeted use of insecticides.

Once the oil palm trees are taller and more mature, introducing cattle as a natural weeding mechanism could also be effective, as long as farmers are already familiar with raising cattle and as long as the oil palm trees are tall enough that the cattle are unable to reach its fronds and will instead graze on unwanted weeds.

Additionally, BMPs include better plantation clearing processes as opposed to current practices of using fire to destroy forest and develop peatland, while plantations already on peatlands could be better managed through a system of integrated water management.

In addition to agronomic BMP approaches, a series of efforts to improve the basic effectiveness of farmers would benefit from both learning from farmers' own solutions through the Farmer Field Schools (FFS) approach and through linking farmer groups with university and industry researchers interested in solving small-scale farmer issues. Examples of this would be the development of better harvest methods to reduce fruit bruising, more efficient forwarding methods of fruit from plantations to collection stations, or the development of lighter, more bearable Personal Protection Equipment (PPE) appropriate to the conditions faced by palm smallholders. The Rainforest Alliance has numerous examples of using this process to bring AT solutions to farmers in other crops including coffee, tea, cocoa, and bananas.

Further discussion of BMPs and AT procedures are outlined in the Sustainable Agriculture Network (SAN) and Roundtable on Sustainable Palm Oil (RSPO) principles and criteria.

b. Implementing germplasm renovation

Many smallholder farms remain unable to access high-quality hybrid seedlings when planting there palm oil plantation in the first place and continue to suffer from low FFB and CPO yields. Renovating these farms with high-quality hybrid seedlings in addition to implementing BMPs could result in higher incomes due to better CPO yields.

Most importantly, many palm oil plantation are aging and are not renovated in a timely fashion. Most smallholder farmers are reluctant to replant palm oil trees at the end of their productive economic life cycle (Indonesian Palm Oil Smallholders Union (SPKS), 2013). Often, these trees can grow to be taller than 12 meters by year 15 (Bonneau, Field Agronomist, 2015), by which point the fruit is more difficult to reach and thus more costly to harvest (Indonesian Palm Oil Smallholders Union (SPKS), 2013). IDH estimates that around 10 percent of independent smallholders cultivate plots dominated by over-aged palms that require entire replanting of the plot (Arif, 2014).

Yet many smallholders continue to delay replanting because of the high cost of renovation, as well as the need for long-term financing to cover the gap between replanting and new oil palm fruit production (Arif, 2014). As payback horizons on renovation can take 8 – 13 years, including the immature phase (IFC, 2013), many smallholders who lack alternative sources of income are resistant to replanting their farms: 40 percent of independent smallholders receive 75-100 percent of their household income from oil palm (IFC, 2013).

Implementing BMPs and renovating farms will allow smallholder farmers to intensify production by dramatically improving their FFB yield and CPO yield from a 17 percent oil extraction rate (OER) to 20 percent OER. Better CPO yields would increase the average FFB price per ton from $109 to $122 (AidEnvironment, 2015). World Growth estimates that smallholders could reach CPO yields of 6-7 tons of CPO produced per hectare, which doubles the current average of 3.04 tons CPO/ha (World Growth, 2011).

By improving their FFB and CPO yields, smallholders will be able to boost their income from an estimated return of $960/ha for low-yield independent smallholders to $2340/ha for high-yield independent smallholders (World Growth, 2011) without having to resort to further expansion of their farms through deforestation. AidEnvironment calculates that a conservative estimate of a 2 CPO ton/ha yield increase would result in a reduced need for nearly 2 million hectares of land to be converted into palm oil[11] (Molenaar & Orth, 2010) assuming the right set of policies were implemented to encourage intensification rather than extension.

c. Capturing added value through smallholder processing

Lastly, independent smallholders – not tied to a mill – may be able to capture value within the supply chain by processing their own CPO. By investing in smallholder-owned processing facilities, farmers may be able to overcome current asymmetries between production and company mills, reducing their dependency on external processing facilities and decreasing the risk of not being able to sell their FFB to external mills.

It is estimated that small-scale mills would capture an added $200 value per metric ton of FFB processed (Levin, 2012). However, these are expensive to operate; they cost between $90,000 and $100,000 per hourly metric ton capacity to build. Construction of small-scale mills – as smaller capacity, lower efficiency versions of the larger (30 tons per hour +) –can be made at one-third the cost of those of their state-of-the-art counterparts (Table 1).

