UNMET NEEDS REPORT 2018

SMALLHOLDER FARMERS IN PAPUA, WEST PAPUA & WEST KALIMANTAN

KOPERNIK

// MAP OF INDONESIA

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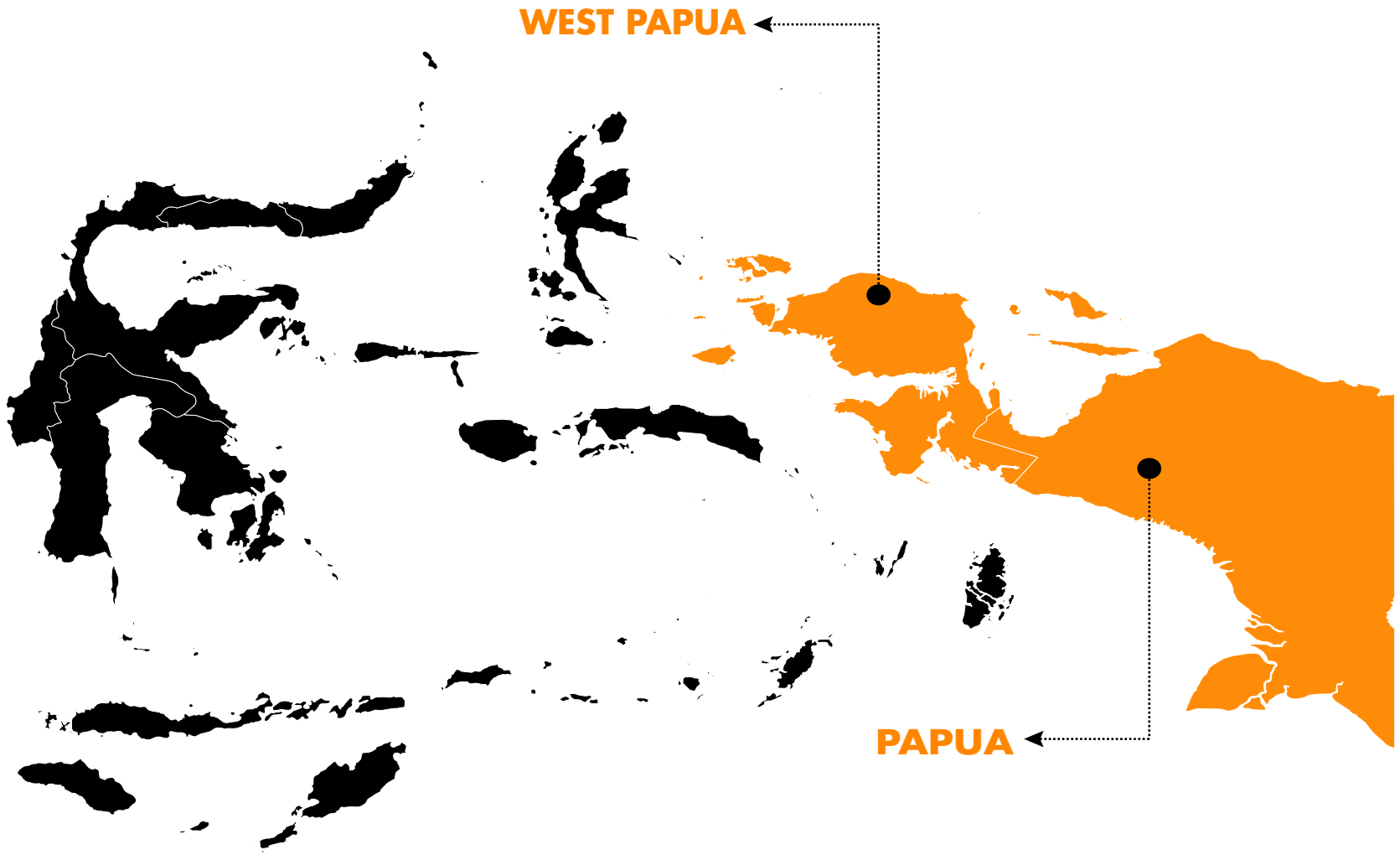
»KOPERNIK



// TABLE OF CONTENTS

// ABOUT THE REPORT

KOPERNIK, SUPPORTED BY THE DAVID AND LUCILE PACKARD FOUNDATION, IDENTIFIED THE NEEDS AND CHALLENGES CURRENTLY FACED BY SMALLHOLDER FARMERS IN THE PROVINCES OF PAPUA, WEST PAPUA, AND WEST KALIMANTAN. THE REPORT HIGHLIGHTS ISSUES FARMERS FACE TO STAY COMPETITIVE IN AGRICULTURAL VALUE CHAINS AND THE ENVIRONMENTAL IMPACT OF THEIR AGRICULTURAL ACTIVITIES.

As the main player in crop production and food supply industry, the needs of smallholder farmers require attention and are critical to address. The Unmet Needs Report 2018: Smallholder Farmers in Papua, West Papua, and West Kalimantan provides in-depth analysis of select commodities farmers harvest in the three provinces. Through this report, Kopernik aims to identify, understand, and address the needs of smallholder farmers in the agricultural value chain. It is an insightful reference for development actors who are interested in tapping into agricultural-based activities in the three provinces.

This report focuses on the three provinces studied - Papua, West Papua, and West Kalimantan - with each provincial chapter consisting of the following components:

- Demographic overview
- Overview of select commodities
- Three-dimensional analysis of the select commodities

An interview with a female farmer at her house in Keder village, Sarmi district, Papua

COMMODITIES	WEST KALIMANTAN	PAPUA	WEST PAPUA
Palm	✓		✓
Rubber	✓		
Rice	✓		✓
Coconut	✓	✓	
Sweet Potato			✓
Cacao		✓	
Sago		✓	

WHY SMALLHOLDER FARMERS

Smallholder farmers cultivate subsistence crops and/or cash crops on small plots of land. These farmers play an important part in the agricultural value chain. They make up more than half of the total farmer households in Indonesia, where agriculture contributes around 14% to its USD 932 billion economy (World Bank, 2016). Yet, despite their crucial role in providing food to the wider population, smallholder farmers often earn modest incomes, partly due to a lack of access to high-value market and minimum access to information on current market demands.

WHERE IS THE STUDY CONDUCTED

The study is conducted in Papua, West Papua, and West Kalimantan where agriculture is the dominant employment sector. It absorbs more than 50% of the total labor force. Yet, most of the smallholder farmers in these provinces still make a modest living from farming activities, generating an average of USD 75 in monthly income.

WHAT COMMODITIES

The research focuses on select commodities based on yield, numbers of smallholder farmers, and environmental impact. The report covers seven commodities across the three provinces that are common for farmers to cultivate, with three cross-cutting commodities – coconut, palm, and rice.

// EXECUTIVE SUMMARY

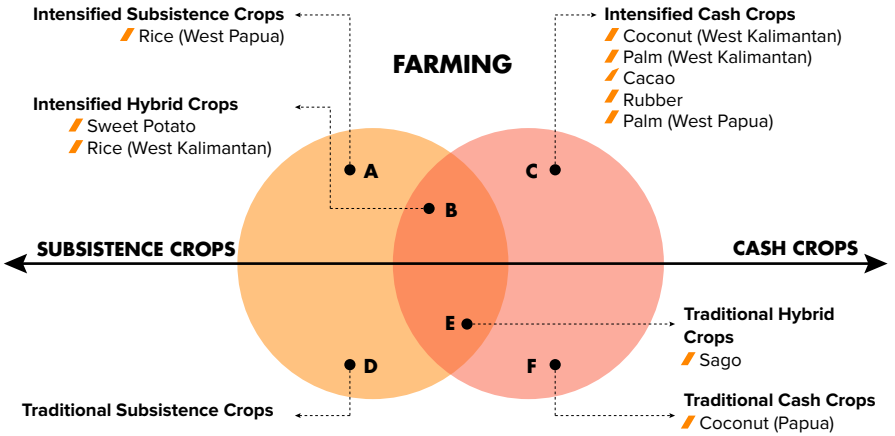
HOW FARMERS VALUE THEIR OWN COMMODITIES

From our interviews, **we find that each commodity has its unique economic value to farmers.** Growing rice, for instance, supports farmers' staple food supply. A certain proportion of their harvest is also sold to gain economic benefit. Despite farmers' low income, not all commodities are grown or gathered for economic gains. To get a better understanding of how these crops fulfill farmers' needs, it is important to classify crops based on two variables – (i) farming goals and (ii) cultivation method.

Farming goals are defined by farmers' intention to grow: in subsistence farming, farmers' intention to cultivate refers to consumption, while cash crop farming is aimed to increase their income by selling agricultural products.

The cultivation methods – farming and gathering – refer to the intensity of labor in crop production. Farming refers to a structured method of producing crops at scale. Starting from land preparation to harvesting, this cultivation method indicates the significance of the commodity for farmers, either in providing them with food supply or generating income. In contrast to farming, gathering does not involve many steps. It does not include farmers replanting crop at scale. The commodities in which yields are gathered are typically wildly grown. Gathering suggests that the crops are readily available and easily found. Using a Venn diagram (see Fig. 1), we develop six crop classifications in which the seven commodities can be categorized.

Fig 1. Crop classification by its type and purposes



TYPE	DESCRIPTION
A	Crops farmed using structured method of cultivation for self-consumption
B	Crops farmed using structured method of cultivation for self-consumption and economic purpose
C	Crops farmed using structured method of cultivation for economic purpose
D	Crops gathered for self-consumption
E	Crops gathered for self-consumption and economic purpose
F	Crops gathered for economic purpose

// EXECUTIVE SUMMARY

Our analysis shows that **most of the commodities fall under type C classification, meaning they are grown through structured farming methods for economic purpose.** Palm in West Kalimantan, for instance, takes over 1.5 million hectares of land with a total yield of 2.1 million tons a year. Given the average price of palm at USD 0.11/kg, though low as it may seem, farmers are able to generate a steady income with competitive buyers in the market. The same principle applies to the other four commodities in this category: coconut (West Kalimantan), rubber, cacao, and palm (West Papua).

Sweet potato and rice (West Kalimantan) are categorized as type B, meaning crops are farmed for self-consumption and also for sale. Selling these crops is reasonable considering that both commodities serve as staple food in the respective provinces.

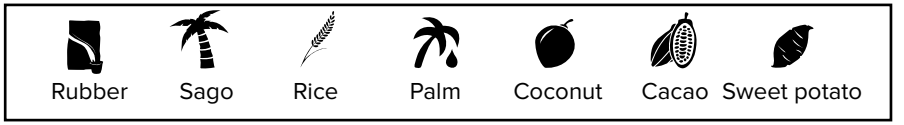
Rice in Papua, on the other hand, is farmed only for self-consumption, thus classified as type A crop. Farmers we interviewed explained that this is due to traditional practices.

A crop that is gathered for self-consumption and economic returns is sago, categorized as type E. Known as a staple food in West Papua; sago is a wildly grown commodity easily found in swampy areas.
Another commodity that is gathered is coconut (Papua). This too is a wildly grown tree; however, the fruits are gathered solely to gain economic returns – grouped as type F.

Former PTPN II palm plantation in Monokwari district, West Papua

// EXECUTIVE SUMMARY

FARMER'S VOICE: CROSS-CUTTING CHALLENGES



- **Market information gap**
  Farmers have little information about the prices and demand for their crops in the market. They tend to make transactions with one trader or sell at one marketplace since they do not have links to enter higher value markets. More so than often, farmers do not know where the crops go after selling and what are they processed into. This information gap hinders farmers to become a competitive player in the value chain.

- **Lack of finance**
  Farmers find it difficult to maintain their farms given limited financial resources. Costly fertilizers and pesticides lead farmers to apply an insufficient ratio to plants, affecting crop quality, and in turn impinging on price. This leaves the farmers with low competitiveness in the agricultural value chain.

- **Plant diseases and pest outbreaks**
  Plant diseases and pest outbreaks are some of the most threatening issues farmers have to deal with. Fungal infectious disease (in rubber plantations) and mice (in rice cultivation) are a few mentioned by farmers that can destroy their harvest and lead to crop failure. The farmers admitted that they have little knowledge about these issues and how to prevent them.

- **Unpredictable weather**
  Weather is found to be a common challenge across the commodities in this study. In rubber plantations, rain can ruin the harvest by contaminating and washing away the collected latex. Meanwhile, for rice cultivation, drought can critically harm the crop given its need for water.

- **Lack of transportation**
  Many farmers do not have their own transportation to carry crops to designated markets. This is one of the reasons they rely on traders who are willing to buy their crops directly from the farms.

THE AGRICULTURAL COMMODITIES FEATURED IN THIS REPORT ARE ANALYZED FROM THREE MAIN ANGLES: LABOR EFFICIENCY (AGRICULTURE), FARMER INCOME (LIVELIHOOD), AND ENVIRONMENT CONSERVATION (CONSERVATION)

- **Labor efficiency** refers to the practice and steps taken by farmers in cultivating crops. A low-efficiency rate would mean a crop is cultivated using intensive manual labor, and often times involve limited use of agricultural machinery.

- **Farmer income** refers to the generated income (month/ha) from selling harvested crops. A low-income rate from cultivating one crop would signal a need for improving processing methods/technologies, growing alternate crops, or intensification.

- **Environment conservation** refers to farmers' practices in treating their land for farming and plantation. It looks at the effect of farming activities on the environment (e.g., deforestation, biodiversity loss). A low environment conservation value would signal that particular crop cultivation applies irresponsible farming practices.

Fig 2. The three parameters used for each featured crop.

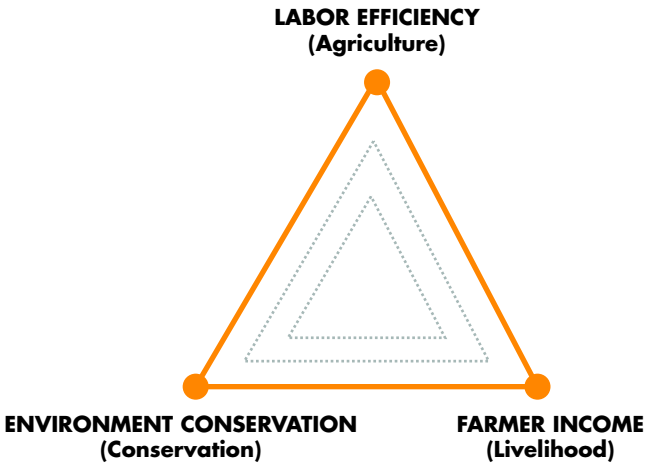


Table 1. Variable analyzed for each parameter.

PARAMETERS	VARIABLES OBSERVED		VALUES		
			LOW (1)	MEDIUM (2)	HIGH (3)
Labor efficiency (Agriculture)	Manual labour in each stage of production (hours/day)		Labor intensive (>4.1 hours of labor/day)	Medium intensity (3-4.1 hours of labor/day)	Minimum intensity (<3 hours of labor/day)
Farmer income (Livelihood)	Income/month/ha		< IDR 1,000,000/month/ha	IDR 1,000,000-2,000,000/month/ha	> IDR 2,000,000/month/ha
Environment conservation (Conservation)	• Air • Water	• Soil • Biodiversity	High practice of burning land and using chemical substances	Moderate practice of burning land and using chemical substances	Low (no) practice of burning land and using chemical substances

LABOR EFFICIENCY:
UNDERSTANDING FARMERS' INVESTMENT IN LABOR

Farming activities in the three provinces are labor intensive with minimum involvement of agricultural machinery to assist in the process. Based on the data we collected, the intensity of labor differs in each stage of production (pre-harvest, harvest, and post-harvest). As shown in Table 2, we categorize the intensity of labor in three levels.

