



# Exploring Smallholder Solutions in the Rubber Sector

FEASIBILITY STUDY:  
THE PROCESSING AND SALE OF  
RUBBERWOOD TO SUPPORT  
SMALLHOLDER FINANCING IN  
INDONESIA

SEPTEMBER 2020

HeveaConnect, Target Corporation, and World Wildlife Fund are engaged in finding solutions to enhance the production and trade of sustainable natural rubber. The three organizations came together in 2019 around the shared interest in understanding how the processing and sale of rubberwood might incentivize the adoption of sustainable practices by natural rubber smallholders and enhance their livelihoods. We enlisted the services of Financial Access to analyze the potential of rubberwood to serve as a mechanism to support smallholder financing in Indonesia. Although the scope of the analysis was limited to two provinces in Sumatra, the findings of this study could be used there and elsewhere in Indonesia to inform the development of sustainable natural rubber initiatives that include the processing and trade of rubberwood as one of several strategies to support equity in natural rubber supply chains.



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HeveaConnect is a digital trading and data platform for the natural rubber supply chain. It is at the forefront of using technology to transform rubber trading and tracing process. This digital transformation provides a simple and secure solution for trading while enabling deeper analysis of the supply chain to uncover environmental, social and financial risks. HeveaConnect plays a vital role in enabling sustainable developments in each segment of the supply chain by adapting and utilising technological advancements. The company envisions a future where consumers are empowered to make smarter decisions through insights on their supply chain.



## FINANCIAL ACCESS

Financial Access is a financial services firm, focused exclusively on frontier and emerging markets. Financial Access provides consulting, financial advisory and financing services to diverse clients including (impact) investors, PE firms, banks, specialised non-bank or microfinance institutions, international donor organisations and NGOs, development finance institutions and private companies.



## SNV

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# EXECUTIVE SUMMARY

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**World Wildlife Fund (WWF), Target Corporation, and HeveaConnect engaged Financial Access Consulting Services (FACS), with additional support from SNV, to investigate whether the processing and sale of rubberwood from over-aged rubber trees in Indonesia can serve as a viable financing mechanism for rubber smallholders.** Low yields are one of the main issues plaguing rubber smallholders in Indonesia, who are often forced to replace rubber with other commodities to improve their livelihoods. This has consequences for Indonesia's dominant position in the rubber sector, and potentially drives deforestation as new land is often cleared to meet demand.

These low yields are caused by a combination of poor management practices and over-aged trees, which are naturally less productive. Low international rubber prices exacerbate these problems, trapping farmers in poverty. Though replanting rubber trees requires a significant investment from smallholders that can only be met with an appropriate financing scheme, selling the rubberwood from their old trees can help lessen their financial need and financing costs over time.

This report investigates the viability of selling rubberwood from the perspective of all stakeholders in the supply chain. We identify a financing scheme that has the potential to ensure that a smallholder avoids a cash shortfall during or after replanting.

While the sale of rubberwood can help lessen financing need, the current quality of rubberwood in Indonesia is sub-optimal due to poor tapping practices, which leads to low prices. This study finds that an agroforestry model, in which intercrops generate income during the immaturity period of the new rubber trees, is a necessary condition for financing. Hence, for the sale of rubberwood to be optimal for smallholders and financial service providers (FSPs) alike, a replanting scheme must combine agroforestry and training in good agricultural practices (GAP). Though such a scheme is analyzed in detail in this report, it should be refined and re-evaluated in the local context where it would be implemented, and discussed in more detail with FSPs.



# 1. BACKGROUND STUDY

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Rubber production is a key income stream for several million smallholders in South East Asia. Ninety percent of Indonesian natural rubber raw material is sourced through smallholders cultivating less than two hectares of land each for a total of roughly 3.2 million hectares of farmed land (Directorate General of Estate Crop 2019). However, Indonesian smallholders are caught in a vicious cycle of low yield and low international prices.

As smallholders try to increase their income to meet their family needs, they commonly use one of two strategies. They often clear their (jungle) rubber holdings in favor of other crops, most notably oil palm, or they increase the size of the land they cultivate with rubber trees. Both strategies have broad adverse consequences. The first strategy causes a decrease in rubber export and associated revenue for Indonesia. Both the first and second can cause a loss of forest ecosystems, biodiversity, and carbon storage capacity.

One way to counter some of these adverse consequences is by replanting current plots with new, higher yielding rubber trees, and improving planting and tapping practices to generate higher yields per hectare. However, financing for replanting and extension services are scarcely available for Indonesian smallholders.

This study investigates if selling rubberwood is a viable mechanism to encourage smallholders to replant and to improve their income while their new rubber trees mature. This report is organized as follows. First, we explain our methodology and formalize the problem statement. Next, we detail a supply chain analysis based on findings from a field visit. The financial model combines the previous information and analyzes smallholders' finances in detail. Finally, we discuss the proof of concept and draw conclusions from the analysis.

# 2. METHODOLOGY

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This study consists of three interrelated steps. First, FACS, with support from SNV, conducted a desk study to identify the stakeholders in Jambi and South Sumatra based on data from the Central Bureau of Statistics (BPS) and FACS's previous engagements. FACS and SNV also studied the agronomic information of rubber and opportunities and conditions for financing rubber smallholders. Second, FACS, with SNV's assistance, conducted a scoping visit that included face-to-face interviews with several stakeholders in the rubberwood supply chain in Jambi and South Sumatra. The objective of the scoping visit was to understand rubberwood farm and price dynamics, and to generate inputs for the financial model. Third, FACS combined the insights generated from the scoping visit with the desk study and agronomic data to build a financial model for rubberwood. The results are presented in this report.

### 3. PROBLEM ANALYSIS

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This chapter contains a problem analysis, starting with background information on rubber and rubberwood, followed by the challenges of rubberwood and smallholder financing in general.

**Problem statement:** Due to the combined effects of aging rubber trees, low yield, and low international prices, the income of smallholder rubber farmers in Indonesia is ever decreasing. Replanting new, high-quality rubber trees, combined with an agroforestry and intercropping scheme, has the potential to lead to higher yields and improved livelihoods. However, access to replanting finance and extension services are scarcely available for small farmers in Indonesia. As a result, escaping poverty is a major challenge.

**Proposed solution:** Develop an innovative financing scheme for the replanting of rubber that addresses the root causes of the poverty trap afflicting rubber smallholders in Indonesia. The financing scheme should focus on (i) increasing productivity/yield through training on good agricultural practices (GAP) and replanting methods, (ii) integrating replanting according to a staggered agroforestry model, and (iii) combining income from rubberwood with intercropping to replace the current monoculture system, which does not build a viable business case.

**Finance as enabler:** Affordable finance is vital for replanting to ensure smallholders have the means to replant optimally and sustainably, guaranteeing higher yields over their trees' productive lives.

**Challenges with access to finance:** Because most traditional financing schemes require borrowers to pledge collateral to the institution, smallholders, who often lack land titles, are often unable to receive formal financing. This is especially true for long-term replanting loans, which are high-risk for financial institutions. However, even when land titles are available, travel costs associated with visiting farmers at their dispersed locations are so high, institutions often find that engaging with them is unprofitable. Overcoming these two barriers is crucial for creating the scale and replicability required to make financing of smallholder replanting a profitable business.

**Conditions for success:** A successful replanting scheme should (i) minimize the number and severity of lean years for farmers, (ii) be standardized and capable of being executed at scale, (iii) be tailored to the individual and household needs of a smallholder, and (iv) improve farmers' skills and knowledge through technical assistance to ensure long-term profitability. Well-designed financing schemes are vital to ensure that these conditions can be met, and that the livelihoods and well being of smallholder rubber farmers can be improved.



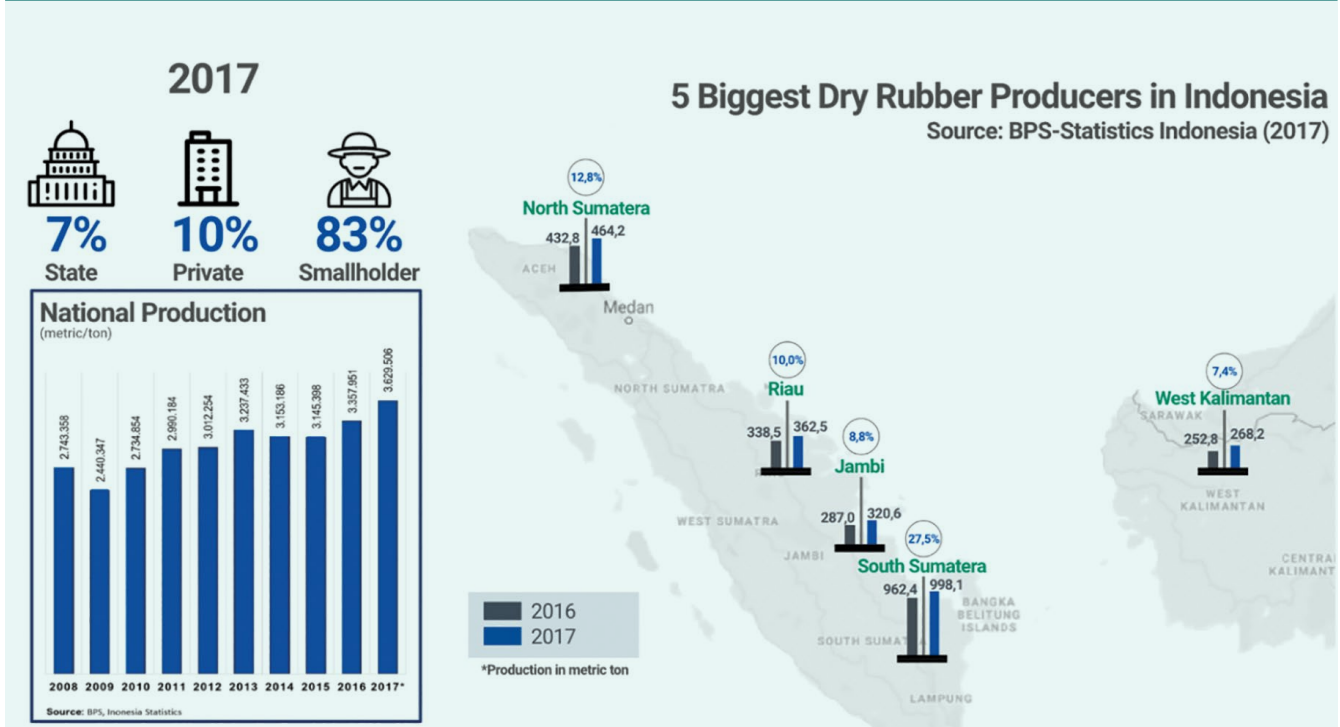
### 3.1 Background Information on Rubber Production in Indonesia

The production of rubberwood in Indonesia is dominated by the 2.25 million small-holders who account for about 83 percent of the cultivated rubber land (Directorate General of Estate Crop 2019). Indonesian exports of natural rubber totaled over 4 billion USD in 2018, constituting 30 percent of the world’s rubber export (Workman 2019), and over 2 percent of Indonesia’s total export value that year (World Bank 2020). Considering processed rubber as well, exports stand at 6.4 billion USD or 3.5 percent of total exports (Workman 2019).