Independent small-scale mills already exist in North Sumatra, where they fill local infrastructural gaps when large mills are unavailable (DAI, 2009). Anecdotal evidence suggests that the smallholders in this area are – as a result of the additionally captured value from primary processing – economically much better off than plasma smallholders tied to mills with greater control (AidEnvironment, 2008).

Smallholder-owned small-scale mills may also benefit smallholders by working in logistically challenged areas such as Kalimantan, Sulawesi, and Papua (DAI, 2009), where the larger mills' capacity cannot meet local FFB production capacity due to smaller or more scattered planting areas, or local FFB production cannot access the mill because of distance or poor infrastructure.

Table 1: Information on micro mills, mini mills and conventional mills

	Capacity* (Metric ton CPO output/hr)	**Land required**** (Ha of FFB production)	**Estimated # of Smallholders*** **	**Cost**
Micro mills	1 – 5 MT	500 – 2500	100 – 500	$90,000 – $100,000
Mini mills	5 – 20 MT	2500 – 6000	500 – 1000	$120,000 - $280,000
Conventional mills	30 – 60 MT	9,000 – 18,000	1000 – 2000	$190,000 - $240,000

**Source:* (DAI, 2009)
***Source:* (Saleh, 2015).
****Based on Rainforest Alliance assumptions.*

[11] Based on estimates of 3 million ha of smallholder land with average yield of 3 tons CPO/ha.

Such small-scale mills are more common in West African palm-producing regions, largely because small-scale mills produce lower quality CPO that is often used more for domestic use rather than CPO that will be marketed to refineries and developed into derivative products for export. On the other hand, 60 percent of Indonesia's palm oil is exported (USDA, 2014), 16 percent is used in the domestic food industry, and 12 percent is used in biodiesel production (USDA, 2015). By the year 2020, 23 million of the projected 30 million tons of palm oil produced by Indonesia will be exported (World Growth, 2011).

Common challenges that small-scale mills need to overcome include those posed by inefficient economies of scale and the lack of the technological inputs necessary to properly store, purify, and filter the processed CPO to be sold to local intermediaries, processors, and exporters. Unless an area proposed for a mini-mill area lacks sufficient post-processing bulking and shipping infrastructure, it is difficult to integrate a small-scale mill into the existing supply chain. It is important to understand that the development of smallholder-owned mills without downstream capacity for bulking stations and shipping terminals poses a risk of shifting the negotiating position from smallholder producers and traders to smallholders and larger mills, as the small-scale mill would need to sell its output for consolidation, rather than directly to manufacturers and exporters.

Introducing small-scale processing to Indonesia is still a relatively new idea, but there have been a few examples of successful mills where smallholders were shareholders, which strengthened their bargaining position (Hanu, 2015). SPKS, a smallholders' union operating across Indonesia, has also presented to financial institutions on the possibility of organizing smallholders and financing investment of a mill, which was received well (Saleh, 2015).

Other possibilities to consider further developing include small-scale biofuel processing and cost savings (DAI, 2009), or further capturing value through vertical integration of a smallholder-owned seedling nursery (Saleh, 2015).

d. Improving access to smallholder financing

As highlighted above, supporting smallholder palm oil producers with the implementation of BMPs and AT, germplasm renovation and processing require the mobilization of short-term and long-term finance to pay for the input, services and infrastructures implied by such activities.

While there are some financing options available to independent smallholders, smallholders who are not tied to company plantations rarely have adequate access to financing for inputs, plantation establishment or replantation. In a survey, the IFC found that only 16 percent of independent smallholders received loans for plantation development (IFC, 2013). Sources of financing for independent smallholders included banks (60 percent), credit unions (13 percent), and cooperatives (9 percent) (IFC, 2013).

Independent smallholders are generally unable to work with formal financial institutions to receive credit; their financing requirements are often too small for banks and too big for microfinance organizations. Often, smallholders are not considered as "credit worthy"; they lack credit history or "hard value" collateral, such as a land certificate (IFC, 2013). Additionally, farmers present high repayment and default risks. For example without proper farm management practices in place, it can take smallholders much longer than the expected 5-10 years to pay back a plantation establishment loan (IFC, 2013).

Short-term on-farm financing needed by smallholders may include fertilizers, labor costs for maintenance or harvesting or FFB transportation costs (IFC, 2013). Mid-term and long-term investments may include investments in land ownership certificates that could be used as collateral in the future, rehabilitation, and renovation of farms (IFC, 2013) or processing infrastructures and activities.