The labor efficiency is categorized as follows:

- **Low:** >4.1 hours of labor/day
- **Medium:** 3 to 4.1 hours of labor/day
- **High:** <3 hours of labor/day

Box 1.1

We define the stages of production involved in the commodity value chain as follows

Pre-harvest	Includes activities on the farm before harvesting crops. Such as preparing and clearing land, seeding, planting, applying fertilizer and pesticides until plants are mature enough to be harvested.
Harvest	Refers to harvesting activity once crops are mature enough
Post-harvest	Consists of processing activities of the harvested crops to reach the market or for self-consumption.

Table 2. Farmers' labor efficiency in each stage of production (hours/day)

Provinces	Commodity	Hours of work			Average	Overall labor efficiency value
		Pre Harvest	Harvest	Post-Harvest		
West Kalimantan	Palm	5	4	3	4.0	Med
	Rubber	4	3	5	4.0	Med
	Rice	3	6	4	4.3	Low
	Coconut	5	5	2	4.0	Med
Papua & West Papua	Cacao	2	3	3	2.7	High
	Sago	2	7	6	5.0	Low
	Coconut	2	5	3	3.3	Med
	Palm	2	2	0	1.3	High
	Rice	8	4	2	4.6	Low
	Sweet Potato	4	3	1	2.7	High

LABOR EFFICIENCY:
UNDERSTANDING FARMERS' INVESTMENT IN LABOR

Sago production in Maribu village, Jayapura district, Papua, requires several workers and is a labor intensive job.

Our analysis (table 2) shows that farmers invest much of their labor during crop harvesting

- In rice cultivation, a farmer can spend an average of 60 days to harvest 1 hectare of paddy field. The massive time and energy spent are largely due to the traditional practice of harvesting – such as using sickles as the main tool to cut rice plants.

- Coconut also requires intensive labor during harvesting as farmers must climb up trees and cut off the fruits using cleavers. As for sago, harvesting involves several steps, starting from clearing branches and weeds to reach sago trees to processing them into starch.

Given the long hours of physical work and other costs invested in these commodities, the crops should be valued at fair rates. However, farmers often experience unfair trading practices where crops are priced low.

FARMER INCOME:
THE EFFECT OF LOW CROP PRICES ON FARMERS' SUSTENANCE

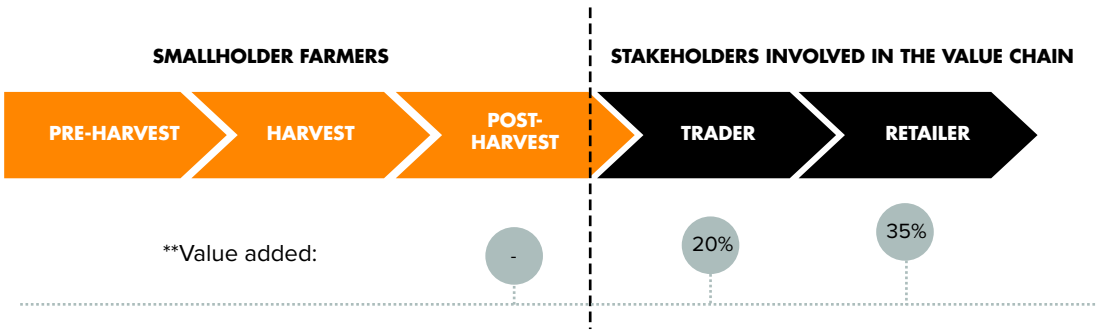
The price of farmers' agricultural products determines their level of earnings. Looking at farmers' bargaining position in the agricultural value chain, **farmers – as the main producer and the first person in the value chain – are economically disadvantaged given their raw goods are relatively low in value.**

As shown in Fig. 3, traders often set low prices when buying directly from farmers. This is partly due to farmers' lack of information on market price, their homogenous network, and low quality of crops.

Traders charge the retailer, say, 20% higher for a kilogram of rice to cover service costs such as porters and transportation. The retailer then charges the consumer 35% higher than the price paid to the trader to pay off packaging and other costs.

Each stakeholder in the chain gets its share no matter what price the crops originated from farmers. However, this also means that the longer the chain, the smaller fraction of the price gets paid to the farmers. The price of crops is often just enough to cover the production cost, and the farmers receive only enough to get by. Consequently, many farmers have to find additional work in other sectors (e.g., construction) to make ends meet.

*Fig 3. Typical value chain in agricultural crops**



* Refers to rice value chain. **Percentage of the prices charged by an actor to the next actor in the value chain. It is calculated by subtracting the price goods sold with the price goods bought.

FARMER INCOME:
THE EFFECT OF LOW CROP PRICE ON FARMERS' SUSTENANCE

What becomes a concern is if the challenges for farmers continue and farmers decide to leave the agricultural sector. This will disrupt agricultural sustainability and food supply in the regions. **Therefore, in order to sustain agricultural development, it is crucial to consider farmers' wellbeing by providing better crop prices that commensurate farmers' work in the field.** This way farmers no longer are the disadvantaged link in the value chain. The value chain becomes efficient, all stakeholders involved can benefit from it and livelihoods are improved. Table 3 below shows the average income of smallholder farmers we interviewed in each commodity. A majority of them earn a low income.

Table 3. Farmers' income by commodity

Provinces	Commodity	Farmer income
West Kalimantan	Palm	High
	Rubber	Med
	Rice	**Low**
	Coconut	Med
Papua & West Papua	Cacao	**Low**
	Sago	Med
	Coconut	**Low**
	Palm	**Low**
	Rice	**Low**
	Sweet Potato	High

Description

- **Low** = < IDR 1,000,000
- **Med** = IDR 1,000,000 -2,000,000
- **High** = > IDR 2,000,000

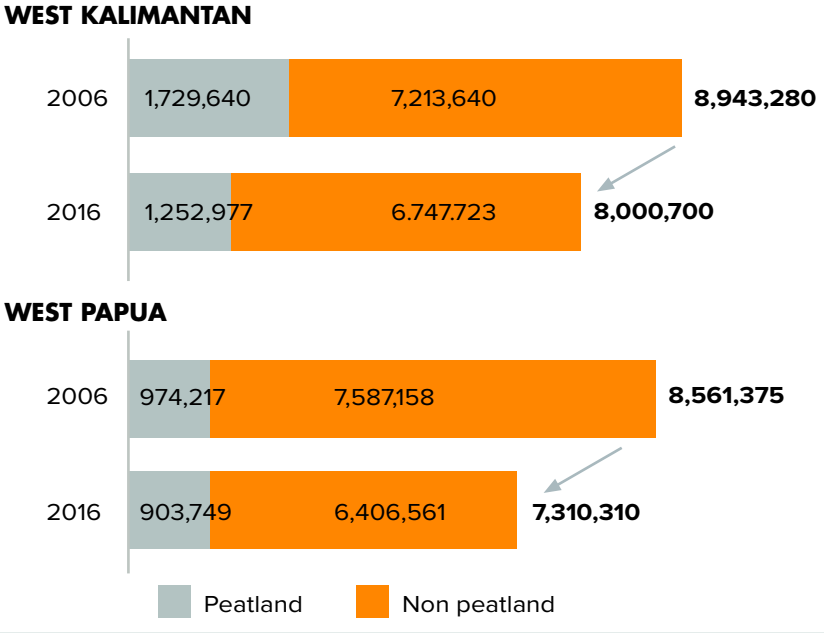
The income is per month per hectare

// EXECUTIVE SUMMARY

ENVIRONMENT CONSERVATION:
DEFORESTATION AND LOSS OF BIODIVERSITY

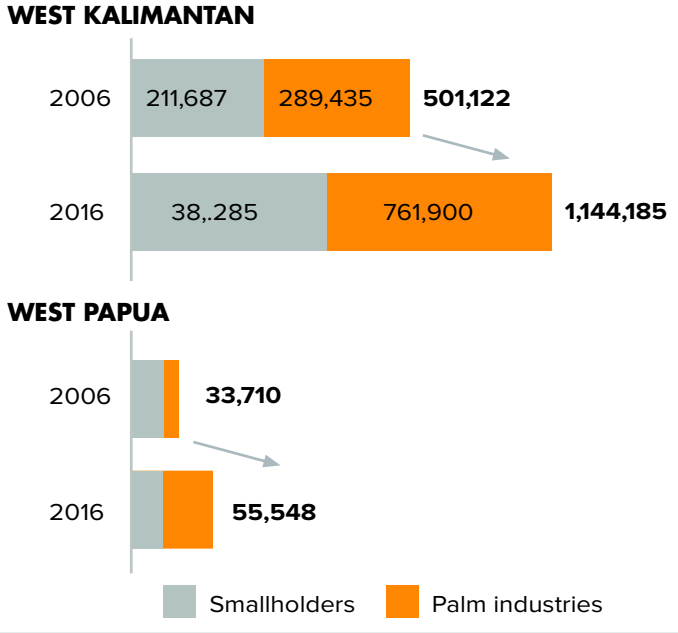
In the past decade, forest areas in West Kalimantan and West Papua have decreased by 11% and 15% respectively, which is attributable to the palm oil sector (Carlson et al., 2012). Large-scale palm oil cultivation practices continue as both smallholders and industries consider it as a cheaper, easier and faster method.

FOREST AREA (HA)



Peatland conversion in West Kalimantan is 28% (2006-2016); that is three times higher than in West Papua. The land conversion has resulted in forest fire especially during the dry seasons, destroying forests and endangering animal species. Furthermore, forest fires create a choking haze that pollutes the air and causes the acute respiratory infection that spreads far to other islands.

PALM PLANTATION AREA (HA)



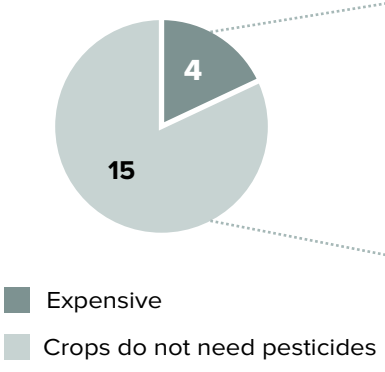
In West Kalimantan, palm expansion by smallholder farmers since 2006 to 2016 is 81% compared to 163% by palm industries. In West Papua, although the total area of palm plantation shows an increase since 2006, the percentage of land expansion by smallholders decreased by 22%. Massive expansion by palm industries increased by 187%, indicating the growing interest of industries to dominate West Papua, leaving the saturated land in Sumatra and Kalimantan.

ENVIRONMENT CONSERVATION:
INTENSIVE USAGE OF CHEMICAL SUBSTANCES-PESTICIDES

Among the farmers interviewed who use pesticide, 80% of them do not understand its effect. While the application of pesticide helps farmers overcome pests, misdirected use could raise problems such as pest resistance, poisoning, chemical residue in the produce, loss of pollinator, soil and water contamination, reduced biodiversity, as well as negative effects to non-target animals (Agne et al.,1995). Specifically, the loss of pollinators has been closely linked with the use of pesticides which could threaten the future of food production, as 35% of global food production depends on pollination.

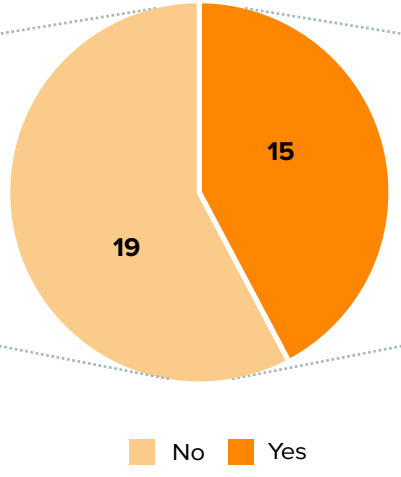
REASONS NOT TO USE PESTICIDES

Farmers (n=19)



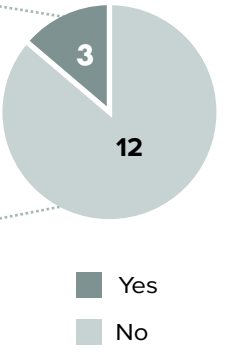
TOTAL FARMERS USING PESTICIDES

Farmers (n=34)



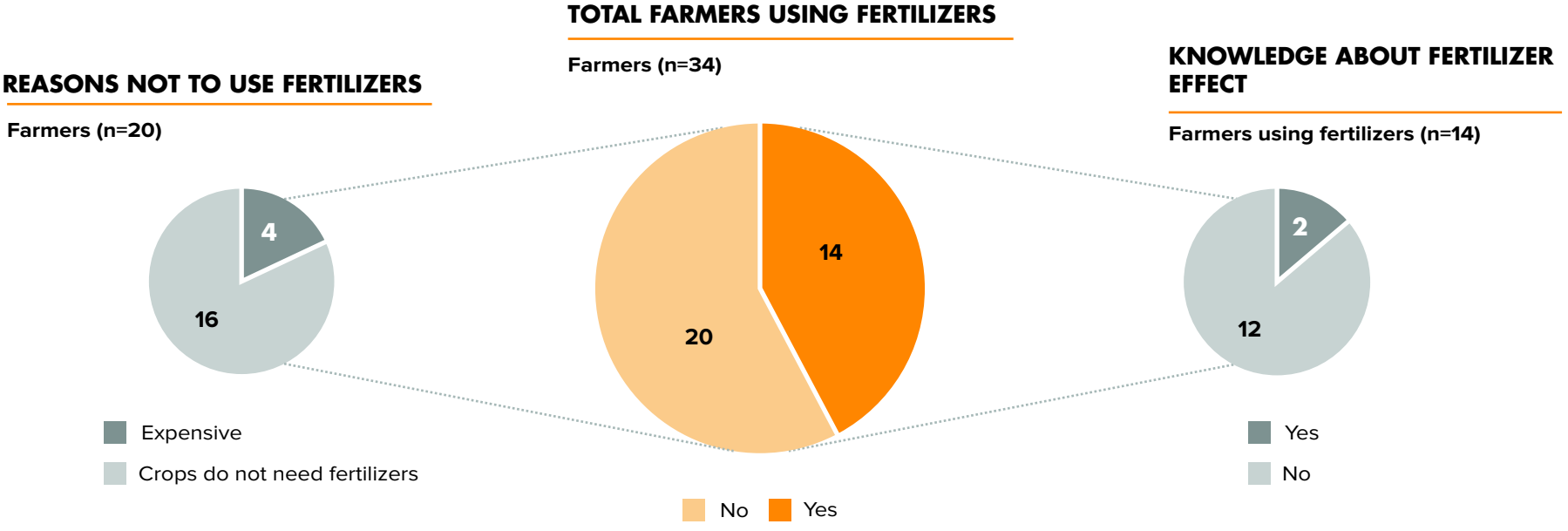
FARMERS' KNOWLEDGE ABOUT THE EFFECT OF PESTICIDES

Farmers using pesticide (n=15)



ENVIRONMENT CONSERVATION:
INTENSIVE USAGE OF CHEMICAL SUBSTANCES-FERTILIZERS

Some commodities such as palm, rice, and rubber require fertilizers to grow optimally. Among the farmers interviewed, 40% use fertilizers but only 15% know its effect on the environment. Commonly used fertilizers consist of nitrogen and phosphorus, required substances in crop productivity. Nonetheless, excessive use of fertilizers has raised environmental concerns. Excess nitrogen affects the leaching of soil nitrate to groundwater. The overuse of phosphorus causes losses to freshwater bodies. Environmental problems are usually not seen as significant concerns to farmers as the impact is not immediately seen.