As of 2017, the Government of Indonesia recorded around 3.7 million hectares of natural rubber plantations, generating an estimated 3.6 million tons of natural rubber. For the last 10 years, production has grown at 1.5 percent per year, driven by the five biggest provinces, which contribute to 66.5 percent of national production (i.e., South Sumatra, North Sumatra, Jambi, Riau, and West Kalimantan). A third of this rise can be explained by more land being dedicated to rubber production, and the other two thirds by increased yields (Directorate General of Estate Crop 2019).

Even though Indonesia is the world’s second largest producer of natural rubber, the downstream rubber industry is not well developed. The country exports about 85 percent of its raw rubber production. Lacking domestic processing facilities, Indonesia must import processed rubber products back into the country. In recent years, however, there has been a slow increase in domestic processing capacity and consumption. About half of the natural rubber utilized domestically is for tire manufacturing, followed by rubber gloves, rubber threads, footwear, rethread tires, medical gloves, and tools.

FIGURE 1: INDONESIA’S NATURAL RUBBER PRODUCTION PROFILE IN 2017



### 3.2 Challenges of Over-aged Rubber Trees

The productivity of rubber in Indonesia is low and stands at 0.96 ton per hectare. Other rubber producing countries such as Thailand, Vietnam and Malaysia reach levels of 1.80, 1.72 and 1.51 tons per hectare respectively.

Karyudi (2015) highlights two main causes of low productivity of smallholder farmers, namely poor maintenance and tree age. Though the latter is the focus for this study, a replanting program could address the former as well. During an interview on 14 June 2019, the Director of Annual Plants and Fresheners of the Ministry of Agriculture (MoA), Irmia Rachmi, stated that most rubber trees in Indonesia were developed in 1978–1991 via several schemes, namely the Perkebunan Inti Rakyat (PIR), Smallholder Rubber Development Project (SRDP), Sector Crop Development Project (SCDP), Tree Crop Smallholder Development Project (TCSDP), and Tree Crop Sector Development Project (TCSSP). International donors such as the World Bank and the Asian Development Bank funded these initiatives. Rubber trees only begin producing latex at around Year 5 until approximately Year 25. After that, yields drop significantly, as does corresponding revenue. This means that almost all natural rubber trees planted under these schemes in Indonesia have passed their peak production and are no longer economically viable to tap. Formally speaking, however, there is no detailed information on the exact ages of rubber trees in Indonesia, so these estimates remain informed guesses.

TABLE 1: PRIMARY WOOD PRODUCTS 2017 – 2018 (ITTO, 2019)

	Production (m <sup>3</sup> )			Imports (m <sup>3</sup> )			Imports (USD)		
	2017	2018	Growth	2017	2018	Growth	2017	2018	Growth
Logs	1.924,2	1.942,1	0,93%	134,6	143,6	6,69%	17.865,6	19.106,2	6,94%
Sawnwood	483,4	484,4	0,21%	150,7	151,9	0,80%	39.695,0	42.112,4	6,09 %
Veneer	13,8	13,9	0,72%	4,3	4,2	-2,33%	3.420,3	3.571,3	4,41%
Plywood	156,7	156,3	-0,26%	29,9	29,5	-1,34%	14.191,3	15.683,8	10,52%
<b>Total</b>	<b>2.578,1</b>	<b>2.596,7</b>	<b>0,72%</b>	<b>319,5</b>	<b>329,2</b>	<b>3,04%</b>	<b>75.172,2</b>	<b>80.473,7</b>	<b>7,05%</b>
	Exports (m <sup>3</sup> )			Exports (USD)					
	2017	2018	Growth	2017	2018	Growth			
Logs	132,5	140,7	6,19%	16.057,7	17.312,2	7,81%			
Sawnwood	154,2	151,1	-2,01%	39.427,1	40.510,8	2,75%			
Veneer	4,0	4,1	2,50%	3.274,5	3.508,9	7,16%			
Plywood	30,2	28,2	-6,62%	14.934,9	16.176,5	8,31%			
<b>Total</b>	<b>320,9</b>	<b>324,1</b>	<b>1,00%</b>	<b>73.694,2</b>	<b>77.508,4</b>	<b>5,18%</b>			

### 3.3 Background Information on Rubberwood

Due to the low and diminishing productivity of most rubber plantations, the Government of Indonesia formulated a long-term replanting plan covering approximately 50 thousand hectares per year starting in 2019, though this remains to be implemented (Wibowo 2019). This ambitious plan, which still falls far short of the level of replanting needed to keep the country's latex supply stable, highlights the need for both large-scale rubber replanting and for sale of the rubberwood extracted from the replanted plots.

The International Tropical Timber Organization (ITTO) reported in 2019 that the production of primary wood products slightly increased in 2018. In addition, the amount of trading (export and import) was increasing faster than production by four percentage points, evidence of a lively processing sector.

Indonesia is the largest producer of tropical roundwood, totaling 73.8 million cubic meters in 2018 (ITTO 2019). However, data from the Indonesian Ministry of Environment and Forestry shows that Indonesia's roundwood production reached just 55.3 million cubic meters in 2017, after a low of 35.3 million cubic meters in 2015. The difference between the two estimates largely represents illegal logging, which is a major problem and represents up to 60 percent of the timber harvest (ITTO 2019). Roundwood is the biggest primary wood product of Indonesia, accounting for approximately 90 percent of primary wood production. Almost all of Indonesia's production is consumed domestically, and is increasingly produced by industrial plantations (for the pulp and paper industries) and forest conversions to agriculture.

Timber is one of Indonesia's important exports. In the period 2012–2016, the export value of Indonesia's primary wood products averaged around 2 billion USD per year according to data released by the Ministry of Industry. However, ITTO (2019) estimates exports to be approximately 20 percent higher. Furthermore, it estimates the export of secondary wood products brought in another 3.5 billion USD per year.

TABLE 2: INDONESIA'S PRIMARY WOOD PRODUCTS (2013 – 2017)

(Ministry of Environment & Forestry, 2017)

(m3)	2013	2014	2015	2016	2017
Roundwood	45.770.454	44.963.519	35.290.288	42.756.116	48.690.623
Sawnwood	992.867	1.458.624	1.765.080	1.820.476	2.812.812
Plywood	3.261.970	3.579.113	3.640.631	3.636.058	3.793.059
<b>Total</b>	<b>50.025.291</b>	<b>50.001.256</b>	<b>40.695.999</b>	<b>48.212.649</b>	<b>55.296.494</b>

Available at: <https://www.bps.go.id/dynamic/table/2015/09/08/862/produksi-kayu-hutan-menurut-jenis-produksi-m3-2000-2002-2017.html>

**TABLE 3: INDONESIA PRIMARY WOOD PRODUCTS EXPORT ACCORDING TO MOI**

(USD Thousand)	2012	2013	2014	2015	2016
Roundwood					
Sawnwood	642.977,50	691.339,40	847.835,40	769.966,70	741.702,10
Veneer	33.905,70	31.446,30	30.274,30	41.316,30	54.214,40
Plywood	1.207.733,10	1.191.420,20	1.262.323,0	1.292.728,0	1.117.026,90
<b>Total</b>	<b>1.884.616,30</b>	<b>1.914.205,90</b>	<b>2.140.432,70</b>	<b>2.104.011,0</b>	<b>1.972.943,4</b>

Available at: <https://kemenperin.go.id/statistiek/peran.php?ekspor=1>

**TABLE 4: INDONESIA PRIMARY WOOD PRODUCTS EXPORT ACCORDING TO ITTO**

(USD Thousand)	2012	2013	2014	2015	2016
Roundwood	17.106	10.765	25.815	13.426	14.307
Sawnwood	417.365	329.905	403.303	351.883	366.074
Veneer	38.633	40.423	38.588	47.375	57.481
Plywood	1.814.543	1.920.613	2.059.900	20.070.155	1.739.650
<b>Total</b>	<b>2.287.647</b>	<b>2.301.705</b>	<b>2.527.606</b>	<b>2.482.838</b>	<b>2.177.511</b>