Without access to finance, smallholders often have difficulties sourcing the right seedlings and inputs needed to for oil palm cultivation. While they may obtain subsidized seedlings and fertilizer from the government and local authorities, these subsidies are often limited by quotas, forcing smallholders to deal with the difficulty of sourcing their own certified quality seedlings. Without initial investment capital, farmers may choose to purchase cheaper seedlings that dampen their farm's productivity for the entire 25-year life cycle (IFC, 2013).

Similarly, smallholders who are unable to access fertilizer through subsidies must instead purchase fertilizer from middlemen in a long distribution chain that often inflates original fertilizer prices (IFC, 2013). For this reason, after plantation establishment, fertilizers become one of the biggest operational costs in oil palm cultivation, averaging about 74 percent of field costs (IFC, 2013).

Promoting access to financing for smallholder palm oil producers is critical to unlocking smallholders' access to quality seedling and inputs and to support sustainable palm oil production. Organized groups would also benefit from access to financing to help smallholders better manage their production as well as potentially invest in processing facilities and support post-harvest shipping.

VI. Cost Structure Analysis

Providing smallholders with technical assistance in combination with financing for BMPs implementation, renovation and/or smallholder processing are avenues to bridge the lack of knowledge and finance that causes a significant yield gap on most smallholder farms. Such an approach would not only benefit farmers, but also contribute to achieving greater sustainability in palm oil.

To determine current financing needs, the Rainforest Alliance conducted a preliminary desk-based analysis of the costs involved with implementing and maintaining a smallholder oil palm plantation; based on cost information received from SPKS and CIFOR.

The Rainforest Alliance identified two scenarios[12] to describe a smallholder's costs depending on the practices implemented and the level of inputs applied (Molenaar & Orth, 2010):

1. "Best Management Practices" (BMPs) scenario reflecting highest sustainability standards and
2. "Low Input" scenario reflecting poor agronomic practices with limited input usage (see tables below).

INPUT USAGE	
BMPs Scenario	**Low-Input Scenario**
Seedlings	
High quality hybrid seed used	Non-hybrid seed used
Fertilizer	
Fertilizer applied at recommended rates and times	No fertilizer applied
Pest and disease control	
Pests, particularly rats, and diseases controlled	No effort to control pests or diseases
Herbicides	
No herbicide used; rely on LCC and weeding instead	Some herbicide used

AGRONOMIC PRACTICES	
BMPs Scenario	**Low-Input Scenario**
Correct seed planting	
Palms planted at correct age and to correct depth	Poor palm planting standards, severe transplanting shock and delayed growth
Plant consolidation	
Plants are consolidated to permit rapid root growth	Poor palm planting standards, severe transplanting shock and delayed growth
Weeding	
Inter-row vegetation controlled and LCC encouraged. Palm circles completely cleared of weeds	Little attempt to control weeds in immature areas. No effort made to clear circles.
Pruning	

[12] Based on AidEnvironment report (Molenaar & Orth, 2010) and RA assumptions

Pruning and circle raking to remove debris done annually	No attempt at pruning or circle raking
Legume Cover Crop (LCC)	
Cover crops established to minimize weeding, minimize erosion, and conserve water	No cover crops planted
Pre-harvest sanitation	
Completed at 24 months and scout harvesting started	No pre-harvesting preparation done

The Rainforest Alliance then modeled different financing options (FO) based on how much input was paid for by the smallholder versus a plantation company or third party, and how much of the labor was done by the smallholder versus by external labor.

FINANCING OPTIONS	
Input Costs	**Labor Costs**
Financing Option 1 (FO1)	
Smallholders pay for all inputs, including seeds, fertilizer, and pesticide	Smallholders perform 85% of labor and pay for 15% external labor
Financing Option 2 (FO2)	
Smallholders pay for all inputs, including seeds, fertilizer, and pesticide	Smallholders perform 100% of labor
Financing Option 3 (FO3)	
Plantation company supplies seedlings, fertilizer, and pesticides	Smallholders perform 85% of labor and pay for 15% external labor
Financing Option 4 (FO4)	
Plantation company supplies seedlings, fertilizer, and pesticides	Smallholders perform 100% of labor

a. Financing is required for seedlings and fertilizers: the main cost drivers implementing BMPs on a new plantation.