ENVIRONMENT CONSERVATION:
IMPACT OF FARMING ACTIVITIES

Current agricultural practices in Papua, West Papua, and West Kalimantan have a direct impact on the environment. Environmental aspects, including air, water, soil, and biodiversity, can be disrupted due to poorly managed farming activities. The table below shows an overview of farmers' activities in the three provinces that cause environmental pollution and contamination. The environment conservation value level refers to impact towards the environment as result of farmers activities including land burning (air), chemical pesticide and fertilizer application (water and soil), and variety of tree in a plantation (biodiversity).

Table 4. Environmental impact in each commodity

	Commodity	Environmental aspect				Environment impact	Environment conservation value
		Air	Water	Soil	Biodiversity		
West Kalimantan	Palm	✓	✓	✓	✓	▪ Loss of biodiversity due to monoculture plantation ▪ Deforestation due to plantation expansion	Low
	Rubber		✓	✓	✓	▪ Loss of biodiversity due to monoculture plantation	Med
	Rice		✓	✓	✓	▪ Pesticide retention causes pest outbreak	Low
	Coconut	✓				▪ Burning of coconut husk might cause air pollution	High
Papua and West Papua	Cacao		✓	✓	✓	▪ Loss of biodiversity due to monoculture plantation	Med
	Sago					▪ No significant long term environmental impact	High
	Coconut	✓				▪ Burning of coconut husk for household cooking fuel might cause air pollution	High
	Palm	✓	✓	✓	✓	▪ Loss of biodiversity due to monoculture plantation ▪ Deforestation due to plantation expansion	Med
	Rice	✓				▪ The practice of slash and burn results in air pollution	Med
	Sweet Potato		✓	✓		▪ Usage of pesticide and fertilizer in moderation	Med

Description	
• Low	75% farmers interviewed use chemical pesticide and fertilizer, practice land burning for expansion, and monoculture farming
• Medium	25-75% farmers interviewed use chemical pesticide and fertilizer, practice land burning for replanting and harvest, and monoculture farming
• High	0-25% farmers interviewed use no chemical pesticide and fertilizer, not burning land, and practice polyculture farming

Number of farmers interviewed for environment conservation=34

LABOR EFFICIENCY, FARMER INCOME, AND ENVIRONMENT CONSERVATION

Drawing on the three parameters' analysis of each commodity, we highlight key recommendations for commodities with the low parameter value. Moving forward, Kopernik recommends interventions that focus on technology, capacity building, and advocacy.

Table 5. Assessment matrix

AREA	Commodity	**Labor efficiency** (Agriculture)		**Farmer income** (Livelihood)		**Environment conservation** (Conservation)	
		Assessment	Key recommendations	Assessment	Key recommendations	Assessment	Key recommendations
West Kalimantan	Palm	Med		High		Low	Introduce, adopt and apply NDPE policy–no deforestation, peat, and exploitation–which has to be enforced across all palm supply chain including smallholders.
	Rubber	Med		Med		Med	
	Rice	Low	Farmers can increase their labor efficiency by using the appropriate paddy harvest machine. This way, farmers can maximize harvest with lesser investment in labor.	Low	As modern rice cultivation method is newly introduced as an intensified cash crop, farmers should receive training regarding crop management and marketing to support them with current information and access to the market.	Low	Encourage and support smart usage of fertilizers and pesticides.
	Coconut	Med		Med		High	
Papua and West Papua	Cacao	High		Low	As most cacao trees in Papua are either old or infected with the disease, farmers should look into the option of planting other commodities that has value to the local area.	Med	
	Sago	Low	By using appropriate technology especially for post-harvest processing, farmers can maximize productivity with lesser investment in labor.	Med		High	
	Coconut	Med		Low	As most coconut trees are old, farmers should consider replantation by applying modern cultivation practices. For this reason, farmers need technical assistance to ease the replantation effort.	High	
	Palm	High		Low	As palm trees in West Papua are no longer productive, farmers can consider the option of converting the area for planting other commodities that have value to the local area, using a sustainable method of land clearing.	Med	
	Rice	Low	Farmers can increase their labor efficiency by using the appropriate technique in the pre-harvest stage.	Low	As it is understood rice in West Papua is not for sale, farmers can cultivate diversified crops common to the local area which can contribute to their income.	Med	
	Sweet Potato	High		High		Med	

Recommended interventions

"Hardware"(Technology)

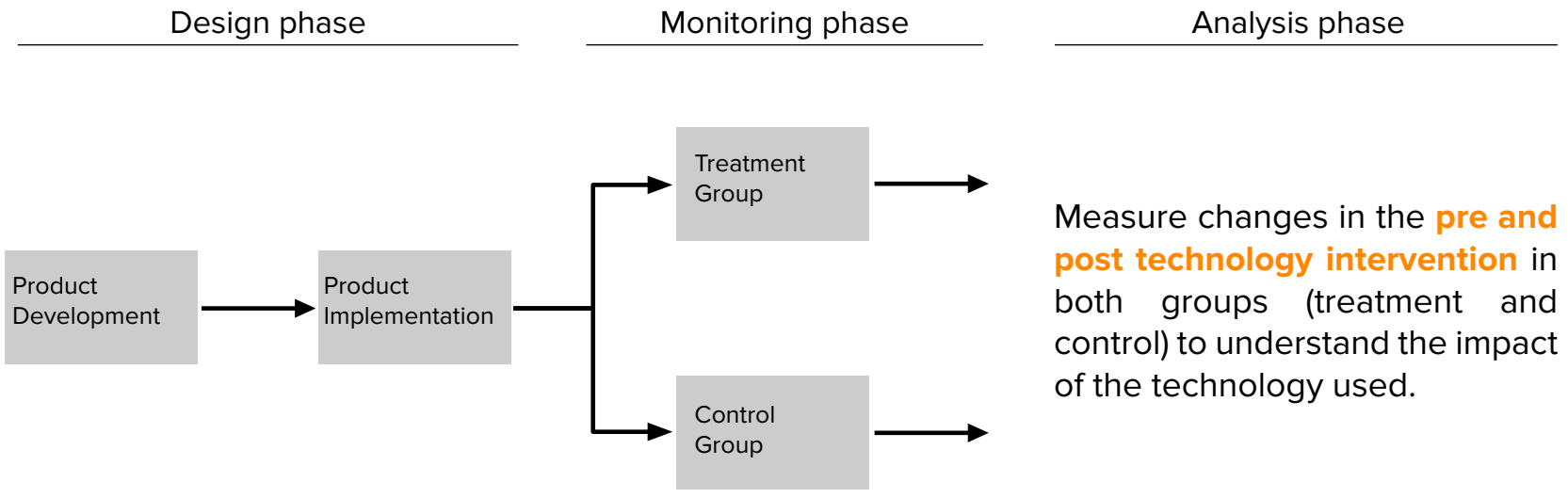
"Software" (Capacity Building)

"Enabling context" (Advocacy)

"HARDWARE" TECHNOLOGY

Based on the identified challenges, we recommend related stakeholders to consider **technology intervention** as an innovative way to increase productivity. The process involves designing, monitoring, and analyzing the intervention. A sound collaboration among the product developers, farmers and community organizations is key to achieving appropriate technology intervention that can effectively address farmers' needs.

Technology experimentation framework

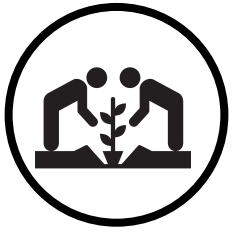


"SOFTWARE" CAPACITY BUILDING

Capacity building is targeted to improve smallholders' **technical and management skills in agriculture.** The framework below provides guidance in conducting a rigorous capacity building for farmers which can be done through workshops, training, and technical assistance. In this framework, assessing the knowledge gap is key to decide what intervention is best for farmers to optimize their agricultural practices.

Farmers' capacity building framework

Assessment	Intervention	Output
Knowledge gap	**Knowledge transfer**	**Optimized practices**



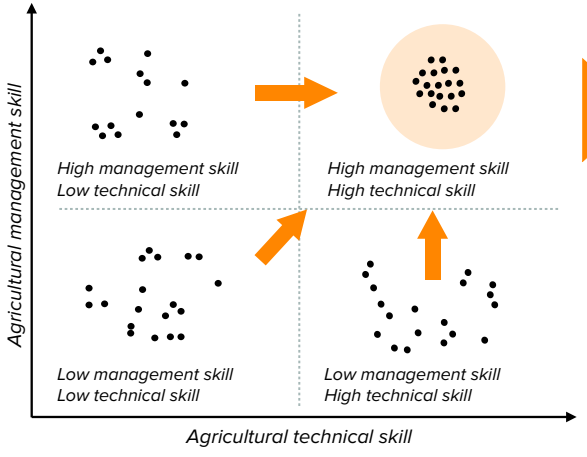
"SOFTWARE" CAPACITY BUILDING

We recommend an action model '*By farmers, for farmers*' where skilled and experienced farmers share their knowledge to others in need. An established common ground provides space for them to freely collaborate with peers, share experiences, and improve skills.

Farmers' capacity building framework

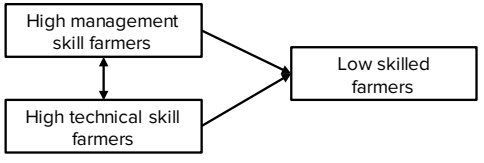
Assessing smallholder farmers' knowledge gap

Agricultural capacity quadrant



Knowledge transfer through mentorship

Action model capacity building



- Farmers with high technical and management skill are recruited and then trained to share their knowledge amongst farmers to foster collaboration within community farmers.

Optimizing practices through farmers' collaboration

Monitoring and Evaluation

- ✓ **Monitoring of optimized process**
- ✓ **Monitoring of outcomes (income, yield, etc)**

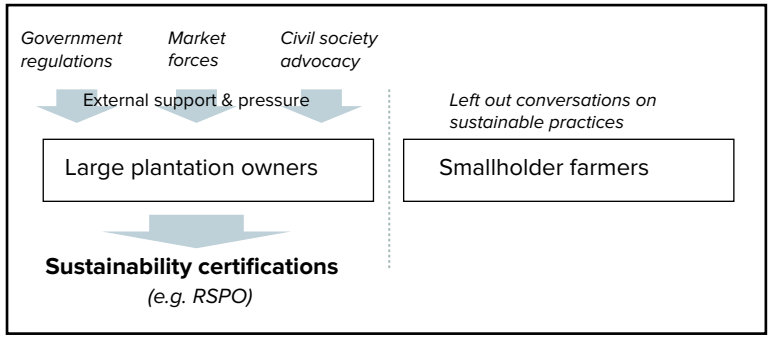
"ENABLING CONTEXT" ADVOCACY

The commodity in most need of favorable regulations and industry practices is palm oil. In the palm oil sector, smallholder farmers have limited information about cultivating sustainable plantations. For this reason, it is important for relevant stakeholders to support and guide farmers to practice sustainable farming by acquiring certifications such as those provided by the Roundtable on Sustainable Palm Oil (RSPO).

Toward sustainable palm oil production

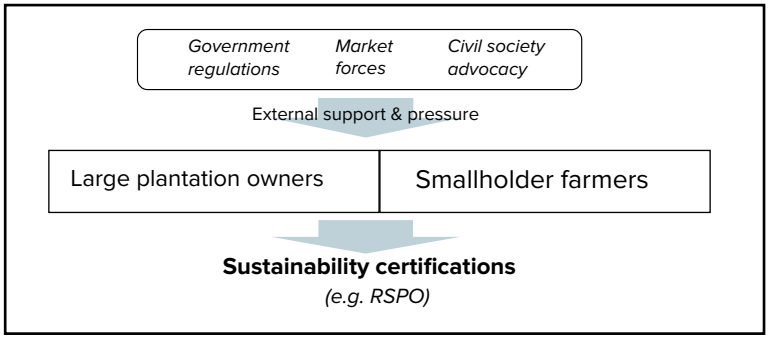
Current State

The government, market forces (i.e., consumer choice), and civil society groups have been encouraging and pushing large plantation owners in adopting and applying sustainable palm practices. However, smallholder farmers have little knowledge and have neither been fully involved nor supported to practice sustainable palm farming.



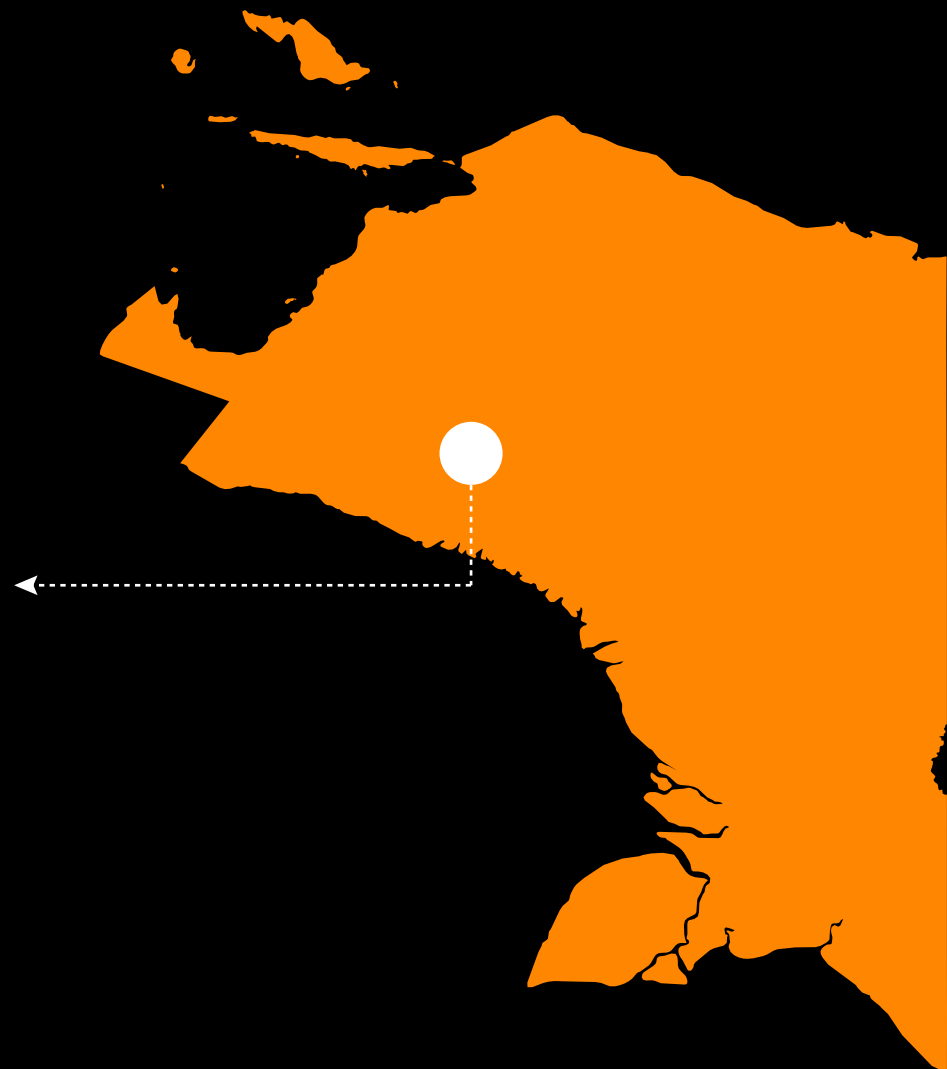
Ideal State

Including smallholders as producers of sustainable palm plantation through certifications will not just improve the environment but also farmers' livelihood. Through certifications, farmers can develop management skills, produce high-quality fruits, and gain better access to markets.