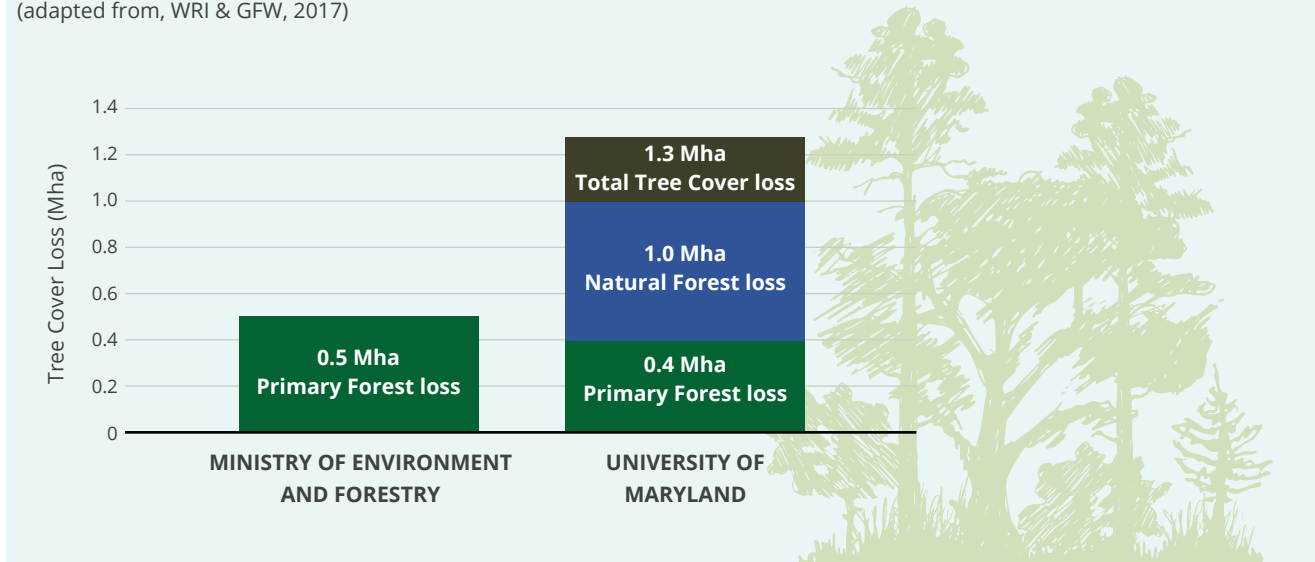
**TABLE 5: INDONESIA SECONDARY WOOD PRODUCTS EXPORT ACCORDING TO ITTO**

(USD Thousand)	2012	2013	2014	2015	2016
Wooden Furniture	1.558.240	1.789.557	1.557.750	1498.406	1.370.931
Builder woodwork	315.786	330.434	341.399	355.271	362.872
Mouldings	568.371	510.511	616.508	613.754	614.540
Cane and Bamboo	361.473	305.168	255.554	155.495	138.251
Other <i>SPWPs</i>	462.936	698.279	862.739	864.927	827.675
<b>Total</b>	<b>3.266.806</b>	<b>3,633.948</b>	<b>3,633.950</b>	<b>3,487.853</b>	<b>3,314.268</b>

The wood industry is very dependent on the availability of forest wood. According to Global Forest Watch, Indonesia had 137 million hectares of natural forest covering 73 percent of its land mass in 2010. In 2018 alone, the country lost 1.22 million hectares of tree coverage, equivalent to 480 metric tons of CO<sub>2</sub> emissions. According to the University of Maryland, the year before, Indonesia lost about 1.3 million hectares of tree coverage including one million hectares of natural forest. Of this loss of natural forest, about 40 percent is primary forest. Yet the Indonesian Ministry of Environment and Forestry holds that Indonesia lost only 0.5 million hectares of primary forest in 2017, and nothing more (see Figure 1).

**FIGURE 2: TREE COVER LOSS IN INDONESIA**

(adapted from, WRI & GFW, 2017)



To combat illegal logging, the Government of Indonesia implemented a timber verification system (*Sistem Verifikasi Legalitas Kayu/ – SVLK*; see more information in Box 1). In addition, the Ministry of Trade applied the prohibition of roundwood export, based on the regulation of the Trade Minister (number 01/M-DAG/PER/1/2007 dated 22 January 2007), into a framework of preserving natural sustainability. The news website JPNN.com (2019) evaluated further efforts of the Government of Indonesia to reduce deforestation in the late 2010s, most notably implementing a moratorium on logging primary forests and peatlands through presidential instructions

### BOX 1: Indonesia’s Timber Legality Verification System

Sistem Verifikasi Legalitas Kayu (SVLK) is an Indonesian Government initiative to address illegal logging and promote legal wood in the country. The system aims to ensure that timber and timber products produced in Indonesia come from verifiable legal sources. SVLK is executed through the independent Lembaga Verifikasi Legalitas Kayu (LVLK), or Timber Legality Verification Institution.

SVLK is based on the Ministry of Forestry P.38/Menhut-II/2009, P.68/Menhut-II/2011, and Permenhut P.45/Menhut-II/2012 concerning standards and guidelines for performance assessment of i) sustainable production forests, ii) the timber legality verification of permit holders, and iii) forest rights (Standard dan Pedoman Penilaian Kinerja Pengelolaan Hutan Produksi Lestari dan Verifikasi Legalitas Kayu pada Pemegang Izin atau pada Hutan Hak).

Timber legality (TL) certificates of holders of Izin Usaha Pemanfaatan Hasil Hutan Kayu/IUIPHHK (Timber Product Utilization License in natural forest) or Izin Usaha Industri/IUI (Industrial Business License) with investments above IDR 500 million are valid for three years. Surveillance audits are required annually to ensure that SVLK is implemented consistently by the holders.

TL certificates of IUI holders with total investments of less than 500 million IDR, or holders of Tanda Daftar Industri/TDI (Industry Listing Mark), craftsmen and household industries, are valid for six years. Surveillance audits are required every other year covering all raw material, production, and marketing documents for the prior three months.

Source: WWF Indonesia ([http://awsassets.wwf.or.id/downloads/flier\\_svlk\\_\\_gftn.pdf](http://awsassets.wwf.or.id/downloads/flier_svlk__gftn.pdf))

on Postponing the Granting of New Permits, as well as improving the management of primary natural forests and peatlands, and controlling forest fires. The evaluation concluded that the rate of forest loss in Indonesia was 40 percent lower in 2018 than the average rate in the period 2002–2016.

### 3.4 Challenges in Access to Finance

For Indonesia to maintain its position as rubber exporter, investment in rubber replanting is crucial and will require significant buy-in from financial institutions. FSPs perceive smallholder rubber farmers as particularly risky, and therefore are reluctant to engage with them.

The exceptional riskiness of smallholder financing stems from three interrelated issues. First, there are significant informational asymmetries, as smallholders often lack a credit history and FSPs lack knowledge about the agriculture sector. This leads to both adverse selection, in which FSPs are unable to understand the risks of a borrower and select the least-risky borrowers, and moral hazard, in which borrowers are less incentivized to maximize their income and minimize their risk after receiving a loan. This appreciably increases FSP credit risk exposure, which the institutions often mitigate by enforcing stringent collateral requirements or by avoiding agriculture altogether. However, from the smallholders' perspective, lack of official land titles means they are effectively locked out of the financial system (see more information on collateral in 3.4.1). Second, there are market risks, such as price fluctuations on the global commodity market and closely linked climate risks (droughts and floods) that have a major impact on farmers' realized income. Third, smallholder farmers often encroach on forests and degrade the land, which can expose FSPs to large legal and reputational risks.

For FSPs, credit and reputational risks are closely related, as over-indebtedness of a community will lead to an increase in their default rates. A higher default rate can quickly color perceptions of the FSP, making future customers unwilling to accept credit from the institution. Over time this not only can lead to a decrease in demand for an FSP; it also can lead to political interference and the closure of an FSP.

Apart from these risks, which translate directly or indirectly into costs for FSPs, the operational costs to reach out to smallholder farmers are also significantly higher than for urban or peri-urban customers. Issues such as the geographical dispersion of farmers, their lack of aggregation points such as cooperatives, and the fact that their loan size is small are important, relevant factors. Furthermore, the cost associated with setting up a branch network in rural areas means that many FSPs would rather avoid the entire rural market segment altogether. The combination and interrelatedness of these risks and operational costs ensure that a fragmented approach is almost certainly doomed to fail.

Only a holistic approach by an FSP — one that addresses risk and operational costs together with smallholders — has the potential to create a profitable and viable business opportunity for smallholder finance.

### 3.4.1 CHALLENGES TO LOAN COLLATERAL IN DETAIL

Hard assets that can be pledged as collateral play a central role in accessing formal finance, especially long-term loans. This section explains accepted collateral types for agriculture lending in Indonesia, including the potential of using trees as collateral. The table below shows an overview of the collateral types for agriculture lending in Indonesia:

TABLE 6: ACCEPTED COLLATERAL TYPES FOR AGRICULTURAL LENDING IN INDONESIA

Adapted from Indonesia Market Study (IFC, 2014)

Smaller loans (~ IDR 20 million)	Larger Loans (> IDR 20 million)
Land and building	Immovable (mostly land)
Movable limited to vehicles	Movable limited to vehicles
Business license	Insurance in case of insufficient collateral value
Letter from village head	
Marriage and education certificates	



As far as farmers are concerned, land titles are the most common collateral accepted by banks and often the only type available. In Indonesia, land titles come in many forms and are granted by different levels of the government. Usually only the strongest (nationally recognized) land titles are accepted as collateral, leaving farmers who hold weaker land titles unserved.

A potential form of alternative collateral in the rubber sector is to secure the loan not only with land titles but also with the trees (wood) grown on the land. Although Indonesian plantation companies account for biological assets in their financial statements according to IFRS – IAS 41<sup>1</sup>, the financial sector and most importantly Bank Indonesia do not recognize them as viable collateral. A methodology on how to value timber trees that may be applicable to rubber plantations is discussed in Box 2 below.

Apart from collateral, corporate guarantees and offtake agreements can be important risk mitigants for FSPs. While offtake agreements are common in the oil palm sector, the use of formal offtake agreements in the rubber sector is very limited. These contracts rely on active engagement from the offtaker and lock-in partnerships for a long time, at least as long as the loan is outstanding. This decreases the willingness of smallholders to participate. Additionally, future price or yield fluctuations can be factors that make writing and enforcing offtake agreements difficult. Unfortunately, both factors are very pronounced in rubber production.

## BOX 2: Valuation of timber trees

In Lao, there has been a large expansion of smallholder teak plantations due to the influx of government-initiated teak projects since 1975, as well as favorable land allocation policies in the 1990s. With high demand for teak wood in the global market, there is potential for high returns from teak farming. However, teak production is largely dominated by smallholder farmers who face increased competition for land, exacerbated by often unclear land tenure. Therefore, the Center for People and Forests (“RECOFTC”) in conjunction with the Lao Provincial Organization for Forestry and Agriculture (PAFO) and the Lao Department of Agriculture and Forestry, developed a teak tree valuation methodology.

To estimate the value of trees as collateral, a volume estimation of the wood and a market value estimation must be conducted. Though FSPs can

have their own valuation method, valuations largely fall into two broad categories, stumpage value and predicted value.