The Rainforest Alliance analysis found that the best case scenario, which describes the cost of BMPs implementation, requires significant investment in inputs including seedlings and fertilizer (Figure 4).

In FO1 and FO2, where the smallholder supports the cost of all inputs, the Rainforest Alliance found a significantly higher five-year cost to implement and maintain 1 hectare of palm under BMPs. If a plantation company or third party were to provide financing for key inputs including seedlings, fertilizer, and pesticides – as picture under FO3 and FO4 – this would greatly reduce the upfront investment cost for farmers, thus making implementing BMPs much more feasible.

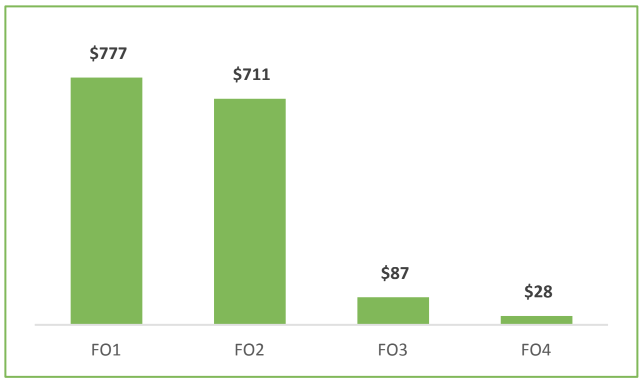

Figure 4: Total 5-year cost to implement and maintain 1 hectare of palm oil under BMPs; depending on financing options

When comparing annual costs incurred over the first five years of a plantation, the analysis indicates that the costs are highest in Year 0 of plantation establishment, driven by the high cost of seedlings.

Figure 5 shows a breakdown of the annual costs for implementing and maintaining 1 hectare of oil palm under BMPs, comparing FO1 and FO3. FO1 represents a high financing need option where smallholders finance all inputs. FO3 represents a low-financing-need option in which smallholders pay for inputs excluding seedlings, fertilizers, and pesticides—which are financed by plantation companies or third parties. In both cases, smallholders also pay for 15 percent of external labor.

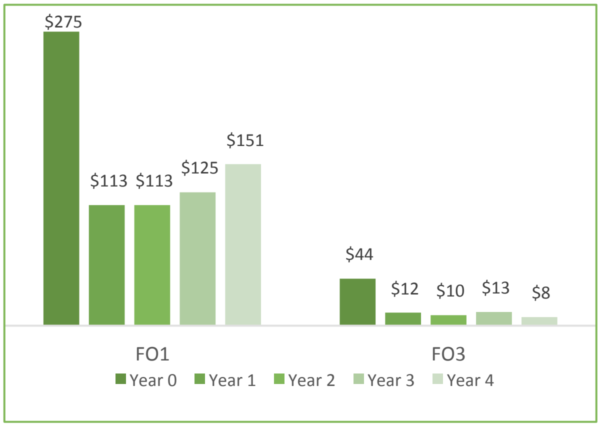

Figure 5: Breakdown of annual cost for implementing and maintaining 1 hectare of oil palm under BMPs for FO1 and FO3

Further analysis of the input costs shows that most of the costs are borne in Year 0, largely due to the high cost of seedlings, estimated at $170 per hectare. In fact, seedling purchase represents about 67 percent of the input costs for Year 0. In the subsequent years, input costs are driven by fertilizer costs, which increase in value as the oil palms grow from small trees to mature producing trees. Fertilizer costs rise from 23 percent in Year 0 to an average of 93 percent of total input costs in the years between plantation establishment and oil palm maturity at Year 4, when the palms begin to bear fruit (Figures 6 and 7).

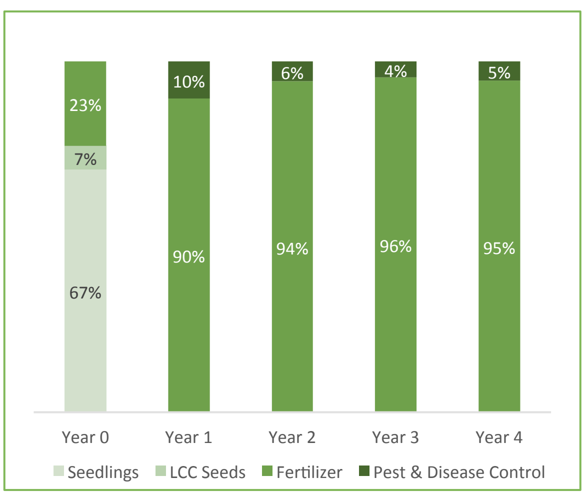

Figure 6: Distribution of cost across different inputs for five years under SC1, FO1