PAPUA

DEMOGRAPHIC OVERVIEW //
CACAO //
SAGO //
COCONUT //



// PAPUA / DEMOGRAPHIC OVERVIEW

The province of Papua comprises 28 districts with Jayapura as the capital city. It is the largest province in Indonesia, with a population of approximately 3.2 million inhabitants dispersed across different districts. **Agriculture is the dominant employment sector,** absorbing 65.8% (or 1 million workers) of the total labor force. The province's GRP per capita is IDR 55.6 million, whereby mining is the biggest contributor. Despite being rich in natural resources, Papua is listed as one of the poorest region in the country with 27.8% of its total population living in poverty.

Source: Badan Pusat Statistik Provinsi Papua, 2017

Table 6. Sanitation and Environment

SANITATION & ENVIRONMENT	PROVINCIAL RATE (%)	NATIONAL AVERAGE (%)
Access to clean water*	33.2	66.7
Cooking with firewood	70.1	29.7
Access to basic sanitation	24.8	61.1
Environmental index (0-100)	80.7 (Satisfactory)	Satisfactory

*Sources of clean water consist of tap water, distributed tap water, drilled well, protected dug well, protected spring water that is used for household purposes.

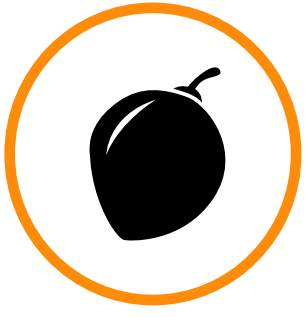
ACCESS TO SANITATION AND ENVIRONMENTAL PRACTICES:

- In Papua, 33.2% of the population has access to clean water, far below the national average at 66.7%.
- Only 25% of the population has access to basic sanitation, a low number compare to the national average of 61%.
- More than half of the population in Papua still uses firewood to cook on a daily basis which poses risks on respiratory health and environmental degradation.
- The environmental index (water, air, forest quality) of Papua is at a satisfactory level.

COMMODITIES

CACAO

SAGO



COCONUT

KOPERNIK

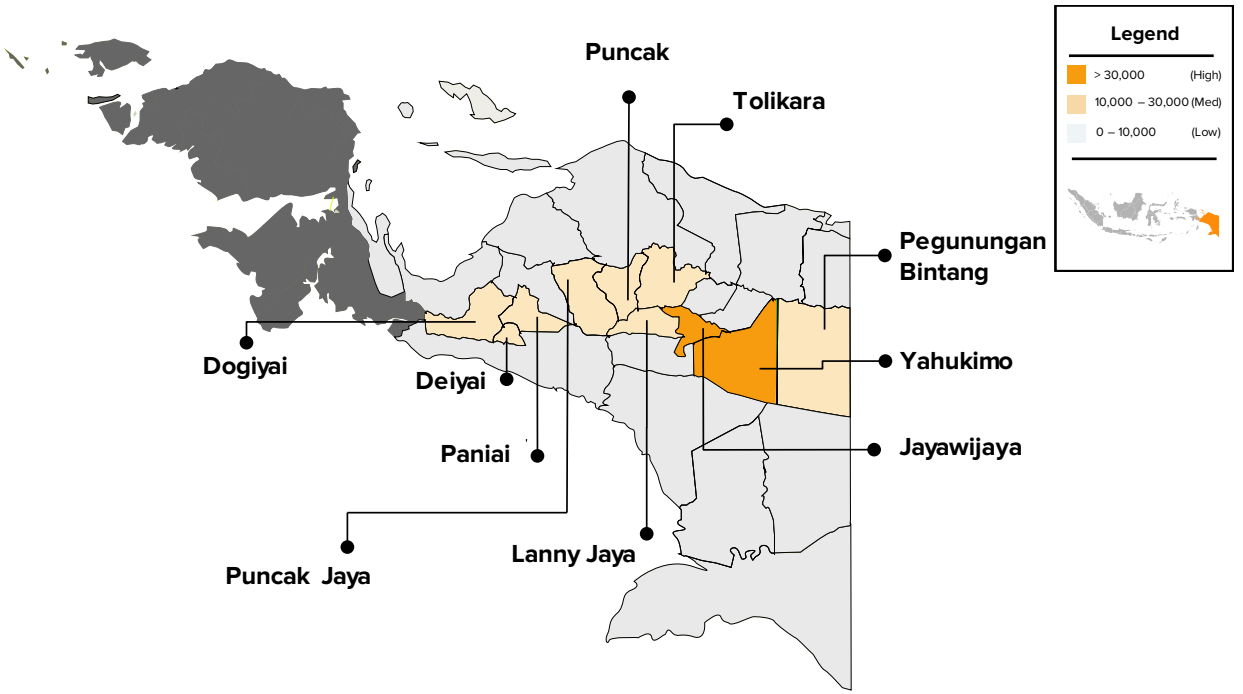
DISTRIBUTION OF SMALLHOLDER FARMERS

Smallholder farmers are mostly concentrated in Yahukimo and Jayawijaya district (40,193 and 32,512 farmer households, respectively) where most of the agricultural activities take place.

Distribution of Smallholder Farmers in Papua (2013)*

# of farmer households (HH)

District	Number of smallholder farmers HH	Ratio of farmers HH/ total HH
Yahukimo	40,193	93%
Jayawijaya	32,512	67%
Lanny Jaya	19,607	50%
Paniai	18,905	52%
Dogiyai	18,491	83%
Puncak	16,481	66%
Deiyai	14,418	90%
Mappi	14,214	75%
Puncak Jaya	14,124	46%
Pegunungan Bintang	13,458	81%
Kota Jayapura	3,150	5%
Keerom	2,010	17%
Sarmi	1,998	26%



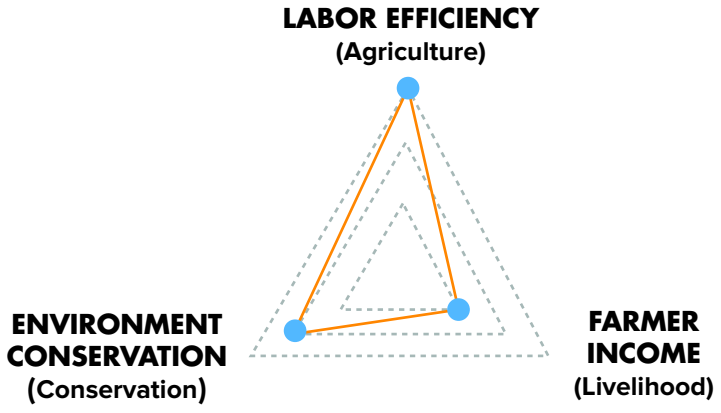
*The table is not a comprehensive list of districts in Papua. Some districts with small number of farmers are not featured

CACAO IN PAPUA

Yield	10,167 tons
Land	34,999 ha
Smallholder farmers	31,801 farmers
Products	Cacao beans
Varieties	Local, Sulawesi 1 (MCC 1), Sulawesi 2 (MCC 2)

Indonesia is the third largest cacao producer in the world. In Papua, cacao is one of the main crops of choice for people who joined the transmigration program in the 1980s and in 1993. Cacao plantation was introduced to local smallholder farmers in several sub-districts, i.e. Keerom, Sarmi, Yapen, Nabire, Waropen, and Jayapura. Despite being one of the main cash crops in Papua, nowadays, a number of cacao farmers cannot solely rely upon cacao as their main income source due to an epidemic of Cocoa Pod Borer (CPB). The epidemic has caused cacao productivity to drop significantly, with a production growth rate of –12% from 2013–2015. The ongoing CPB epidemic has also caused reluctance among farmers to replant cacao due to the laborious practice and fear of the persisting plant disease.

COMMODITY PERFORMANCE



Current cacao farming practices show that environment conservation is satisfactory as farmers have recently applied a polyculture system, in which there is more than one type of plant within the farm. However, the use of chemicals is still visible. The crop cultivation is still labor intensive, and farmers do not make much earnings from selling cacao beans as they are valued at a low price due to poor post-harvest processing. This is because farmers dry the cacao beans approximately for two days which does not allow the beans to reach optimum dryness level.

FARMER INCOME

Commodity	Monthly income		
Cacao	Low	Med	High

The income of cacao farmers is relatively low due to the low productivity of cacao fruits, especially if the trees are infected with diseases. **The CPB disease infecting many cacao plants in Papua has affected farmers' livelihood.** The disease has caused cacao fruits to bear fewer pulps and beans, decreasing the productivity of cacao trees. As a result of low productivity, some farmers cannot solely rely on cacao for their main farming income and are forced to leave the cacao sector.

Efforts for replantation have started in several old cacao plantations. The initiative, usually spearheaded by farming facilitators, is done by clearing half of the existing cacao plantation and planting new trees. Farmers will also grow vegetables in the meantime while waiting for the new trees to mature. Therefore, they can still earn income from half of their existing cacao trees and the vegetables grown on the remainder of their land. The same process will apply for the other half of the remaining cacao trees. However, farmers still fear that the new trees can be infected with CPB.

Transmigrant smallholder farmer shows how to operate pesticide spray in Arso III, Keerom, Papua

KEY CHALLENGES

Many of the cacao farmers we interviewed were part of the government-led crop intensification project in the 1980s. However, since its conception and opening in the 1980s, there have been no visible replanting efforts for cacao trees in Papua.
Many cacao trees have grown past their productive age.

RECOMMENDATIONS

Government and NGOs: Support farmers in replantation activities and provide them with the relevant knowledge and skills in managing and maintaining plantations.

KOPERNIK

FARMER INCOME: THE VALUE CHAIN

The cacao value chain below shows that smallholder farmers' work is concentrated in the pre-harvest stage, whereas the least amount of work occurs during post-harvest. Here, farmers only dry the cacao beans, which are valued at a low price by middlemen.

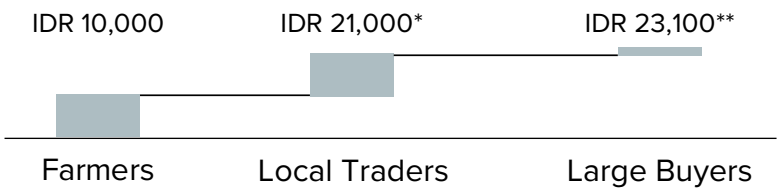
SMALLHOLDER FARMERS

OTHER STAKEHOLDERS INVOLVED IN THE VALUE CHAIN

PRE-HARVEST	HARVEST	POST-HARVEST	LOCAL TRADERS	LARGE BUYERS	MANUFACTURERS & RETAILERS	CONSUMERS
Prepare land Seeding Planting Apply fertilizer	Maintain farm Collect cacao beans	Dry cacao beans for 1-2 days	Check cacao beans' moisture level Dry beans for 5-7 days	Collect cacao beans from different districts in a centralized area	Process cacao beans into different forms (i.e. cacao powder, cacao butter)	Purchase cacao-based products

Value added: 52% 10%

Price received by actors (per kg):



Local traders buy dried cacao beans from farmers for the price of IDR 10.000/kg. **By drying the beans longer, local traders add value to the product and sell it to large buyers at a price 52% higher.**

*Price paid after 1-2 days drying time
**Price is calculated based on average cacao global price in February at icco.org at the exchange rate of IDR 13,603/USD (average BI exchange rate in February 2018)

LABOR EFFICIENCY: PRE-HARVEST

HOURS OF WORK

Commodity	Pre-harvest
Cacao	2 hours/day

In Keerom district, cacao farming requires low labor intensity where farmers spend approximately 2 hours a day in the field during the pre-harvest stage. First, farmers use polybags to germinate seeds for three months until the seeds enter the vegetative and growth phase. Then, farmers relocate the young cacao trees from the polybags into the ground with a distance of 4 square meters between the trees. Cacao trees require fertilizers and pesticides, especially in the first and second year of cultivation to maintain fruit quality. Generally, fertilizers are applied twice a year. Farmers require 4 sacks* of fertilizers per hectare of land. Fertilizers are relatively cheap in Keerom, but pesticides are not. The standard requirement of pesticide usage may cost farmers up to IDR 500,000/ha – a high price to pay for smallholder farmers. Because of this, farmers do not apply the correct proportion of pesticides, which in turn negatively affects the cacao plants, i.e. prone to diseases.

* One sack is about 50 kg

CPB epidemic in Papua found in Arso III, Keerom district, Papua

KEY CHALLENGES

Farmers rarely take any steps to cope with pest infestation.

RECOMMENDATIONS

Government and NGOs: Provide farmers with continuous training and assistance on how to treat common diseases of cacao trees.

LABOR EFFICIENCY: HARVEST

HOURS OF WORK

Commodity	Harvest
Cacao	3 hours/day

Two years after planting, cacao fruits are ready to be harvested on a regular basis. In the harvest stage, farmers spend up to 3 hours working in the field. Cacao is harvested by opening the pods and scraping off the beans to later be dried. Before the spread of CPB in Keerom, farmers used to harvest every week. Now, they can only harvest once a month with approximately 120 kilograms of cacao since many of the fruits are hardened due to the disease. Farmers' inability to maintain the cacao farm is also a contributing factor to the decline in fruit production. This, in part, is due to the limited knowledge of farmers and very little support from the local government in providing training on agricultural management.

Fruit infected with CPB epidemic found in Arso III, Keerom district, Papua

KEY CHALLENGES	RECOMMENDATIONS
There are minimum replanting efforts for cacao in Papua due to the CPB disease.	**Government and NGOs:** Consult with the farmers on replanting efforts. Support and facilitate farmers in organizing a sustainable cacao replantation practices. **Farmers groups:** Actively coordinate with authorities on replanting efforts.
CPB decreases cacao fruit productivity, which in turn negatively affects farmers' income.	**Farmers groups:** Convert lowest producing plots to other value added commodities. **Government and NGOs.** Support farmers in their farming activity of other value added commodities by subsidizing materials and providing agricultural training.

LABOR EFFICIENCY: POST-HARVEST

HOURS OF WORK

Commodity	Post-harvest
Cacao	3 hours/day

Similar to the harvest stage, farmers spend around 3 hours a day working in the field processing the beans. The beans are traditionally processed by sun-drying, which requires a moderate level of manual labor.

Once dried, cacao beans are collected by village collectors in each farm. The price depends on the level of dryness of the beans, which typically takes about 5 to 7 days to reach an optimum dryness level with a remaining moisture level of 7%. Beans at this condition are sold at IDR 21,000/kg.

All too often, farmers in Papua immediately sell their beans just after 1 to 2 days of drying due to the need of immediate cash and to avoid weight depreciation. Beans that are not properly dried are valued at a low price, approximately IDR 11,000/kg.