**Stumpage value** refers to the volume of the wood multiplied by the current market price of the tree. Many factors determine the stumpage value, but the most important are the species, quality, size, age and location of the trees, as well as prevailing market conditions, the terrain, and the amount of wood.

**The predicted value** calculates the expected future financial return from harvesting a mature stand at today's value, corrected for expected inflation. The primary purpose of the predicted value method is to compare forestry investment to other investment in terms of the opportunity cost of planting trees for the wood.

Source: <https://www.recoftc.org/sites/default/files/public/publications/resources/recoftc-0000078-0001-en.pdf>

<sup>1</sup> More info in the conference paper: Accounting of Biological Assets in Indonesian Plantation Companies (N. Baroroh et al, 2018)



# 4. RUBBERWOOD SUPPLY CHAIN ANALYSIS

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Rubberwood was traditionally used as a cheap source of fuel in countries where rubber plantations were abundant (FAO 2001). Due to a lack of durability, rubberwood was rarely used as timber except in timber-scarce countries where alternatives were not easily available. In recent decades, however, significant research has helped overcome problems associated with using rubberwood as timber. These solutions included rubberwood seasoning and preservation. After these innovations, rubberwood developed into one of the largest export timbers in Southeast Asia (FAO 2001). Rubberwood has certain advantages over conventional timbers from the natural forest because it is a plantation by-product and is available at a relatively low cost.

## 4.1 Characteristics of Rubberwood

The main characteristics of rubberwood (*Hevea brasiliensis*) are its stability and relatively low shrinkage indicated by its density. Rubberwood's density is 0.62–0.65 g/cm<sup>3</sup>, which is similar to acacia, ramin and mahogany (Towaha and Daras 2013). It is easily processed, for instance, by cutting/sawing, molding, shaping, lathing, drilling, square holing, sanding, nailing and coloring. It also has good adhesion and preservation capacity.

## 4.2 Rubberwood Utilization

According to Towaha and Daras (2013), rubber timber can be used as processed wood, sawn wood and plywood. As processed wood, rubberwood's yield is around 50 percent, and can be made into furniture and woodwork for housing construction. Plywood is fabricated wood made of veneers with thickness of 0.25–0.75 mm.

There is also rubberwood waste, which can be used in multiple ways, namely:

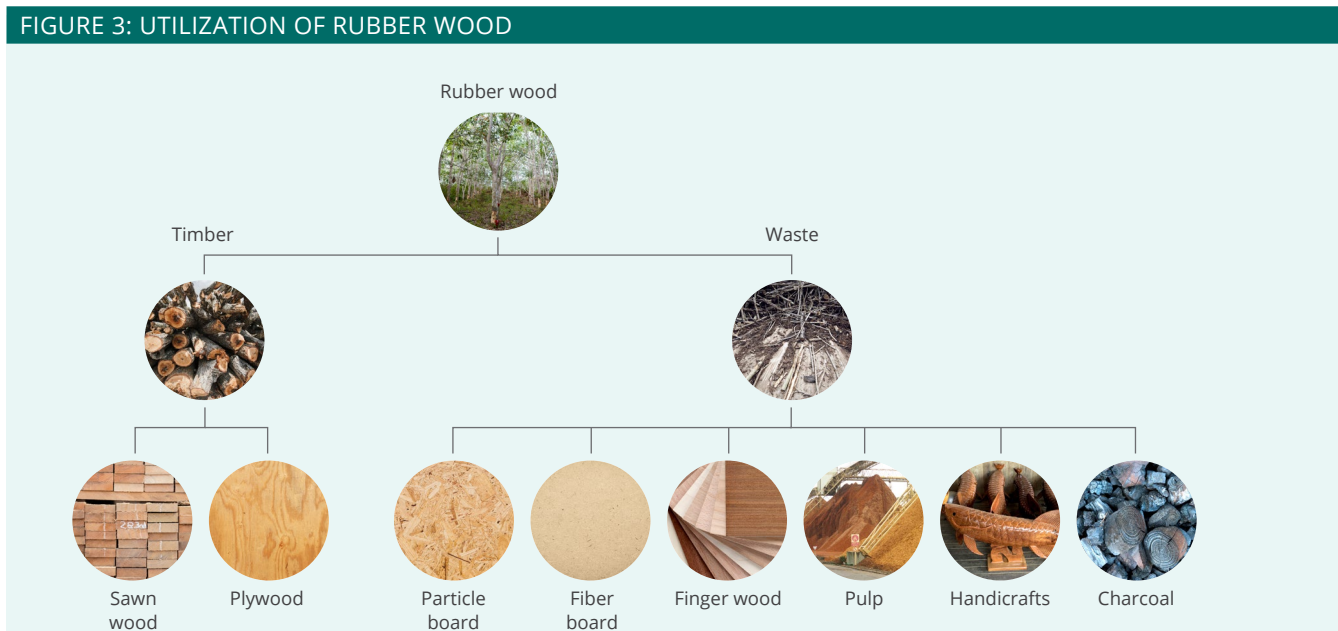
- **Particleboard**, made of rubberwood chips. Its density of 0.5–0.8 g/cm<sup>3</sup> makes it suitable for interior and exterior purposes. It also can be processed into wood plastic particleboard that is waterproof.
- **Fibreboard**, a wood panel product made from fine wood powder reinforced with resin. Most examples are produced in the form of medium-density fibreboard ("MDF") with a density of 0.4–0.8 g/cm<sup>3</sup> and a smooth, solid surface. Paint or coating can easily be applied, and it is well suited to screws and nails. MDF production does not require high specifications, so almost all the main stems of rubberwood can be used.
- **Finger jointed wood** is made from small pieces of rubberwood that are glued together with synthetic adhesive to form wooden beams in various shapes and sizes.
- **Pulp** is a raw material for paper. It can be made of rubberwood due to rubberwood's holocellulose content of about 67 percent. Holocellulose fiber paper is recognized as a sustainable alternative to petroleum-based plastics.
- Finally, rubberwood **waste** can be used as handicrafts such as wooden accessories toys, and charcoal, and can also produce liquid smoke flavoring.

Agustina (2012) compares the utilization of rubberwood in three major rubber producer countries, Thailand, Malaysia and Indonesia. Forty percent of the total utilization of rubberwood in Thailand is for timber products (furniture, household appliances, toys, etc.), 30 percent for firewood, 17 percent for wood particles, 11 percent for charcoal, and 2 percent for building pillars. In fact, Thai rubberwood furniture constitutes 60 percent of the total production of wooden furniture in the country. In Malaysia, industry once used rubberwood as raw material for furniture. Today, rubberwood also is used for door and window components, parquet flooring, molding, laminates, finger joints, plywood, particleboard, MDF, wood cement board, blockboard, and wood pulp.

According to Agustina, the development of a large-scale rubberwood processing industry in Indonesia began in the late 1980's in North Sumatra, Jambi, South Sumatra, Lampung and Java due to limited forest wood. Historically, rubberwood was only used as firewood and charcoal. Currently, it is used mostly as timber or MDF.

### 4.3 Rubberwood Supply Chain

There are two different types of rubberwood value chains in South Sumatra (Nugraha, Alamsyah and Agustina 2018). In the first type, farmers sell wood directly to end buyers, such as brick producers or wood processing companies. In the second type, farmers sell to a rubberwood supplier or agent, who then sells to end buyers. Usually, wood with a diameter less than 15 cm will be sold to brick producers, whereas the larger diameter wood is sold to wood processing companies. Smallholders most commonly sell their rubberwood to agents, who cover the cost of cutting down the trees and transporting them. Poor infrastructure and smallholders' difficulties in reaching out directly to processors further entrench their dependency on agents.

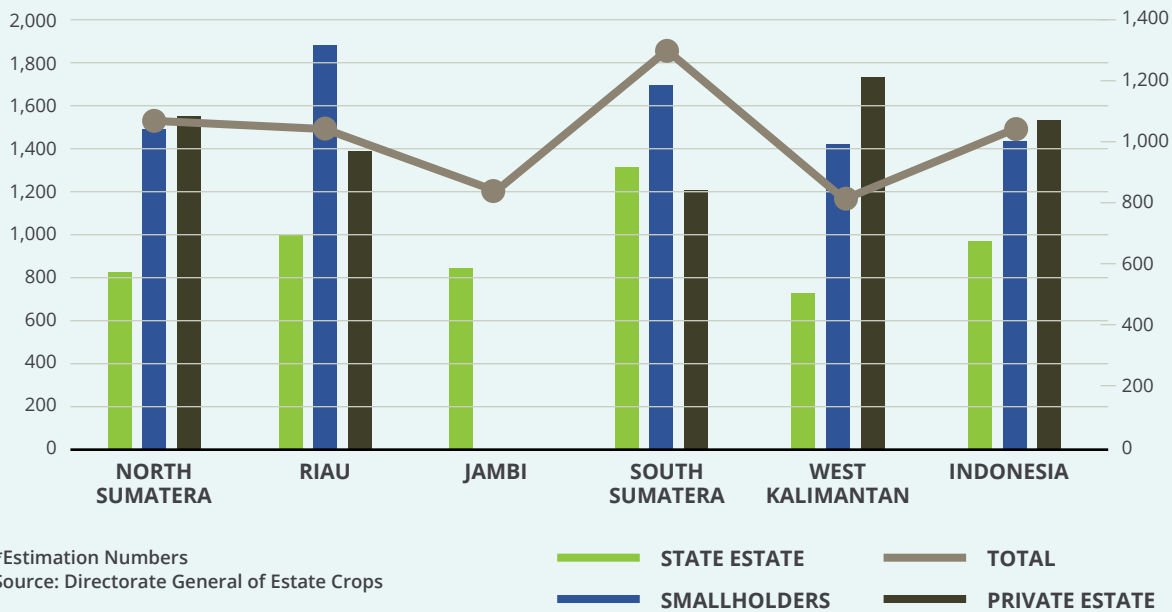


# 5. FIELD VISIT FINDINGS

To study the supply chain and market dynamics for rubberwood in more detail, FACS conducted a field visit in the bordering provinces of South Sumatra and Jambi. The generic observations made in the previous section were adapted to this specific geographical context.