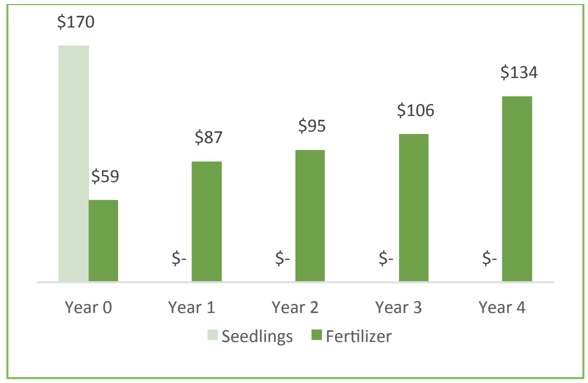

Figure 7: $ Value of Seedlings and Fertilizer for five years under SC1, FO1

b. Bridging the financing gap to catalyze BMP implementation

"Low-input" smallholders who do not receive inputs from plantation companies or third parties, require substantial amounts of financing to reach BMP standards. As shown in Figure 8, "low-input" smallholders require additional financing estimated between $510 and $570 per hectare over the first 5 years of a plantation implementation to reach BMP standards depending on the percentage of external paid labor (15 percent under FO1 and 0 percent under FO2).

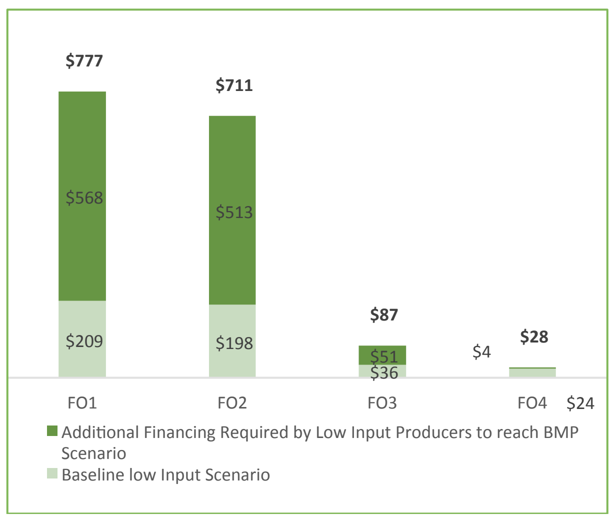

Figure 8: The financing gap between SC4 Low Input to SC1 BMPs

Specifically, financing is required to cover the cost of fertilizer, which is a key variable in yield performance. Financing can also support other inputs such as pesticides and equipment needed for better farm management, as well as the cost of extra labor in applying BMP practices such as consolidation, weeding, pruning, LCC establishment and maintenance, plantation infrastructure, maintenance, and pre-harvest sanitation.

As oil palm cultivation is a major source of income to many independent smallholders, financing new seedlings for renovation in combination with better practices and other inputs will significantly improve production, and therefore impact farmer income and livelihood.

Such financing will also resolve the issue of farmers reluctant to make necessary investment in the long-term productivity of their farm. There is a strong business case for such investment because financing can help smallholders pay for better-quality seedlings and afford the necessary agronomic inputs that can double production throughout the life cycle of the oil palm plantation.

The Rainforest Alliance is interested in further exploring the financing needs for independent palm oil smallholders in Indonesia to better understand smallholder needs and existing financing options.

VII. Next Steps

As a next phase to this desk research, the Rainforest Alliance proposes to ground test existing internal and external analyses with data from a number of districts in Kalimantan. This region is the second greatest source of palm oil supply in Indonesia behind Sumatra. Nonetheless, palm developments in Kalimantan are more recent and often implemented by smallholder populations less familiar with palm and in greater need of technical assistance. The goal for evaluating and promoting additional investments will be to improve quality and quantity of palm oil, and create a more sustainable and competitive supply chain in an area of critical environmental and economic importance. In the future, similar research can also be conducted in other regions as opportunities and potential supply are identified.

In addition, the Rainforest Alliance aims to develop a technical training package for smallholder palm oil producers in Indonesia. To advance finance for sustainable palm oil, smallholder farmers must have access to training to improve their sustainability, competitiveness, and financial literacy.

Contact & Information

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