Drying cacao beans at a local trader in Arso II, Keerom district, Papua.

KEY CHALLENGES	RECOMMENDATIONS
The drying process becomes interrupted when it rains. Therefore, crops are not properly dried which decreases the price of cacao.	**Farmers groups:** Use a simple solar dryer to avoid interruption of the drying process, and achieve consistent heat temperature to maximize drying results. **Government and NGOs:** Assist farmers in using agricultural technologies.
The price of cacao is set by the middlemen. Farmers have little control of the price due to lack of information of the market price.	**Government and NGOs:** Inform and encourage farmers to consider cacao as a sustainable agribusiness that can improve their livelihood. Assist farmers in gaining direct access to the market.
Lack of financial institution to support smallholder farmers in post-harvest activities.	**Farmers groups:** Establish a cooperative to hold a specific control of the commodity price to retain competitiveness in the market.

ENVIRONMENT CONSERVATION

Commodity	Conservation Impact				Environment conservation value
	Air	Water	Soil	Biodiversity	
Cacao	High	Med	High	Low	Med

Interviewed farmers in Keerom show that they have moderately preserved the cacao farmland. The monoculture nature of cacao plantation in Papua bears the risk of biodiversity loss. Like any monoculture plantation, cacao is prone to pests, the most common being *Helopeltis* spp. This insect hardens the fruit, making it inconsumable. *Helopeltis* benefits from the local environmental condition as it develops faster in low altitude areas with high temperature. Despite multiple efforts to overcome the pests, the disease persists. Farmers have not been able to afford the pesticide for treating the pests. While they have also tried to use natural predators – ants – against the pests, it has not been practical as the ants would cover the fruit and hinder the harvesting process.

Young cacao fruit

KEY CHALLENGES

Farmers have difficulties in pest control and management.

RECOMMENDATIONS

Government: Support farmers to replant by subsidizing prime cacao variety followed by appropriate training in pest control and management considering that current trees are old and in need of regeneration.

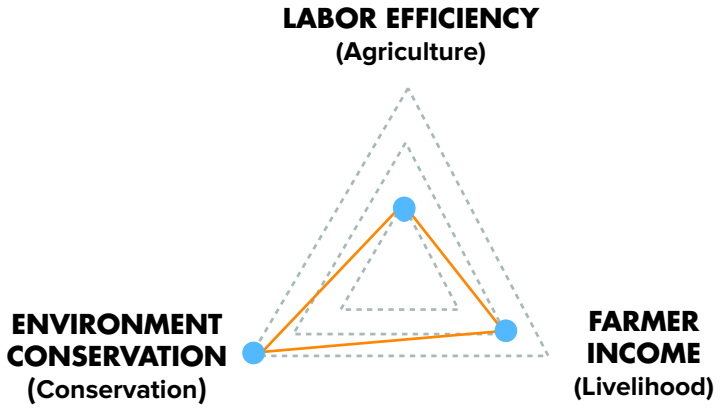
Farmers groups: Experiment with alternative pesticides such as fungus that can be sprayed to the cacao pods without affecting the harvest.

SAGO IN PAPUA

Yield	29,834 tons
Land	38,548 ha
Smallholder farmers	-
Products	Sago starch
Varieties	Wild Sago, *yepah* sago, *para* sago

Typically associated with the eastern region of Indonesia, sago holds a cultural significance as a staple food in Papua. Farmers gather sago that is widely available near bodies of water or swampy peatland. These areas are typically far from settlement areas, which often requires smallholder farmers to set up huts and processing workshops inside the forest in order to process the sago into starch.
Harvesting sago requires a contribution from the farmer's household members. The logging and grounding of sago trees are done by male members, while female members are typically tasked with straining the sago. Initially known as a subsistence crop, sago has now become a value-added crop that generates income for farmers.

COMMODITY PERFORMANCE



Current sago farming practices show that land is well preserved. This is because the plants are widely available and require no further intervention by farmers (e.g., land burning, applying chemical substance) to scale up cultivation. Regarding labor efficiency, cultivating sago relies heavily on manual labor equipped with traditional tools. Farmers can spend days in the forest to gather and process one sago tree. Nevertheless, each harvest allows farmers to generate a modest income from selling the sago starch.

FARMER INCOME

Commodity	Monthly income		
Cacao	Low	**Med**	High

The income of sago farmers in Papua is relatively modest. **Sago starch is usually collected in 15 kg sacks and sold at IDR 200,000 per sack**. Generally, a sago farmer can collect about 15 sacks of sago starch from one tree. The price of sago can be much higher in December and January due to Christmas and New Year celebrations when demand is high, but supply is lower due to the festivities.

Sago plantations in Papua are owned mostly – if not entirely – by indigenous farmers. It is an essential commodity for Papuan as a staple food, especially before the introduction of rice. Sago starch is the most common form of sago that smallholder farmers sell.

While processing sago is a laborious practice, it **is as much a social activity as it is an economic one**. Despite the lack of farming groups surrounding sago processing, farmers usually involve the women of their households or neighbors for the starch extraction, who take home the processed sago as payment.

A sago grinding machine.

KEY CHALLENGES

Despite being the second largest producer of sago in Indonesia, farmers have not seen sago as an economic opportunity to intensify sago-derived products that can later contribute to their income.

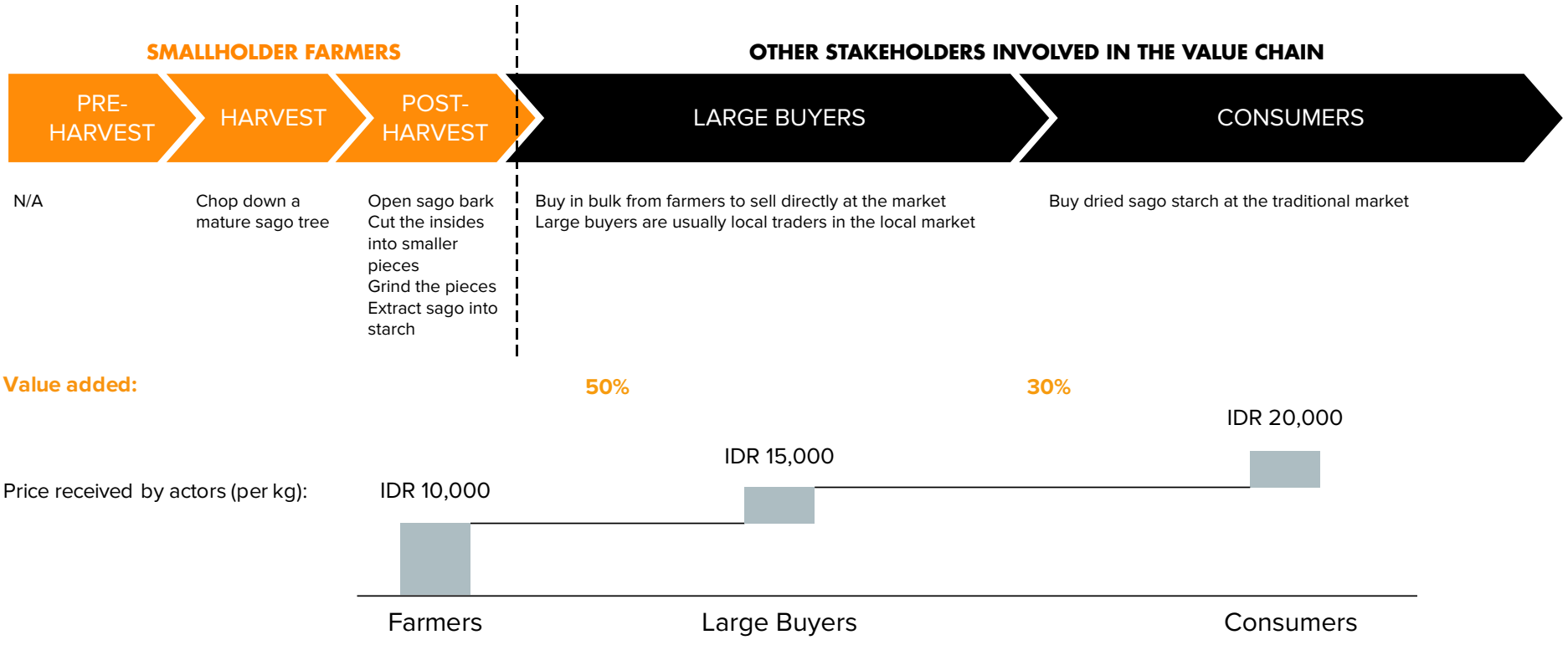
RECOMMENDATIONS

Government and NGOs: Support farmers through business development training to equip them with the sufficient knowledge in producing and managing sago-derived products.

KOPERNIK

FARMER INCOME: THE VALUE CHAIN

Most of the sago production is focused on the harvest and post-harvest phase where it requires labor-intensive work. However, the price of sago product sold in the local markets is double the price farmers received. It would be ideal for farmers to have access to the local markets and sell their product directly. This way, farmers can benefit from the market price of their sago products.



LABOR EFFICIENCY: PRE-HARVEST

HOURS OF WORK

Commodity	Pre-harvest
Sago	2 hours/day

In the pre-harvest stage, farmers do not require intensive labor as there is only little work involved. For instance, to obtain the seedlings, farmers need only to cut the buds growing from the lower part of the sago tree stem. This ability to continually grow a new bud means that sago can have a naturally sustained growth without the need for agricultural chemical substances. This technique of sago cultivation in Papua has been passed on for generations, where farmers manage, expand, and share their sago plots by traditional regulations.

Farmer shows a new sago shoot to be used for replanting in Maribu, Jayapura, Papua

KEY CHALLENGES

Sago cultivation for many smallholder farmers is still done in a traditional, non-intensified method.

RECOMMENDATIONS

Government and NGOs: Assist farmers on how to improve cultivation practice to increase sago yield.

LABOR EFFICIENCY: HARVEST

HOURS OF WORK

Commodity	Harvest
Sago	7 hours/day

Sago harvesting requires farmers to work up to 7 hours a day as it involves logging the trees manually using simple tools such as an ax and a crowbar. Once the tree is chopped down, farmers take the sago trunk to be cut into small pieces, approximately 0.5 to 1 meter in length. The small pieces are then opened with a crowbar in order to take out the starchy stems. These are further cut into smaller pieces to ease the grinding process.

Sago bark is chopped down into smaller pieces before grinding

KEY CHALLENGES

Farmers do not have the appropriate equipment to maximize harvest. Breaking open a sago tree with an ax often leaves some of the sago to waste, because some can still be stuck in the bark.

RECOMMENDATIONS

Farmers: A chainsaw type of technology can help farmers to make more precise cuts and maximize harvest.

LABOR EFFICIENCY: POST-HARVEST

HOURS OF WORK

Commodity	Post-harvest
Sago	6 hours/day

Sago farmers spend the most time working during the post harvest stage which takes up to 6 hours a day in the field. Farmers usually process the sago directly after harvest. This involves grinding and squeezing the harvested sago to extract the starch. The starch of the squeezed sago will settle on the bottom of the tub and then is collected and placed into sacks as wet sago starch.

Farmers will keep a certain proportion for self-consumption, and will sell the rest to local traders at IDR 10,000/kg.

Sago starch production is usually done by individual farmers with the help of household members

KEY CHALLENGES

Muddy paths and small rivers along the route to the harvesting and processing area hinder farmers in carrying the sago back to the village when selling.

Farmers only sell a single product variety of sago – the starch, which generates relatively modest to low income.

RECOMMENDATIONS

Government: Local government to provide better paths for farmers to reach their sago plantation area and to carry the harvest.

Farmers: Farmers are advised to produce value-added products such as sago flour and sago sugar, to improve income.

ENVIRONMENT CONSERVATION

Commodity	Conservation Impact				Environment conservation value
	Air	Water	Soil	Biodiversity	
Sago	High	High	High	High	High

Farmers we interviewed show that they have preserved the sago land sustainably by practicing responsible harvesting, i.e., replanting sago for future harvest without adding chemical substances such as fertilizers and pesticides to enhance production. The growth of sago trees are nurtured by nature; hence there is no threat to the environment from the current agricultural practice.

As home to 85% of sago forest in Indonesia, with around 60 genetic varieties spread across the island, sago forest in Papua island have an ecological function as carbon reserve, the water regulator, and biodiversity preservation.

Local Papuans making sago starch into Papeda, common Papuan food

KEY CHALLENGES

As an indigenous commodity, sago is protected by both government and local customary law. Under these laws, sago forests are not to be converted into other land use. Unfortunately, rapid economic growth makes infrastructure development inevitable, some even reaching sago forest. There have been numerous incidents of land conversion from sago forest to building facilities or to monoculture plantations.

RECOMMENDATIONS

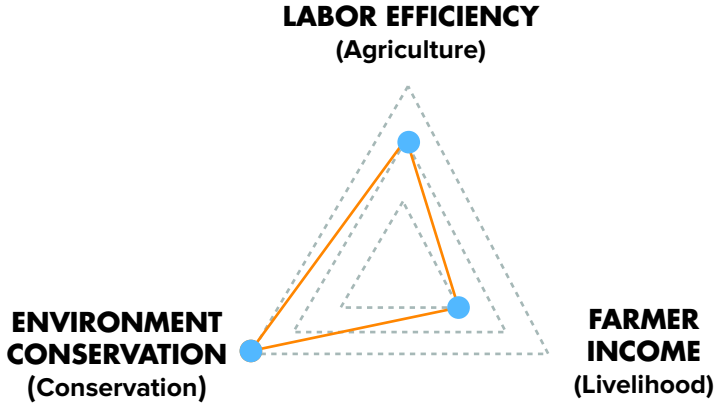
Government, NGOs and farmers' groups: With the collaboration and commitment of these stakeholders, the enforcement of the existing law is plausible to ensure no more conversion of sago forest.

COCONUT IN PAPUA

Yield	15,993 tons
Land	25,151 ha
Smallholder farmers	34,586 farmers
Products	Whole coconut, coconut husks, copra, coconut oil
Varieties	-

A typical tropical crop, coconut plantations are spread across Indonesia. In Papua, Sarmi district has the most enormous amount of land used for coconut plantations. In most of Sarmi, coconuts are farmed traditionally without a systematic cultivation method. While some sell whole coconuts, copra is also a common form of processed coconut that is monetized. Coconut oil processing units and simple technologies are also readily available; however, only a small number of groups are still actively processing coconut oil. This is due to the limited access to markets and the low price of coconut oil which have discouraged farmers from intensifying coconut-based products.

COMMODITY PERFORMANCE



Current coconut farming practices in Papua show that land is well preserved as farmers use very little fertilizers and pesticides on their farm. Farmers wait for the old coconuts fall to the ground rather than climbing the tree to pick them up. These old coconuts are processed into copra and sold to middlemen for only IDR 4.500/kg, the relatively low price received by farmers.

FARMER INCOME

Commodity	Monthly income		
Coconut	Low	Med	High

Sarmi holds the second largest area for coconut plantation in Papua, covering almost 4,000 hectares. However, its productivity is still at 734 kg/ha, lower than the average provincial productivity of 845 kg/ha. The low productivity rate signals a gap in crop intensification. While coconut is most often sold in its unprocessed fruit form, some coconut farmers interviewed in Sarmi also process coconut into copra and virgin coconut oil (VCO). Unfortunately, the income of coconut farmers in Sarmi generated from selling these coconut-derived products is relatively low due to lack in price information and access to markets.