The location for the field visit was based on multiple factors. First, the productivity level in South Sumatra is the highest in Indonesia. In absolute size, South Sumatra is also the largest producer. The natural rubber area in the province is almost 23 percent of the total national productive area, and smallholders make up 98.5 percent of this area.

FIGURE 4: INDONESIA'S NATURAL RUBBER PRODUCTIVITY IN 2017



Second, FACS identified which areas are due for replanting based on the current status and age of rubber farmland. The total damaged/unproductive land cultivated by smallholders in Indonesia is estimated at 56,530 ha. Of this land, 10,437 hectares are in Jambi and 15,885 hectares are in South Sumatra. Though these figures are so low that they are most certainly inaccurate, they do point to the relative and absolute importance of replanting in the two areas.

In the two areas, farmers mainly sell their rubberwood to an agent, who in turn sells it to a wood processing mill. On average, one hectare of land can produce approximately 12-15 truckloads or 120 tons of rubberwood.

The two biggest end-buyers in the area are PT Sumber Graha Sejahtera (Sampoerna Kayoe), which produces plywood products in Jambi, and PT Indonesia Fibreboard

Industry (Tbk.) which produces MDF in Musi Banyuasin, South Sumatra.

Even though the usage of rubberwood for furniture is common in other countries, it seems to be limited in Indonesia, and even absent in the two provinces studied. The most common woods used by the furniture makers we visited were Sungkai (*Peronema canescens*), Pulai (*Alstonia species*), Jelutung (*Dyera costulata*), meranti (*Shorea species*), and Keruing (*Dipterocarpus*

species). In addition, anecdotal evidence indicates that mindi wood (*Melia azedarach*) is more popular for furniture making in Indonesia than rubberwood, as it is similar in price, with an attractive wood grain. Further research is required to investigate the usage of mindi wood.

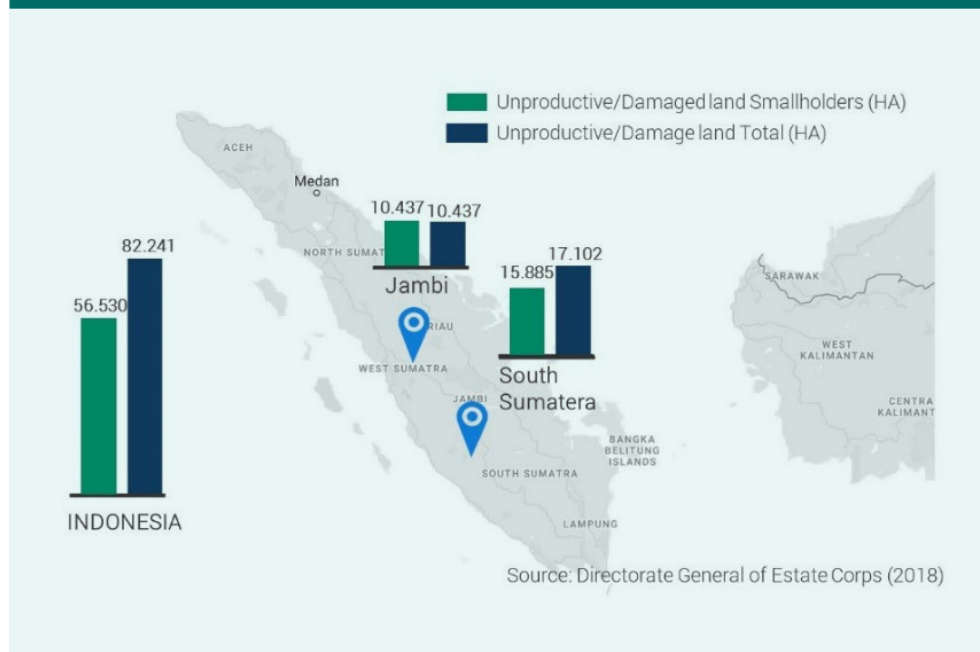
## 5.1 Price Dynamics

The rubberwood selling process (Figure 6), price dynamics (Figure 7), and legal aspects were discussed with the different stakeholders in the rubberwood value chain. The chapter below outlines a summary of the findings per stakeholder: rubberwood growers, traders, agents and processing mill.

### 5.1.1 RUBBERWOOD GROWER

There are three dominant selling schemes in Jambi and South Sumatra that differ in their unit of measurement, namely area (ha), weight (ton) or volume (m<sup>3</sup>). The payment in the first scheme depends on the area of trees sold by the smallholder per hectare (ha). Based on the findings from the field visit, the price the farmer receives from the trader is between 3 million–5 million IDR per ha, which should be paid before cutting down the trees. This scheme has minimal waste, but land clearing might not be optimal. The price received by the smallholder is considerably lower than with the other schemes. Under the second scheme, the farmer receives between 25,000–30,000 IDR per ton of rubberwood. This scheme is simple and results in minimal waste. The third scheme is based on volume, cubic meters (m<sup>3</sup>), and is recommended for large logs

FIGURE 5: OVERVIEW UNPRODUCTIVE/DAMAGED LAND



in good condition, not always attainable for rubberwood due to damage in the tapping panel. In this scheme, farmers receive about 100,000–150,000 IDR per m<sup>3</sup>. The downside of this scheme is that scraps are sold along with the large logs, and for just IDR 20,000–30,000 per m<sup>3</sup>.

The smallholder price is heavily influenced by the transportation costs incurred in the process of moving the wood to the processor. This depends on general road conditions, which are especially poor in the last miles to the farmer's land, as well as on seasonality. During the rainy season, for instance, road conditions deteriorate and transportation costs soar. The decrease in supply these transportation issues may cause can have the effect of increasing the price the processor is willing to pay for the wood. However, the narrow replanting window for rubber means that smallholders are generally unable to benefit from price changes because they sell their rubberwood when the crop cycle dictates.

### LEGAL REQUIREMENTS

Rubberwood legality must be proven with a land title ownership certificate, or a land right acknowledgement letter (surat pengakuan hak/SPH) if the rubber farm is in a non-forest area. The SPH is issued by the Head of the Village to clarify that the SPH holder has usufructuary rights to the land. If farmers want to sell rubberwood from forest areas, they must get approval from the forest office (Dinas Kehutanan) based on the Timber Legality Verification System ("SVLK") (see Box 1 for more information).

#### 5.1.2 RUBBERWOOD TRADER

If smallholders sell their rubberwood based on area, they receive their payment up-front from the trader. In some cases, the trader can ask for a loan from their agent to purchase the wood. However, the trader is then obliged to sell the wood to that agent. The trader sells the rubberwood either based on volume (340,000 IDR/m<sup>3</sup>) or weight (240,000 IDR/ton), or as waste (80,000 IDR /m<sup>3</sup>). The farmer is paid by the trader after receiving payment from the agent. The payment from the agent is received when the rubberwood has been delivered to, measured, and accepted by the wood processing company. This means the smallholder only gets paid after several days or weeks.

The agent pays the trader the amount to be paid to the smallholder, as well as (i) logging (40,000 IDR /ton or 75,000 IDR/m<sup>3</sup>), (ii) loading (60,000 IDR/ton or 120,000–140,000 IDR/m<sup>3</sup>), and (iii) transportation (1 million IDR/truck) costs. This means that the trader incurs these costs before getting reimbursed for them.

The price that a trader receives for the rubberwood itself is largely dictated by the agents, who base it on the price they receive from the wood processing mill. However, as competition between agents is significant, prices fluctuate and are unlikely to become inflated over time. Another important price aspect to consider is that, as stated above, some agents extend loans to traders, which lowers the final price-at-payment they receive.

### LEGAL REQUIREMENTS

To ensure the sale of rubberwood, the trader must have a Delivery Order (DO) from the agent prior to purchasing the rubberwood from the farmer. The agent provides the DO after examining the origination of the wood through a copy of the SPH or landowner shipping certificate.