VCO processing by farmers in Sarmi, Papua

KEY CHALLENGES

Farmers are discouraged to produce VCO due to the limited market access and the lack of farmers' competitiveness in setting the price.

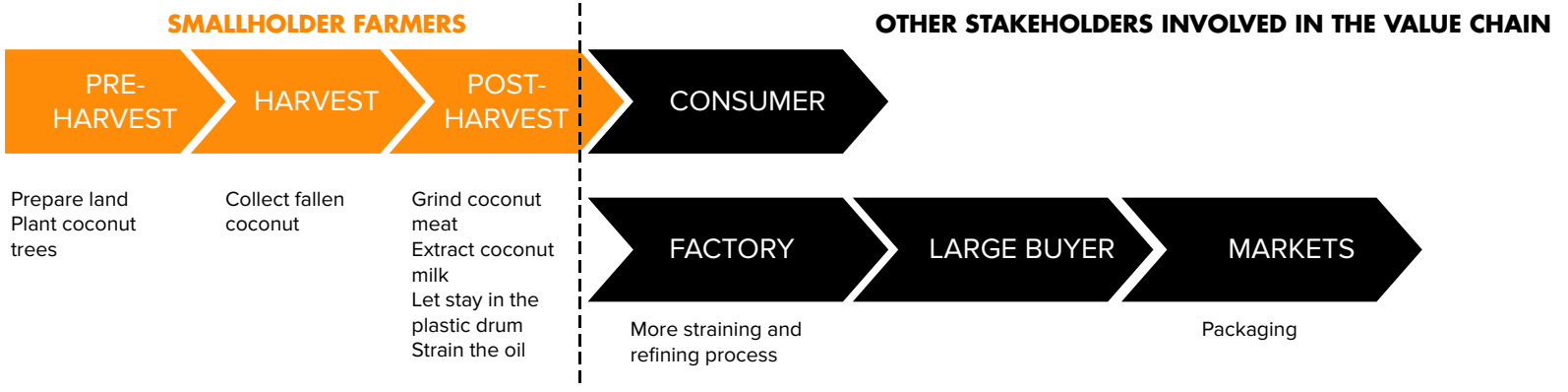
RECOMMENDATIONS

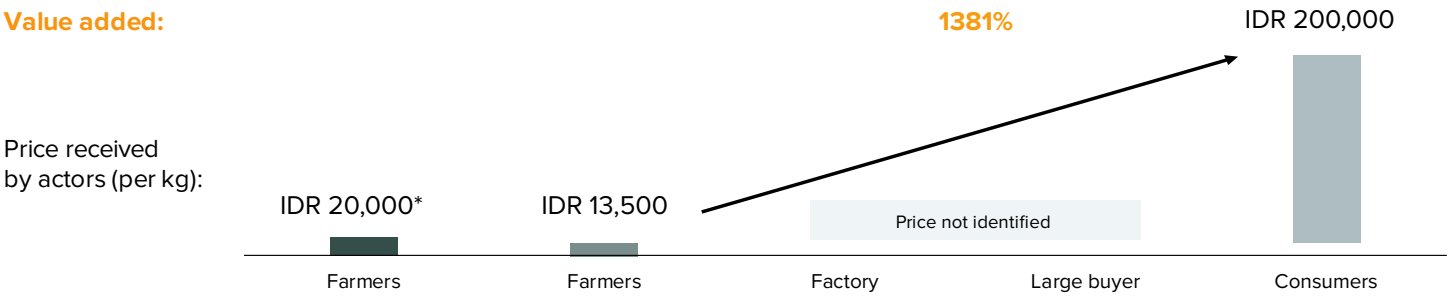
Government: Support farmers through government-led programs that take into account the control of standard pricing and market access to farmers.
NGOs: Support farmers through training in agribusiness management for sustainable agricultural development.

KOPERNIK

FARMER INCOME: THE VALUE CHAIN - VCO

VCO production in Keder Village, Sarmi district has been minimal. Only one out of the five previously formed VCO groups is still actively producing. Farmers are still discouraged from producing VCO due to low prices and lack of market access and information. While there is an option to sell the product directly at local markets for IDR 20,000/liter, farmers choose to sell to factories despite a lower price because factories serve as an assured buyer where farmers do not have to worry about products being unsold.



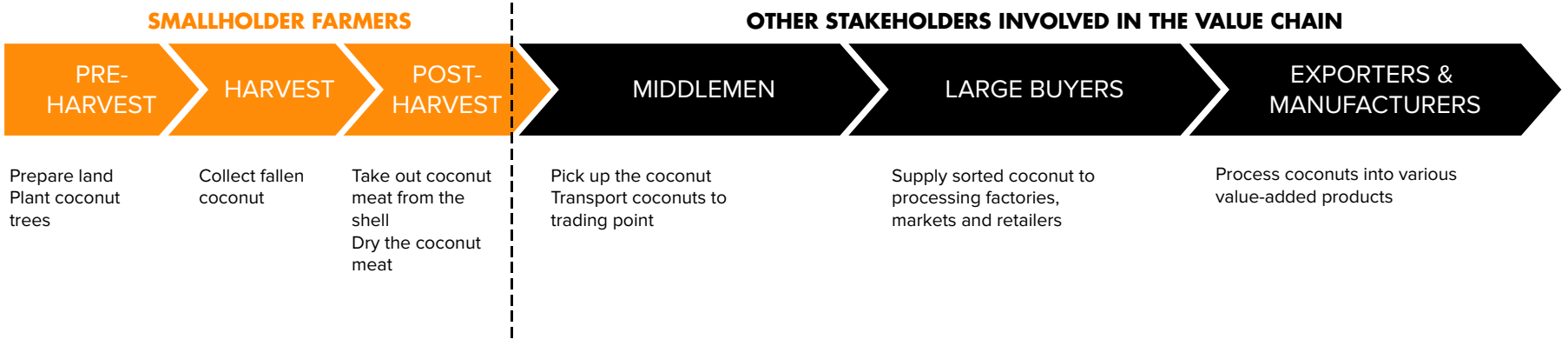


*If farmers sold the product directly at the market

// PAPUA / COCONUT

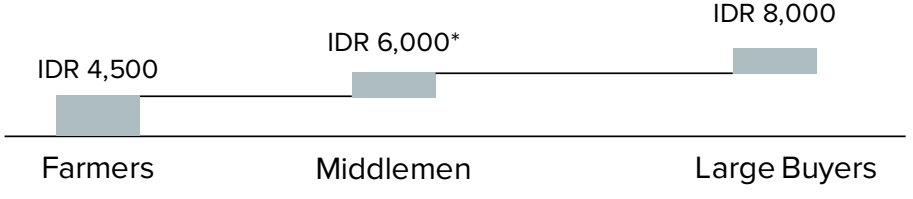
FARMER INCOME: THE VALUE CHAIN - COPRA

In Keder village, Sarmi, copra is the primary form of coconut product that is monetized. The majority of farmers have made an effort to turn their coconut into copra rather than selling whole, raw coconuts. They usually sell copra at a price range of IDR 4,000 – 5,000 to middlemen who come to pick up the copra. The middlemen usually come from Jayapura or Keerom districts, who then sell the produce to large buyers in Surabaya.



Value added: 33% 33%

Price received by actors (per kg):



*Estimate price received by middlemen

LABOR EFFICIENCY: PRE-HARVEST

HOURS OF WORK

Commodity	Pre-harvest
Coconut	2 hours/day

In the pre-harvest stage, farmers do not require intensive labor as there is only a little work involved, i.e., coconut trees are already at a mature age and ready for harvest. It takes approximately four to eight years for coconut trees to mature and bear fruits, depending on the type of seeds, soil condition, and farm maintenance.

In general, coconut farming requires fertilizing and pesticides to maintain the quality of coconuts and productivity. However, farmers in Sarmi do not practice these farming methods. Most coconut trees in this area are old and have been there for decades. There are efforts by farmers' groups to start new coconut plantations with prime varieties in new plots.

Coconut trees in Sarmi are taller than the electricity poles.

KEY CHALLENGES

When interviewing the farmers in Sarmi, **none indicated any challenges faced during the pre-harvest stage of farming**. However, we observed that the coconut trees are very tall, reaching more than 15 meters. This indicates that the trees are more than 30 years old which lowers productivity.

RECOMMENDATIONS

Government and farmers groups: Farmers to do coconut replantation with the local government subsidizing prime coconut seed variety to farmers.

// PAPUA / COCONUT

LABOR EFFICIENCY: HARVEST

HOURS OF WORK

Commodity	Harvest
Coconut	5 hours/day

During harvesting farmers only spend roughly 5 hours a day collecting fallen coconuts on the ground. The practice of only collecting fallen coconut on the ground is because most coconuts are processed into copra. The fallen coconuts indicate they are old fruits with lower water content and more meat which makes it more preferable to be processed into copra.

A coconut farmer deshelling coconut to get the meat

KEY CHALLENGES

When interviewing the farmers in Sarmi, none indicated any challenges faced during the harvest stage. However, we observed that farmers invest a significant amount of time waiting for coconuts to fall to be collected for copra processing, when they can work on other income generating activities.

RECOMMENDATIONS

Local government: To support farmers in diversifying agriculture crop by providing initial crop seed varieties (e.g., fruits, vegetables) commonly grown and consumed locally. As well as facilitation in conducting farming activities using modern techniques.

LABOR EFFICIENCY POST-HARVEST

HOURS OF WORK

Commodity	Post-harvest
Coconut	3 hours/day

During post-harvest, farmers spent up to three hours a day to produce copra, a moderate-intensity labor activity. Starting from peeling the husks, and splitting the coconut in half, farmers then take the meat out of the coconut shell using a simple screwdriver-type tool. The meat is dried under the sun or dried through a smoking method. Both methods take about three days to reach the optimal drying level of copra. To make one sack (80 kg) of copra takes around 400 coconuts. The buyers usually come from other regions of Papua, such as Jayapura or Keerom and pick up the copra in Sarmi.

Coconuts on a drying platform to be turned into copra

KEY CHALLENGES	RECOMMENDATIONS
Farmers have stagnant production capacity due to traditional method of processing.	**Government and NGOs:** Identify and assess technologies that can help farmers process copra faster, hence enabling more production. Assist farmers in capacity building to better equip them with the knowledge and skills in maximizing production.
The price of copra is set by the middlemen or large buyers. Farmers have little control over copra price.	**Government and NGOs:** Strengthen farmer groups to form a farming cooperative and establish bargaining power with the local buyers.

// PAPUA / COCONUT

ENVIRONMENT CONSERVATION

Commodity	Conservation Impact				Environment conservation value
	Air	Water	Soil	Biodiversity	
Coconut	High	High	High	Med	High

The farmers we interviewed showed that they have preserved the land sustainably by avoiding the use of chemical substances, which could affect the soil and groundwater sources. Farmers also cultivate other crops in between the coconut trees which protects biodiversity. We also observed that husks from the peeled coconuts are piled in front of farmers' houses and left unprocessed. With proper knowledge and skills, farmers can turn husks into value-added biomass fuel.

The growth trend of coconut plantation areas in Sarmi has remained flat in the present years. This implies that farmers might feel content with the current yield and production of coconut or they need assistance in intensifying coconut-derived products to contribute to their income.

Coconut meat for further processing

KEY CHALLENGES

Farmers have little knowledge on how to effectively manage coconut waste, i.e., husks.

RECOMMENDATIONS

Government and NGOs: Assist farmers in capacity building to better equip farmers with the knowledge and skills to effectively manage coconut waste and turning it into eco-friendly biomass fuel.

WEST PAPUA

DEMOGRAPHIC OVERVIEW
PALM
SWIDDEN RICE
SWEET POTATO

// WEST PAPUA / DEMOGRAPHIC OVERVIEW

West Papua province comprises 12 districts with Manokwari as the capital city. The province holds a total population of 890,000 inhabitants. Similar to Papua, agriculture is the dominant employment sector, absorbing 45% (160,000 workers) of the total labor force. The province's GRP per capita is IDR 72 million, with the construction sector as the most significant contributor. Unfortunately, West Papua's poverty rate is second highest in the nation after Papua at 27.8%.

Source: Badan Pusat Statistik Provinsi Papua Barat, 2017

Table 7. Sanitation and Environment

SANITATION & ENVIRONMENT	PROVINCIAL RATE (%)	NATIONAL AVERAGE (%)
Access to clean water*	58.5	66.7
Cooking with firewood	43.7	29.7
Access to basic sanitation	65.8	61.1
Environmental index (0-100)	84.5	Satisfactory

*Sources of clean water consist of tap water, distributed tap water, drilled well, protected dug well, protected spring water that is used for household purposes.

ACCESS TO SANITATION AND ENVIRONMENTAL PRACTICES:

- More than half of the population have access to clean water. The provincial rate is 58.5% which nearly reaches the national average rate at 66.7%.
- The provincial rate for basic sanitation is high, indicating that the inhabitants have sufficient sanitation facilities.
- Almost half of the population still use firewood to cook on a daily basis, which poses risks to the environment.
- The environmental index (water, air, forest quality) of West Papua is at a satisfactory level.

COMMODITIES

PALM

RICE

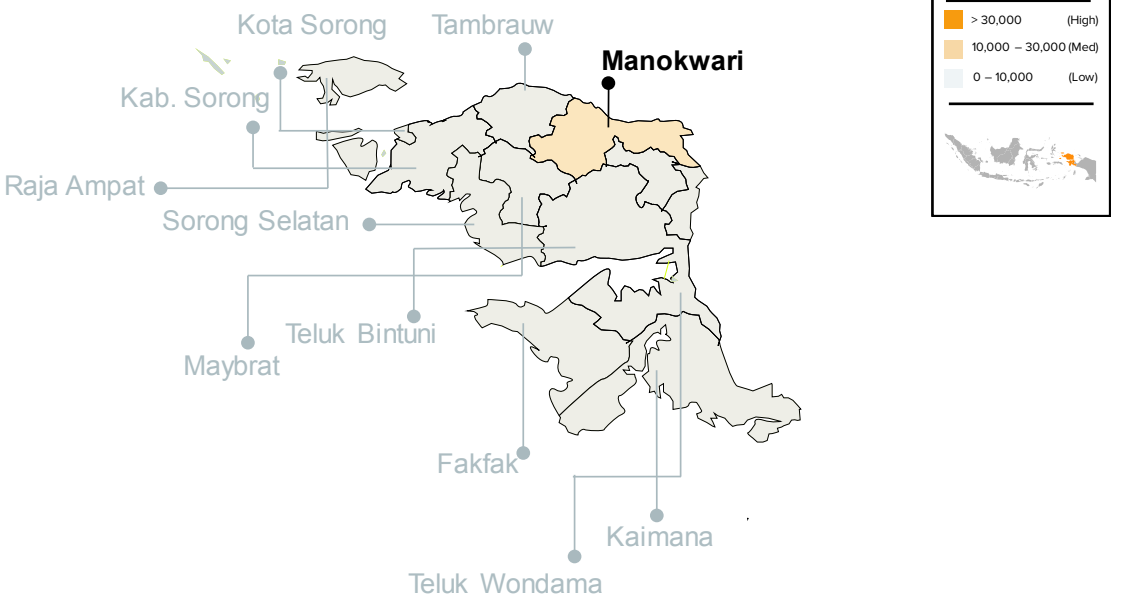
SWEET POTATO

DISTRIBUTION OF SMALLHOLDER FARMERS

Smallholder farmers are mostly concentrated in Manokwari district (12,605 farmer households) where most of the agricultural activities take place.

Distribution of Smallholder Farmers in West Papua (2013)
# of farmer households (HH)

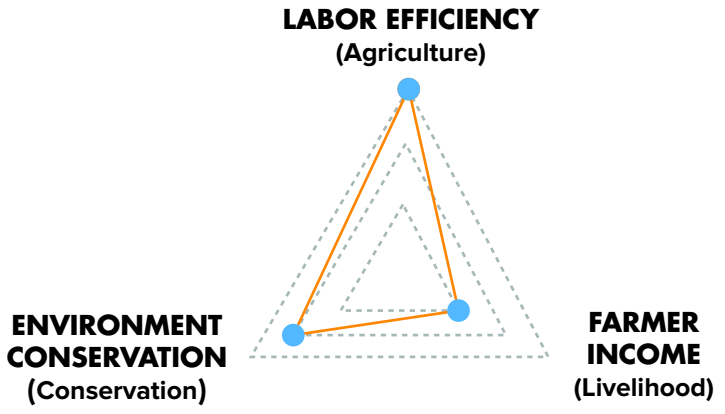
District	Number of smallholder farmers HH	Ratio of farmers HH/ total HH
Manokwari	12,605	37%
Sorong	3,941	22%
Raja Ampat	3,776	38%
Sorong Selatan	3,451	42%
Maybrat	3,122	44%
Teluk Bintuni	2,745	22%
Fakfak	2,430	16%
Kota Sorong	2,199	5%
Teluk Wondama	1,335	21%
Kaimana	1,252	11%
Tambrauw	714	25%



PALM IN WEST PAPUA

Yield	144,826 tons
Land	43,477 ha
Smallholder farmers	9,964 farmers
Products	Palm kernel bunches
Varieties	-

COMMODITY PERFORMANCE



Palm plantations in West Papua were opened in the early 1980s as part of a government scheme led by a state-owned company, PT Perkebunan Nusantara (PTPN) II. Under the Perkebunan Inti Rakyat (PIR) system – or Nucleus-Plasma system – private plantation companies were to establish operations (known as 'inti' or Nucleus), where they open lands and plant palm trees for smallholder farmers (known as plasma) to manage and supervise once the palm trees have matured. The total area of palm plantations is roughly around 23,000 hectares in three sub-districts: Warmare, Masni, and Prafi. However, since the plantations were established in the 1980s, there have not been any visible efforts for replantation, leaving smallholder farmers with palms that have grown past the productive years and diminished earning streams.

Current palm oil farming practices in the Prafi plains of Manokwari is largely non-existent. The palms have mostly grown past their productive age with many of them producing very little or no fruits at all. This condition has led farmers to abandon their palm trees since they are no longer profitable. Thus, most of the palm trees that exist in the Prafi plains are left as idle assets. Farmers with productive trees usually rent out their land for a monthly fee to those interested in harvesting and keeping the produce (usually migrant workers with the knowledge to harvest palm fruits).

FARMER INCOME

Commodity	Monthly income		
Palm	Low	Med	High

Each of the smallholder farmer households in Prafi were allocated around 2 hectares of palm plots under the PIR scheme. Palm oil became one of the main source of income for farmers in Prafi, who otherwise cultivate fruits (e.g., rambutans, durians) and vegetables.

Thirty-five years since establishment, palm plantations in Prafi have never seen any replantation efforts, leaving farmers with palms that have grown past their productive age. Several farmers who were interviewed have shifted from palm oil plantations as their source of income. Palm trees that have grown past 10 meters in height and the absence of a nearby processing unit also serve as an additional factor that has caused farmers leaving the palm sector. The current practice of some farmers with still producing palm is to hire a harvester or rent out their land.

A palm farmer explaining about current condition of his plantation

KEY CHALLENGES

Most palm oil plantations in Prafi are sitting as idle resources for farmers due to low productivity and absence of an active processing unit nearby. Most farmers are unable to generate any income from their existing palm trees.

RECOMMENDATIONS

Farmers: Household-scale technology to process kernel oil or livestock feed from existing palm resources can be beneficial for farmers.

Government and NGOs: Assist farmers in procuring appropriate technology and knowledge transfer for palm processing at the household level.

KOPERNIK

FARMER INCOME: THE VALUE CHAIN

Indigenous farmers in West Papua have not invested much agricultural effort in the value chain process as most of the palm trees are currently unproductive. For farmers who were able to harvest their produce, palm fruits are sold to the middlemen at IDR 900/kg.

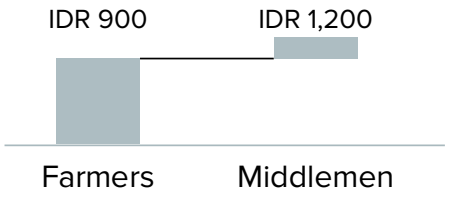
SMALLHOLDER FARMERS

OTHER STAKEHOLDERS INVOLVED IN THE VALUE CHAIN

PRE-HARVEST	HARVEST	POST-HARVEST	MIDDLEMEN	FACTORY	LARGE BUYER	PROCESSOR	WHOLE SALER	RETAILER
N/A	Hire people to collect palm fruit	N/A	Buy and collect harvested crops from farmers. Transport and sell crops to the factory.	Process palm into kernel and crude oil. Sell/export and transport to large buyers.	Supply kernel or crude palm oil to processing factories.	Process and package kernel or crude palm oil into marketable goods. Sell to wholesalers.	Distribute marketable goods to retailers in large quantity.	Sell goods to consumers.

Value added: **25%**

Price received by actors (per kg):



// WEST PAPUA / PALM

LABOR EFFICIENCY: PRE-HARVEST

HOURS OF WORK

Commodity	Pre-Harvest
Palm	2 hours/day

Palm trees that belong to farmers who started the plantation in the 1980s still exist. However, the productivity is low since most of the trees have matured past its productive age. There are no visible replantation efforts yet. At the beginning of the plantation, the private companies (nucleus) provided farming inputs and technical assistance to support farmers (plasma). In return, plasma farmers were obligated to pay as much as 30% of the total yield to the private companies.

A palm oil plantation in Prafi Plains, Manokwari district, West Papua

KEY CHALLENGES

There has been no revitalization effort to increase palm productivity.

RECOMMENDATIONS

Government and NGOs: Support farmers in revitalization effort that is environmentally responsible (i.e., RSPO).

LABOR EFFICIENCY: HARVEST

HOURS OF LABOR

Commodity	Harvest
Palm	2 hours/day

Some palm trees in Prafi, Manokwari have grown up to 10 meters in height. Indigenous farmers who are still willing to harvest the palms will typically hire harvest workers (usually a migrant worker with more knowledge and experience who approximately spend 2 hours a day in the field).

Since many plantations are no longer productive, the maximum production of the plantation is 50-80 fresh fruit bunch (FFB) with around 10-15 kg per bunch in each harvest period.

Palm oil tree in Prafi sub-district, Manokwari district, West Papua that has been overgrown by weeds

KEY CHALLENGES	RECOMMENDATIONS
There is a knowledge and tool gap for local farmers to harvest the palm trees on their own.	**Government, NGO, and farmers groups:** Consolidate training and best practices for optimal cultivation and harvest processes.

// WEST PAPUA / PALM

LABOR EFFICIENCY: POST-HARVEST

HOURS OF WORK

Commodity	Post-harvest
Palm	N/A

In the post-harvest phase, farmers only sell the harvested palm bunches to processing factories. However, these factories are located far away from where farmers live. In Prafi district, the nearest factory is about 45 km away. This is one of the reasons why farmers gain little income which has made them lose interest in the palm sector. Therefore, relying on the palm alone cannot sustain their livelihood. There is an urgency for farmers to seek alternatives in other crop cultivation to contribute to their income.

Unproductive palm plantation being cleared in Prafi sub-district, Manokwari district, West Papua

KEY CHALLENGES

Since palm fruits are no longer supplied to factories due to its low production, farmers are having difficulties to find a way to add value to existing palm fruits.

RECOMMENDATIONS

Farmers: To look into processing oil using household scale kernel oil processor. Farmers to process the palm leaf bunches into animal feed.
NGOs: To provide technical assistance, identify, and experiment with alternative technology to produce kernel oil that can be sold locally.

ENVIRONMENT CONSERVATION

Commodity	Conservation Impact				Environment conservation value
	Air	Water	Soil	Biodiversity	
Palm	Med	High	High	Med	Med

As palm oil plantations in Prafi and Warmare are no longer productive and many have been abandoned by the farmers, there have been no fertilizer usage to maintain the palm plants. While there have been talks among the government to revitalize or replant the palm plantations, there needs to be a special attention to a more environmentally responsible method of palm cultivation before beginning the replantation. One example of such methods is through the RSPO certification.

High and unproductive palm trees in Prafi sub-district, Manokwari district, West Papua

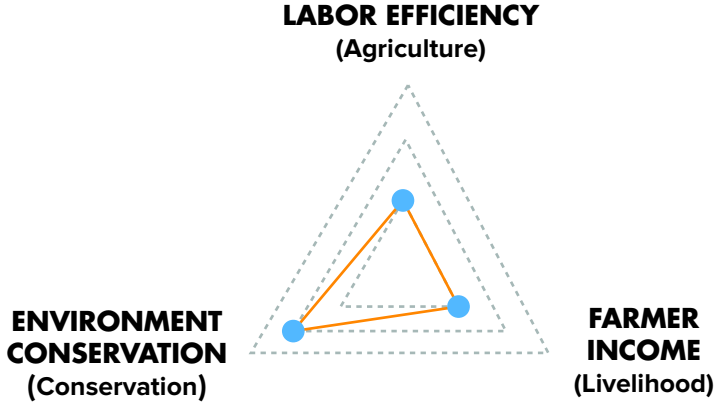
KEY CHALLENGES	RECOMMENDATIONS
Unproductive palm plantation.	**Government, NGO, and farmers groups:** Formulate a strategic revitalization method for non-productive palm oil plantation plots.

SWIDDEN RICE IN WEST PAPUA

Yield	1,779 tons
Land	680 ha
Smallholder farmers	-
Products	Rice
Varieties	Local variety

There are mainly two types of rice cultivation in West Papua: dryland and wetland. Indigenous farmers prefer to cultivate rice using a dryland paddy system, whereas migrant farmers use a wetland paddy system to grow rice. This dryland paddy cultivation method is known as the swidden method — a traditional shifting cultivation. The swidden method is commonly associated with cultural traditions is mostly applied to rice cultivation which is intercropped with sweet potato, cassava, and banana fruit (polyculture).

COMMODITY PERFORMANCE



Current swidden rice cultivation practices in West Papua gives moderate impact towards land preservation. In addition, the polyculture system also protects biodiversity. The labor efficiency and farmer income are low as swidden rice is not an intensified commodity and is mostly cultivated for farmer's own consumption.

FARMER INCOME

Commodity	Monthly income		
Swidden Rice	Low	Med	High

Swidden rice in West Papua is not treated as a cash crop. Most of the harvested rice is kept for farmers' household consumption. Only a few farmers sell rice to the local markets. As surveyed in the Prafi and Warmare plains, swidden rice is cultivated by Local Papuan households (mostly from the Arfak tribe) along with fruits and vegetables. Most – if not all – swidden rice farmers still rely on external services to mill their rice. Rice processing units are usually available through migrant farmer groups. The fee is usually paid in the form of goods, i.e., the milled rice where the miller gets to keep 10% of the milled rice.

Community rice milling facility

KEY CHALLENGES

Interviewed farmers did not raise any specific issues. However, it is observed that the availability of organic fertilizers, which can be a tool to increase yield and land fertility, remains a challenge.

RECOMMENDATIONS

Government, NGOs: Design programs for subsidized organic fertilizers and intensify training for farmers on the proper fertilizer usage.
Support farmers with simple composting technology to locally produce organic fertilizer.

KOPERNIK

FARMER INCOME: THE VALUE CHAIN

Indigenous rice farmers in Papua and West Papua see rice as subsistence or near-subsistence crop which means that most of the yield is for household consumption. Several farmers, however, do sell the produce when there is a surplus. The rice is directly sold by the farmers themselves at a local market for IDR 10,000 per kg.

SMALLHOLDER FARMERS

OTHER STAKEHOLDERS INVOLVED IN THE VALUE CHAIN

PRE-HARVEST	HARVEST	POST-HARVEST	CONSUMERS
Prepare land Clear the land	Cut rice stalks	Store the unhulled rice Bring to rice miller to mill and dehusk the rice	Buy rice directly at the local market

Value added: **N/A**

Price received by actors (per kg): IDR 10,000

Farmers

// WEST PAPUA / SWIDDEN RICE

LABOR EFFICIENCY: PRE-HARVEST

HOURS OF WORK

Commodity	Pre-harvest
Swidden Rice	8 hours/day

Swidden rice farmers usually move their plot every year. While more farmers are starting to employ herbicide as a first step in clearing the field, slash-and-burn methods are not uncommon. This method not only clears the land for agricultural purposes but also adds mineral vegetation to the soil as fertilizer. The decision to burn takes cultural contexts (e.g., humidity, temperature, wind, and other factors) into consideration. Also, reducing insect, fungi, and disease is another reason for the slash-and-burn method. Farmers usually spend 8 hours a day working in the field during the pre-harvest stage.

Swidden rice are often planted amongst other crops such as banana or cassava

KEY CHALLENGES	RECOMMENDATIONS
Farmers are still using the traditional method to prepare land for cultivation (slashing and burning).	**Government and NGOs:** Provide technical assistance for sustainable farming practices.
Dryland paddy plantations are prone to pests and wild animals such as boars that may eat the plants. There is still a knowledge gap among some farmers on how to properly maintain the plantation.	**Government and NGOs:** Provide technical assistance to maintain rice plantation.

LABOR EFFICIENCY: HARVEST

HOURS OF WORK

Commodity	Harvest
Swidden Rice	4 hours/day

Swidden rice is ready to be harvested nine months after planting. Harvesting is usually done manually using traditional tools which require farmers to work up to 4 hours a day in the field. After harvested, un-threshed rice is stored.

Typically, they cultivate the cropland for a year long and move on to the next cleared land before coming back to the same area in about four to six years.

During the harvest period, farmers rely on household members and community to share the labor. Those who help are usually paid by the harvested yield or cash.

A farmer group and government facilitators in Jayapura, Papua

KEY CHALLENGES	RECOMMENDATIONS
Most indigenous farmers still rely on hand tools which require extensive labor work due to the upland location.	**Government:** Provide access to alternative farming tools.

// WEST PAPUA / SWIDDEN RICE

LABOR EFFICIENCY: POST-HARVEST

HOURS OF WORK

Commodity	Post-harvest
Swidden Rice	2 hours/day

Not many processes are taken into account in the post-harvest phase of rice cultivation by indigenous farmers. Until the rice is ready to be consumed or sold, farmers usually store un-threshed rice. Farmers carry the rice to the available processing units within the district. To pay for threshing and milling services, usually, 10% of the milled rice is taken as payment. As a subsistence crop, rice of indigenous farmers is stored either in the farm or at home storage.