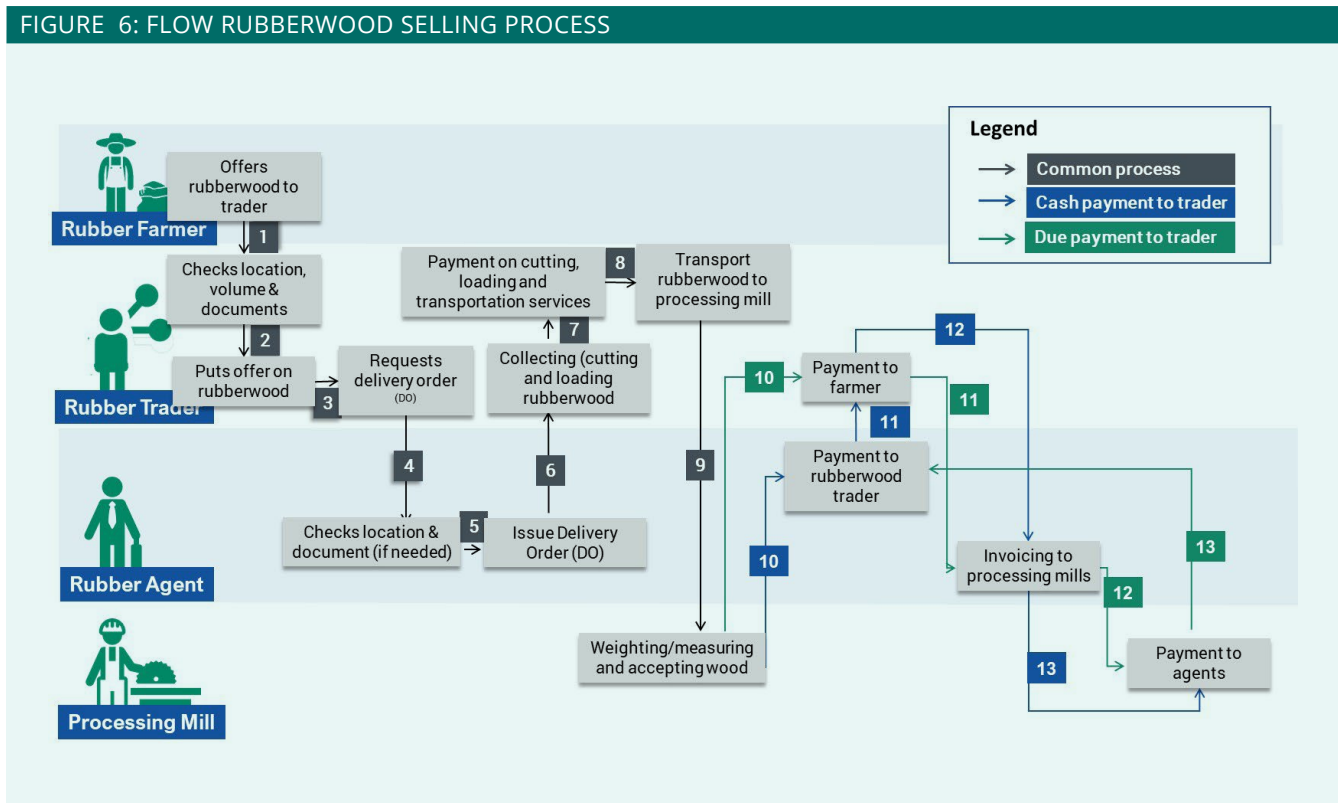
### 5.1.3 RUBBERWOOD AGENT

The rubberwood agent pays the trader either in cash on the spot after receiving the weight report of the rubberwood, or upon receiving payment from the rubberwood processing company. The price is based either on weight (260,000 IDR/ton) or volume (560,000–650,000 IDR/m<sup>3</sup>). In general, agents have very little influence over the price they receive, as it is set solely by the wood processing mill. There is little competition between mills as they are located at significant distances from each other and transportation costs are large. They usually receive payment within 3–14 days. Many agents employ field operators to carry out part of their work. Each is paid a commission of around 5 IDR/ kilogram.

### LEGAL REQUIREMENTS

An agent must be registered with the wood processing mill and fulfill several business requirements. For instance, agents must be a legal entity, either a Perseroan Terbatas (PT), CV (Firm) or Cooperative. The agent must also ensure that all wood comes from legal sources and adheres to all relevant regulations.

Figure 6 summarizes the payment schemes:



## 5.1.4 Wood Processing Mill

During the field visit, the team met with two wood processors, Sumber Graha Sejahtera (Sampoerna Kayoe) in Jambi and PT. Indonesia Fibreboard Industry (Tbk), in South Sumatra.

Sampoerna Kayoe is member of the Sampoerna Group, one of the leading conglomerates in Indonesia. The company was established in 1970 and is currently the Indonesia market leader of engineered wood. The national production capacity is about 850,000 m<sup>3</sup>/year divided between six processing plants and 10 satellite veneer plants across the country. The wood processing unit in Jambi focuses on rubberwood and has a production capacity of 72,000 m<sup>3</sup>/year. Currently it supports farmers in obtaining Forest Stewardship Council (FSC) certification to ensure the traceability of rubberwood. The program is rather limited and has just six farmer groups in Jambi, covering 95 families and 347 hectares. It helps these farmers replant IRR 39 (a type of rubber clone) and gain FSC certification, which Sampoerna Kayoe sells to buyers who specifically request certified wood. The local staff expressed an interest in cooperating with WWF in this area; specific needs could be further investigated.

PT. Indonesia Fibreboard Industry (Tbk), known as IFI, was established in 2007 and started production in June 2012. The company has three wood processing units in South Sumatra. Initially, IFI only manufactured MDF with a capacity of 25,000 m<sup>3</sup>/year. Over the years, IFI developed and expanded into a variety of processed wood products, such as veneer and plywood. Though staff in the factory was hesitant to meet





TABLE 7: WOOD PROCESSING MILLS

	PT Sumber Graha Sejahtera (Sampoerna Kayoe)			PT. Indonesia Fibreboard Industry (Tbk.) ("IFI")		
<b>Product and Market</b>	Plywood, laminated veneer lumber (LVL), decking, door and doorframes, etc. Local and international market (approx. 30%)			MDF Local and international market		
<b>Capacity</b>	Production capacity up to 6,000 m <sup>3</sup> /month. (Jambi site) Current utilized capacity is 5,000 m <sup>3</sup> /month due to low demand			Production capacity of 1,000 ton/day.		
<b>Mechanism</b>	Purchasing based on m <sup>3</sup> Measurement can be made on location through internal grader or at the mill Payment after 3-5 days by bank transfer			Purchasing based on weight (ton) Measurement is made in the processing mill Payment after max 14 days by bank transfer.		
<b>Purchase price</b>	<b>L (cm)</b>	<b>Ø cm</b>	<b>IDR/m<sup>3</sup></b>	<b>L (cm)</b>	<b>Ø cm</b>	<b>IDR/m<sup>3</sup></b>
	130	16 (min.)	560,000	130	20 – 29	260,000
	260	16 (min)	650,000	160	30 – 48	260,000
	Additional purchase price of IDR 50,000/m <sup>3</sup> , if the wood has Forest Stewardship Council (FSC) certificate			No additional purchase price		
<b>Initiative</b>	Facilitating 95 families (6 farmer groups) ca. 347 ha in Jambi for FSC certificate by planting IRR 39, which enable bigger diameter of timber and good latex production.			N.A.		

us, they provided some information informally. This report recommends that when there is a clear business case established, follow-up discussion should occur to gauge Jakarta headquarters interest.

The figure below summarizes the price dynamics in the rubberwood value chain. It distinguishes if the price for rubberwood is set based on weight (ton), area (ha) or weight (m<sup>3</sup>), and shows the different selling prices between the actors in the supply chain.

FIGURE 7: PRICE DYNAMICS IN THE RUBBERWOOD VALUE CHAIN

				
	Rubber Farmer	Rubber Trader	Rubber Agent	Processing Mill
<b>Weight (ton)</b>	IDR 25 -30 thousand/ton	IDR 240 thousand/ton	IDR 260 thousand/ton	
<b>Area (ha)</b>	IDR 3-5 million/ha	<i>Trader will sell on volume basis to agent</i>		
<b>Volume (m<sup>3</sup>)</b>	IDR 100 – 150 thousand/m <sup>3</sup>	IDR 340 thousand/m <sup>3</sup>	IDR 560 – 650 thousand/m <sup>3</sup>	
<b>Costs</b>	<b>Logging</b>	40 thousand/ton / 75 thousand/m <sup>3</sup>		<b>Field operator</b> 5 thousand/ton
	<b>Loading</b>	60 thousand/ton / 120 - 140 thousand/m <sup>3</sup>		
	<b>Transportation</b>	1 million/truck @ 10 tons		



## 6. BUSINESS CASE

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The financing needs of rubber farmers can be divided into short-term financing (working capital) and long-term financing (replanting and/or establishment of an agroforestry model). This section examines both types of financing needs. We build an extensive financial model to understand the financial dynamics of rubber smallholders. Though this model provides many parameters for checking the robustness of the model, the assumptions used throughout this report are:

- A smallholder holds 2 ha of land (this is the most common land-size held by over a third of farmers).
- A family has two adults, one child in primary school, and one child of pre-primary school age.
- The family's outside income covers half of its household costs.
- Estimated latex yield and costs are an average between estimates from the Government of Indonesia and the Dutch non-governmental organization (NGO) SNV, which has extensive experience in rubber replanting.
- For future prices, estimates of an industry organization are used. Results are checked against increased and decreased prices to ensure robust validity.

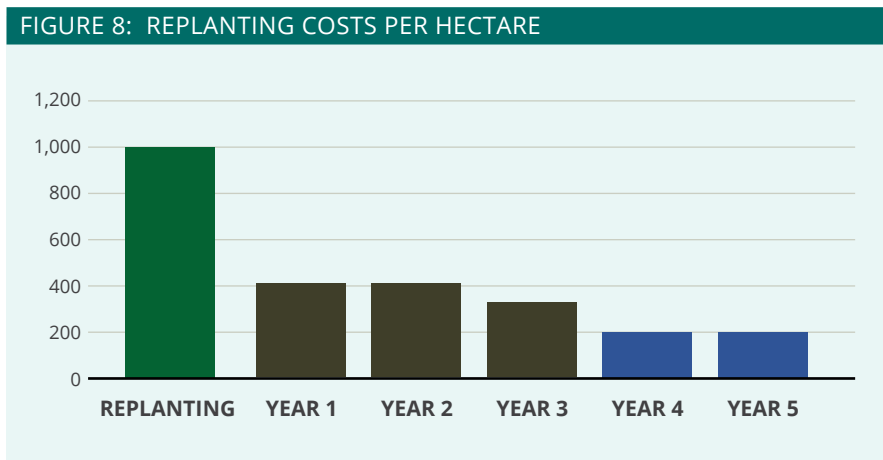
### 6.1 Short-term

Rubber farms need continuous maintenance, including the application of fertilizer, pesticides and herbicides. Furthermore, weeding must be undertaken periodically, which is often done manually. As harvesting the 2 ha that smallholders often hold is rather time intensive, the use of outside labor is common, which comes at a small fee. Over the course of the year, a smallholder will spend around 460 USD per hectare to cover these operational expenses. As latex is harvested fortnightly, income flows into the farm regularly. This means that there is generally little need for financing farm-related costs. The main need for short-term financing, therefore, comes not from the farm, but rather from the household, where lump-sum expenditures on festivals or school fees are common. Strictly speaking, these short-term loans would therefore be consumer loans rather than business loans. However, as the repayment capacity for these loans is generated by the farm, it is appropriate to analyze them as if they were working capital loans. Depending on the household structure and financial need, a repayment tenor of between three and six months should be ample to ensure successful repayment of these loans. The repayment schedule can take the form of an annuity (constant payments) or bullet payments. The optimal form depends more on the household situation than on the rubber farm, as the farm will generate near-continuous revenues regardless.

Important to note here is that due to the small loan amount, short repayment tenor, and high acquisition costs associated with farmers, providing working capital loans is rather unappealing to FSPs.

## 6.2 Replanting

The main financing opportunity in rubber lies in replanting. These costs are very substantial and incurred over the five-year immaturity period of the new rubber trees. In total, the process costs around 2,600 USD per hectare, with the first year accounting for about half of this amount. After the third year, the costs decrease significantly, as the trees slowly mature.



Though all these costs are incurred before the trees can be tapped, there are two important ways of generating income to offset costs, even partially. Agroforestry, where intercrops are grown alongside the rubber trees and can be harvested during these crucial years, is discussed in the next section. The main intervention discussed in this section is the sale of the rubberwood of existing trees. As analyzed in more depth earlier,

the sale of rubberwood can yield anywhere between 3 and 5 million IDR per hectare. In the model used for this report, an estimate of 4.2 million IDR is used, or 28 m<sup>3</sup> of rubberwood sold for 150,000 IDR. This means that the smallholder receives 290 USD per hectare in the first months of replanting. Though this reduces the burden on smallholders, it still leaves them with a cash shortfall of 2,300 USD for one hectare of land. This shortfall is the result of taking the monthly revenues and subtracting the costs over time. Though one might think that a loan of equal size might be ample to cover the shortfall, the reality is slightly more complicated. Due to the timing of different costs and the required payments to a financial institution of both interest and principal, the actual loan size needed is much larger.

This is perhaps best illustrated by taking a concrete example. A common household found in Indonesia includes two parents, one young child, and one child in primary school. The family will generally have an income of around 30 USD per month from sources outside of the farm, such as a little shop or day labor. However, the replanting costs are doubled, as most smallholders hold two hectares of land. When taking the financial needs of the household into account alongside the needs of the farm, a total cash shortfall of 7,014 USD arises, even after selling the rubberwood. If this family were to take a commercial loan with a 15 percent interest rate per annum with a one-year grace period – during which only interest is paid and the following five years are used for repayment – a total loan size of 22,000 USD, disbursed over seven years, would be required to ensure the household does not have a cash shortfall during replanting. Even this staggering loan would leave the family with a 2,500 USD cash shortfall afterwards, as it struggles to pay off the enormous debt taken on to finance replanting. This means that even though rubberwood is sold, this commercial loan product cannot accommodate the needs of the smallholder, as it still leaves the smallholder with a cash shortfall. Selling rubberwood by itself is therefore not sufficient to guarantee that replanting rubber is an attractive and realistic course of action for smallholders.

The example above shows three important features. First, because the household and farm are tightly interrelated, one must fully consider household dynamics when designing long-term loan products for smallholders. Second, because financing comes with significant costs for the smallholder, the financing need is several times larger than the cash shortfall estimated without a loan product. Third, the “optimal” loan product during replanting might saddle a smallholder with more debt than the family can possibly repay. Thus, even though rubber farming has a healthy rate of return for smallholders (the revenues over time are much larger than costs over time), the long lag between when costs are incurred and revenues are generated makes financing rubber replanting difficult.

### 6.3 Agroforestry Model

As shown above, though the sale of rubberwood has a positive effect on a cash shortfall, it is far from sufficient to create a convincing investment case. A valuable option to explore is the agroforestry model. Because the canopy leaves plenty of space for sunlight to reach the ground, many intercrops can be grown in the first two years after replanting. After this, the canopy closes and only spices, which generally do not need much sunlight, can be grown alongside rubber. An agroforestry model is an integrated farming system in which these intercrops grow alongside rubber. These intercrops generate income during the immaturity period of the rubber trees, and so further decrease the cash shortfall of farmers and most importantly make the financing need much smaller and more manageable. To leverage the benefits of agroforestry fully, staggered replanting, in which one hectare is replanted in Year 1 and the other hectare in Year 2, is part of the model.

Under this staggered agroforestry model, smallholders’ cash shortfall decreases from 7,014 USD under full rubber replanting to 2,796 USD. This directly decreases smallholders’ financing need. In addition, even during those periods when rubber is unproductive, revenue is generated by the intercrops. This not only lowers the smallholder’s periodic financing need, it also increases the smallholder’s repayment capacity. Finally, replanting becomes a more profitable undertaking for the smallholder because the rate of return increases.

Using the example of the typical family from above, the family would require a total loan size of 6,215 USD, disbursed over five years. Furthermore, this still rather high loan size would not only help the family during the replanting stage, it also would ensure that they do not have an expected cash shortfall afterwards. This loan would thus enable the family to profitably and sustainably invest in the replanting of their rubber farm.

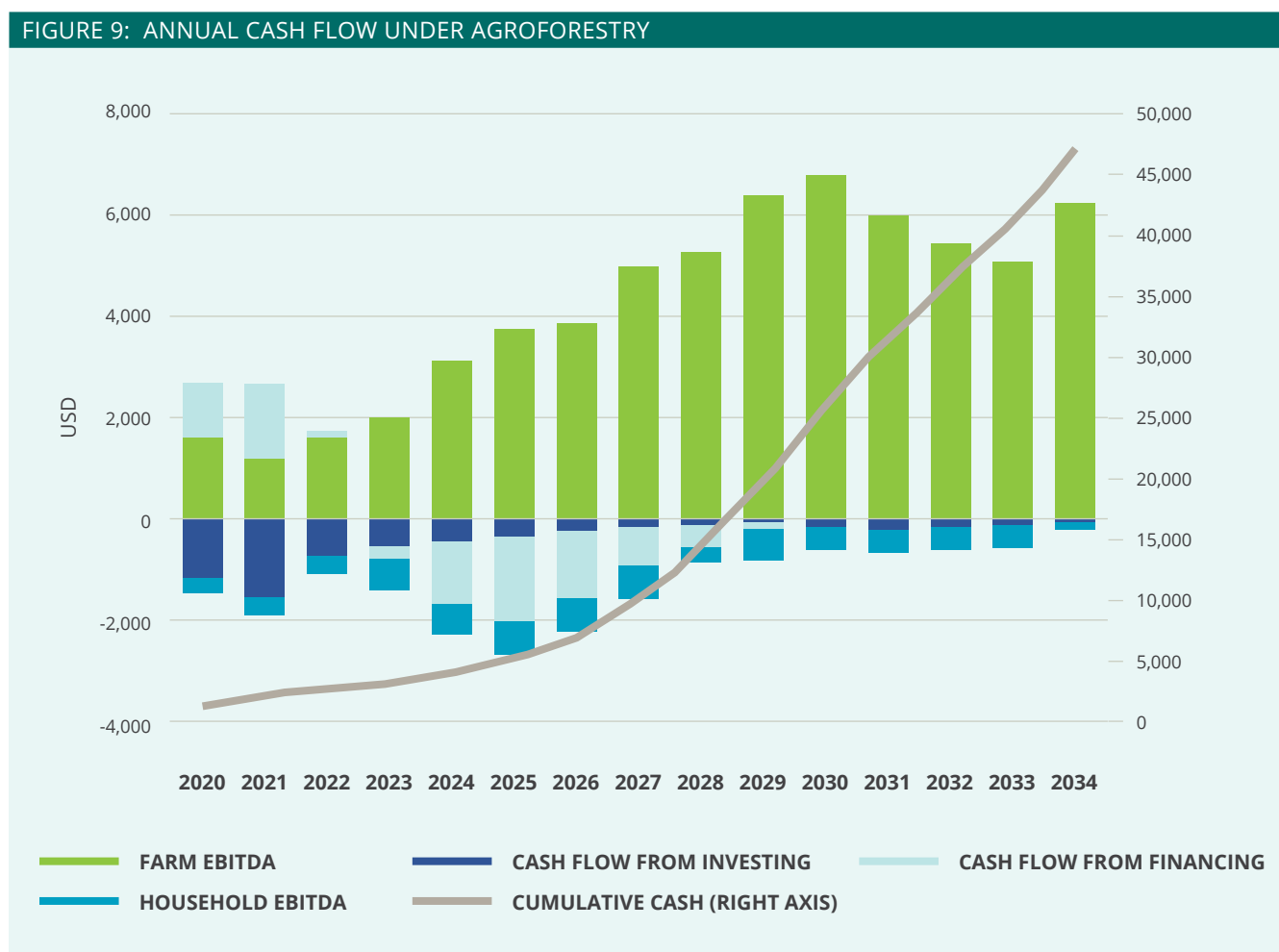
**TABLE 8: LOAN REQUIRED FOR ZERO CASH SHORTFALL**

(\* indicates this loan still fails to create a zero cash shortfall after the 7-year period)

Loan disbursement (USD)	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Cumulative
Monoculture *	3,074	2,322	2,937	4,030	5,328	4,303	3,005	21,993
Agroforestry	1,229	2,117	1,229	1,229	410	-	-	6,215

The appropriateness of the agroforestry model combined with financing can be seen from the cash flow graph below. The bars indicate the annual cash flow of the farm for both operational and investment activities, the cash flow of the household, and the cash flows created by the financing product. As illustrated, during the first two years, when the highest replanting costs are incurred, significant cash inflow from the loan product is required to ensure that a smallholder does not fall below 0 USD in their account. In the two years afterwards, repayments of the loan essentially offset the inflow from the loan disbursements, reducing net cashflow to zero. In the years afterwards, repayments towards the loan are significant, but can easily be shouldered by the smallholder thanks to cash generated by the farm. On balance, the smallholder will hover around zero cash during replanting, with cash inflows and outflows largely offsetting each other. After replanting however, the smallholder's cash position will burgeon to 47,000 USD in Year 15.

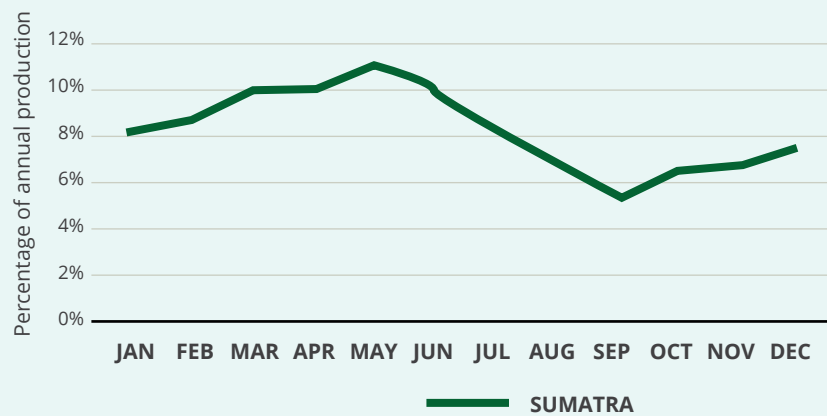
FIGURE 9: ANNUAL CASH FLOW UNDER AGROFORESTRY



Furthermore, seasonality is an important short-term dynamic to consider in rubber production and loan product design. Though rubber trees produce latex year-round, the quantity produced significantly improves when rainfall is high in the evening, and is absent in the morning. In addition, increased suitable rainfall improves the stem flow of the trees, allowing the coagulated latex to be collected more easily and quickly. Also, there is a large difference in smallholder behavior during the rainy and dry seasons: the lower number of tapping days and the shorter length of tapping on days during

the dry season lead to lower yields (Siregar 2014). In the areas of the field visit, Jambi and South Sumatra show highest yields in May (rainy season) and lowest in September (dry season) with a factor of two separating the yields in the two months. Long-term yield trends and short-term yield seasonality will be important factors to consider when designing an appropriate loan product for replanting.

FIGURE 10: SEASONALITY OF RUBBER PRODUCTION



This indicates that even though the sale of rubberwood is unambiguously advantageous for a smallholder, it is far from sufficient for ensuring that they can actually replant their farm profitably. A more holistic approach, with a crucial role for intercroops, is necessary to make replanting a viable option for both the smallholders and potential financial institutions.



A man in a light-colored striped shirt and shorts is crouching in a mangrove nursery field. He is holding a bundle of mangrove seedlings. The field is filled with rows of young mangrove plants in plastic mulch. A wooden sign on the right reads "KELOMPOK P3T BELEKAM".

KELOMPOK  
P3T  
BELEKAM

# 7. PROPOSED PROOF OF CONCEPT

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Based on the observations from the scoping visit, desk research, and cash flow model, we have identified a clear path forward to enable smallholder rubber replanting. However, the main limitation of this report is that it is based on general observations across a large geographical area. Therefore, once a location for a pilot project is identified, much of the analysis in this report must be validated, deepened, and further informed within the local context. More specifically:

## CONTEXT ANALYSIS

A more extensive and localized context analysis will (i) allow for a deeper understanding of private sector engagement in the local supply chain and willingness to join in a pilot project, for instance through the provision of off-take agreements; (ii) build a clear picture of smallholders' current situation and the assistance they receive from NGOs; (iii) help identify enabling stakeholders, most notably local governments, who are crucial for success; and (iv) allow for closer cooperation with FSC to understand certification challenges and needs.

## MARKET ANALYSIS

As the agroforestry model relies on intercropping, the optimal mix of intercrops for the local context must be analyzed and validated. These intercrops should be both easy to grow and have strong local markets. Only the former was considered in the analysis above. Second, the demand side of the financial sector must be analyzed, and smallholders' (perceived) barriers to financial inclusion must be addressed. Third, points of aggregation and support, such as cooperatives and the Unit Pengolahan dan Pemasaran Bokar collectives (UPPBs) in the target area must be mapped, and their capabilities and level of professionalism analyzed. These aggregation points are vital for the two previous points (intercrop selection and demand-side analysis), as well as for scaling up to a level sufficient to create an attractive investment case for FSPs.

## FINANCIAL SECTOR MAPPING

The third prong of the proof of concept is an analysis of the supply side of finance to smallholders in the target area. This includes interviews with FSPs to build a detailed understanding of their current product offering, requirements for smallholders, and FSPs' appetite for participating in a pilot program. Though a hard commitment from an FSP should be the ultimate goal, a clear willingness to experiment and co-create a loan product for rubber replanting should be present.

## PILOT DESIGN

Informed by the three analyses above, a clear design of a pilot project should emerge. The pilot should involve between 100 and 1,000 farmers to ensure it is both manageable and creates enough scale to be attractive to FSPs. The opportunities for all stakeholders should be clearly identified to ensure their buy-in to the program. Furthermore, the knowledge gaps for FSPs and smallholders should be addressed through a technical assistance program.

## 8. CONCLUSION

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Low yields are one of the main issues plaguing rubber smallholders in Indonesia, who are often forced to replace rubber with other commodities to improve their livelihoods. This has consequences for Indonesia's dominant position in the global rubber sector and potentially drives deforestation, since clearing of new land is often necessary. Low yields are caused by a combination of poor management practices and over-aged trees, which are naturally less productive. These problems are exacerbated by low international rubber prices, which trap farmers in poverty.

Though replanting rubber trees requires a significant investment from smallholders that can only be met with an appropriate financing product, selling the rubberwood from their old trees can help lower the financial need and make financing costs smaller over time. This report investigates the feasibility of selling rubberwood from the perspective of all stakeholders in the supply chain.

Finally, a financing scheme is developed that ensures a smallholder will avoid a cash shortfall during or after replanting. The sale of rubberwood can help lower the financing need and bring it closer in line with capital expenditures. However, the current quality of rubberwood in Indonesia is low due to poor tapping practices; this means rubberwood is sold at a low price. This study finds that an agroforestry model, in which intercrops generate income during the immaturity period of the new rubber trees, is a necessary condition for financing. Hence, to be optimal for smallholders and FSPs alike, a replanting scheme must combine agroforestry and GAP training with the sale of rubberwood. Though such a scheme is analyzed in detail for the region selected for this report, it should be refined and re-evaluated in the local context where it is being implemented and discussed in depth with FSPs.



## References

- Agustina, D. (2012), "Pemanfaatan Kayu Karet di Beberapa Negara Produsen Karet Alam Dunia", *Warta Perkaretan* 2012,31(2),85-94
- BPS-Statistics Indonesia. (2018). *Indonesian Rubber Statistics 2017*
- Director General of Estate Crops (2018). Unproductive/Damage Plantation Area (Ha)
- Director General of Estate Crops (2019). Estate Crop Statistics of Indonesia, 2012-2014, 2013-2015, 2016-2018, 2017-2019
- FAO (2001), Non Forest Tree Plantations, available at <http://www.fao.org/3/a-ac126e.pdf> (accessed 10 February 2020)
- Global Forest Watch. (2019). Indonesia Country Dashboard, available at <http://bit.ly/2FzUvq2> (accessed 10 Feb 2020)
- IFC (2014), Indonesia Market Study: Movable Assets-based financing to Micro, Small and Medium Enterprises. Available at: <https://www.ifc.org/wps/wcm/connect/407000c1-a365-4857-8944-0194bffc706/Indonesia+Market+Study-Movable+Assets+based+Financing+to+MSMEs.pdf?MOD=AJPERES&CVID=lqWA.3V> (accessed: 11 February 2020)
- International Tropical Timber Organization. (2019). Biennial Review and Assessment of The World Timber Situation 2017-2018, International Tropical Timber Organization, Yokohama, Japan.
- JPNN.com (2019), Upaya KLHK Turunkan Deforestasi Mendapat Pengakuan Dunia. Available at: <https://www.jpnn.com/news/upaya-klhk-turunkan-deforestasi-mendapat-pengakuan-dunia> (accessed: 11 February 2020)
- Karyudi. (2015). *Current Condition and Challenges of the Rubber Industry in Indonesia*. In: *The 5th International Plantation Industry Conference and Exhibition* [online]. Available at: <http://www.iipm.com.my/wp-content/uploads/2016/05/DR.-IR-KARYUDI.pdf> (Accessed 12 February 2020)
- Ministry of Environment and Forestry. (2017). Forest wood production based on type of production, 2000-2017.
- Ministry of Industries. (2016). Statistics of exports, 2012-2016.
- Nugraha, I. S., Alamsyah, A., Agustina, D. S. (2018), "Tata Niaga Kayu Karet Serta Pengaruh Harga Karet Terhadap Pendapatan Pemasok Kayu Karet: Studi Kasus Desa Sembawa, Sumatera Selatan", *Jurnal Penelitian Sosial dan Ekonomi Kehutanan*, Vol. 15 No. 3, 183-194
- Siregar THS. (2014). Pola musiman produksi dan gugur daun pada klon PB 260 dan RRIC 100. *J. Penel. Karet*. 32(2): 88-97.
- Towaha, J. and Daras, U. (2013), "Peluang Pemanfaatan Kayu Karet (*Hevea Brasiliensis*) Sebagai Kayu Industri", *Warta Penelitian dan Pengembangan Tanaman Industri* 2013, Vol. 19 No. 2, 26-31
- The Center for People and Forests (RECOFT). 2015. Trees as loan collateral: Valuation methodology for smallholder teak plantations. RECOFT, Bangkok, Thailand.
- Wibowo, I. (2019), Pemerintah Siapkan Skema Replanting Karet. Available at: <https://www.medcom.id/ekonomi/mikro/Rb13AYIK-pemerintah-siapkan-skema-replanting-pohon-karet> (Accessed: 11 February 2020)
- World Bank (2020) World Integrated Trade Solution. Available at: <https://wits.worldbank.org/countrysnapshot/en/IDN/textview> (Accessed:6 March 2020)
- Workman, D. (2019) World's Top Exports, Indonesia's Top 10 Exports. Available at: <http://www.worldstopexports.com/indonesias-top-10-exports/> (Accessed: 6 March 2020)
- World Resource Institute. (2018) Technical Blog: Indonesia Tree Cover Loss and National Deforestation data explained. Available at: <https://wri-indonesia.org/en/blog/technical-blog-indonesia-tree-cover-loss-and-national-deforestation-data-explained> (Accessed: 6 March 2020)
- WWF. (2012). *Sistem Verifikasi Legalitas Kayu* (Wood Legality Verification System), available at [http://awsassets.wwf.or.id/downloads/flier\\_svlk\\_\\_\\_gftn.pdf](http://awsassets.wwf.or.id/downloads/flier_svlk___gftn.pdf) (accessed at 11 Feb 2020).

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THOUGH REPLANTING RUBBER TREES  
REQUIRES A SIGNIFICANT INVESTMENT  
FROM SMALLHOLDERS THAT CAN ONLY BE  
MET WITH AN APPROPRIATE FINANCING  
PRODUCT, SELLING THE RUBBERWOOD  
FROM THEIR OLD TREES CAN HELP  
LOWER THE FINANCIAL NEED AND MAKE  
FINANCING COSTS SMALLER OVER TIME.





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