From left: rice miller for community use. A working shelter for rice and soybeans in Jayapura, Papua

KEY CHALLENGES	RECOMMENDATIONS
Limited processing unit facilities result in damaged grains.	**Government:** Increase processing units to be accessible by farmers.

ENVIRONMENT CONSERVATION

Commodity	Conservation Impact				Environment conservation value
	Air	Water	Soil	Biodiversity	
Swidden Rice	Low	Med	High	Med	Med

Interviewed farmers in Warmare and Prafi in West Papua show that environmental conservation is achieved through the absence of synthetic/chemical usage in swidden rice cultivation. The aspect of biodiversity preservation is present as several swidden rice plots involve poly-cropping methods, with some area of plots also planted with cassava or corn.

The potential risk posed by swidden farming methods is related to the slash-and-burn practice. While the decision to burn takes into consideration cultural context (e.g., humidity, temperature, wind and other factors), air pollution is a factor that should not be neglected.

Newly grown rice

KEY CHALLENGES

There is no significant challenge mentioned by the farmer. However, if slash-and-burn is not properly carried out, it might be harmful to the environment.

RECOMMENDATIONS

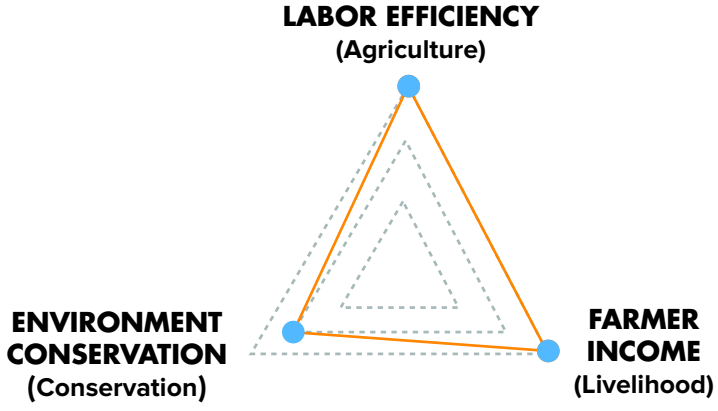
Government and NGOs: Monitor the practice of slashing and burning practiced by farmers.

SWEET POTATO IN WEST PAPUA

Yield	302,976 tons
Land	22,346 ha
Smallholder farmers	-
Products	Sweet Potato
Varieties	Salossa, Sawentar, Pattipi

Sweet potato has historically served as the primary staple food of most Papuans, especially villagers in the hill area. Sweet potato farming among smallholder farmers in Papua is generally divided into two methods: the traditional method and the *bedeng* or plot method. While both methods cultivate the crop from the stems of existing sweet potato plants, there are differences in crop maintenance and harvesting method. Sweet potato cultivated using the traditional method can be harvested more than once in one crop cycle. For smallholder farmers, the leaves of the sweet potato are also utilized as a food source.

COMMODITY PERFORMANCE



Current sweet potato farming practices in West Papua show that the environment is moderately preserved. Farmers use a sufficient amount of chemical substances to grow the sweet potato. In terms of labor efficiency, many farmers use traditional tools to harvest. Farmers generally sell their harvest in its raw form directly to the local markets. The absence of middlemen in the commodity value chain has helped farmers to earn a good and stable income.

FARMER INCOME

Commodity	Monthly income		
Sweet Potato	Low	Med	High

Farmers earn a good and stable income as some of them are able to sell raw sweet potato directly to the local market. Farmers can increase income if they produce diversified value-added products (e.g., chips, flour).

Different from most intensified food crops, sweet potato cultivation in Papua is mostly done traditionally through a system called *kuming*/cuming or selective harvest, in which the harvest is done multiple times. Only mature sweet potatoes that are larger are harvested, while the smaller produce is kept in the soil to be harvested after it has matured. Since the majority of sweet potato in Papua is sold in its raw form, there are limited options for farmers to add value to the produce. This is also due to the knowledge gap for sweet potato post-harvest processing.

A sweet potato farmer in his field in Arso, Keerom, Papua

KEY CHALLENGES

Farmers have limited knowledge to diversify sweet potato derived product.

RECOMMENDATIONS

Government and NGOs: Support by providing business development training.

KOPERNIK

FARMER INCOME: THE VALUE CHAIN

Sweet potato is a commonly cultivated crop for local farmers and is commonly seen in almost all markets. Sweet potato and its leaves are also purposed for farmers' consumption. While farmers have the option to sell directly at markets for IDR 10,000 per kg, the presence of large buyers is still important to some farmers as assured buyers for sweet potato.

Value added: **223%**

Price received by actors (per kg):

// WEST PAPUA / SWEET POTATO

LABOR EFFICIENCY: PRE-HARVEST

HOURS OF WORK

Commodity	Pre-harvest
Sweet Potato	4 hours/day

Sweet potato farming activities in Papua are mostly done by women. Clearing and tilling the land are mainly done by the males of a farming household using only traditional tools such as scopes, machetes, and forks. These activities can take up to 4 hours a day in the field.

Male farmers typically pile up ground beds of soil known as *bedeng*. In 200 meter square land, they usually have two *bedeng*, with 3 x 20 meter in size each. This cultivation method is known as Hipere wen.

Herbicide usage is commonly used during the initial stage of land preparation to clear out the weeds and wild grass. In rural areas, sweet potato is planted alongside other crops, e.g., banana, cassava, or even dry paddy in the hill.

A smallholder farmer shows his sweet potato farm in Arso, Keerom, Papua

KEY CHALLENGES

The production of sweet potato has not been optimum due to the use of traditional method.

RECOMMENDATIONS

Government, NGOs: Introduce the importance of proper farming techniques.

LABOR EFFICIENCY: HARVEST

HOURS OF WORK

Commodity	Harvest
Sweet Potato	3 hours/day

Generally, harvesting is done by women, which involves working in the field for up to three hours a day. They use crowbars or wood to search for mature sweet potato in the *bedeng*. Once located, farmers take out the mature ones and leave the young crops for the next harvest. This ensures that farmers household have sufficient food reserve to sustain daily consumption.

An untreated sweet potato farm in Arso, Keerom, Papua

KEY CHALLENGES

Currently, farmers keep the crops in the soil as storage. This exposes farmers to the risk of crop failure due to heavy rain.

RECOMMENDATIONS

Farmers: Simple, affordable storage technology can assist farmers to reduce the risk of crop failure.

// WEST PAPUA / SWEET POTATO

LABOR EFFICIENCY: POST-HARVEST

HOURS OF WORK

Commodity	Post-harvest
Sweet Potato	1 hour/day

Farmers have not yet applied any advanced post-harvest processing. Post-harvest activities that are commonly done is in the form of washing, simple storing, sorting, packaging in gunny sacks, and selling. Simple storing refers to keeping the crops in the house with no specific space (e.g., placed on the floor, in the kitchen). Prior to selling, sweet potatoes are usually washed and sorted.

Example of direct selling to consumers. Sweet potatoes are sold in piles/bunches

KEY CHALLENGES

Minimal or no knowledge of sweet potato post-harvest processing among smallholder farmers.

RECOMMENDATIONS

Government and NGOs: Support farmers by providing business development training.

ENVIRONMENT CONSERVATION

Commodity	Conservation Impact				Environment conservation value
	Air	Water	Soil	Biodiversity	
Sweet Potato	High	Med	Med	Med	Med

Farmers we interviewed show environment conservation is achieved through the minimal use of chemical fertilizers and pesticides in sweet potato cultivation. The only potential risk is the use of herbicide during initial land clearing, before planting. However, the risk of herbicide usage is minimal since it is only sparsely used. Nevertheless, Farmers need to be aware so that water sources are not contaminated. Biodiversity preservation is also in good terms, as sweet potato plantations are often poly-cropped with cassava or banana trees.

Visiting sweet potato farm

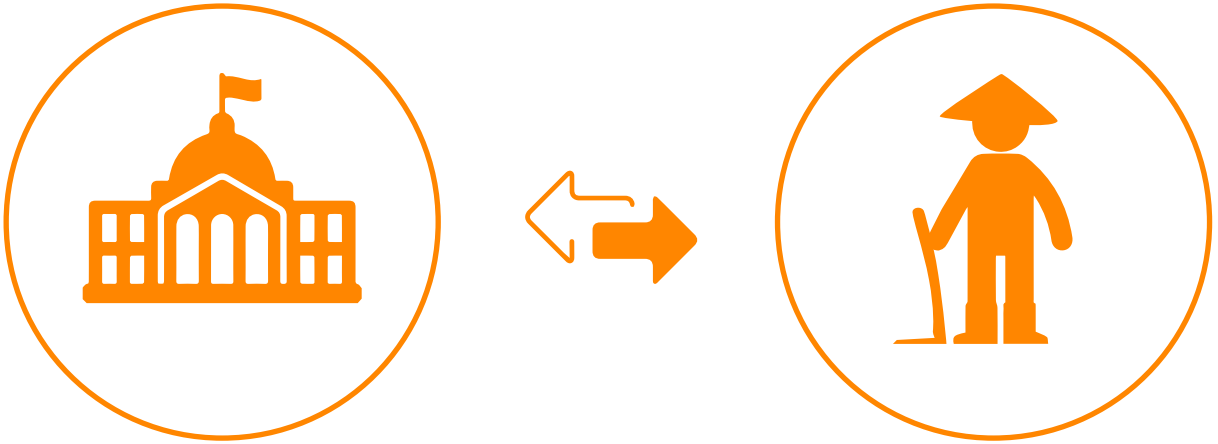
KEY CHALLENGES

While there was no immediate challenge, farmer's knowledge of organic fertilizer, which can potentially increase yield, has been observed to be limited.

RECOMMENDATIONS

Government, NGOs: Design programs and provide training for farmers on subsidized organic fertilizers.

Farmer groups: Apply simple composting method to produce organic fertilizers locally.



The Indonesian government has been working closely with farmers towards sustainable crop production and improving farmers' livelihood to reduce rural poverty. Many farmers are now supported with agricultural machinery, subsidized agricultural inputs, and on-field trainers. However, **there are inconsistencies between the support provided by the government with the actual needs of farmers**. Therefore, it is critical to improve communication between farmers and related government agency to plan and map out the needs of farmers to maximize crop productivity.

WEST KALIMANTAN

DEMOGRAPHIC OVERVIEW
PALM
RUBBER
RICE
COCONUT

// WEST KALIMANTAN / DEMOGRAPHIC OVERVIEW

Located on Borneo island, West Kalimantan comprises 12 districts and two cities, with Kota Pontianak as the capital city. With a population of 4.8 million inhabitants, 50% of the population live in the coastal areas. As the dominant employment sector, agriculture absorbs 1.1 million workers of the total labor force. The unemployment rate reaches 4.2%, with approximately 100 thousand inhabitants who are unemployed. The province's GRP per capita is IDR 28 million where the agricultural & plantation sector is the main contributor. In 2017, the province's poverty rate is 7.9%, slightly better than the national rate of 10.1%.

Source: Badan Pusat Statistik Provinsi Kalimantan Barat, 2017

Table 8. Sanitation and Environment

SANITATION & ENVIRONMENT	PROVINCIAL RATE (%)	NATIONAL AVERAGE (%)
Access to clean water*	41.6	66.7
Cooking with firewood	29.4	29.7
Access to basic sanitation	45.0	61.1
Environmental index (0-100)	84.5 (Satisfactory)	Satisfactory

*Sources of clean water consist of tap water, distributed tap water, drilled well, protected dug well, protected spring water that is used for household purposes.

ACCESS TO SANITATION AND ENVIRONMENTAL PRACTICES:

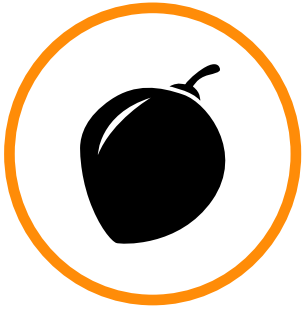
- Almost half of the population have access to clean water. The provincial rate is at 41.6% which still requires improvement.
- Accessible sanitation facilities in each household is 44.97%, still below the national average at 61.1%.
- The people still use firewood to cook which poses risk to the environment and health.
- Despite forest fires that often occur, the environmental index (the quality of air, water, and forest) for West Kalimantan is at a satisfactory level.

COMMODITIES

PALM

RUBBER

RICE



COCONUT

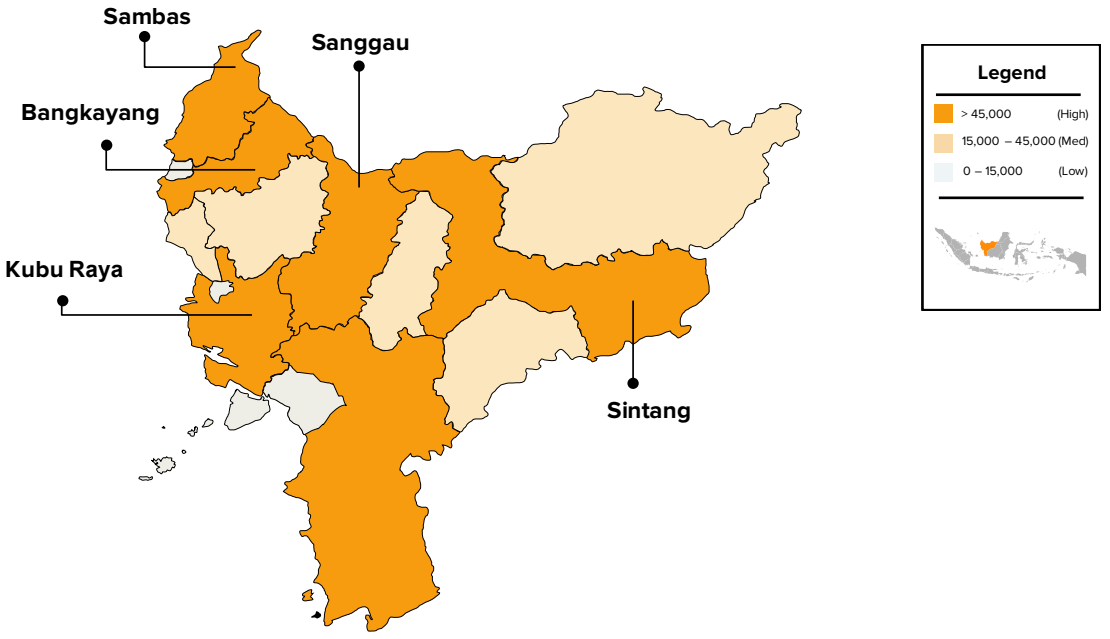
DISTRIBUTION OF SMALLHOLDER FARMERS

Smallholder plantation farmers are mostly concentrated in Sanggau district (116,829 farmers) which is dominated by rubber plantation.

Distribution of Smallholder Farmers in West Kalimantan (2016)

# of farmer

District	Number of smallholder farmers HH	Ratio of farmers HH/ total HH
Sanggau	116,829	26%
Sambas	75,426	14%
Sintang	69,256	17%
Bengkayang	55,103	15%
Ketapang	53,732	11%
Kubu Raya	47,643	9%
Landak	37,634	11%
Kapuas Hulu	34,156	14%
Sekadau	33,145	17%
Mempawah	29,318	12%
Melawi	22,314	11%
Kayong Utara	11,876	11%
Kota Singkawang	9,982	5%
Kota Pontianak	0	0%

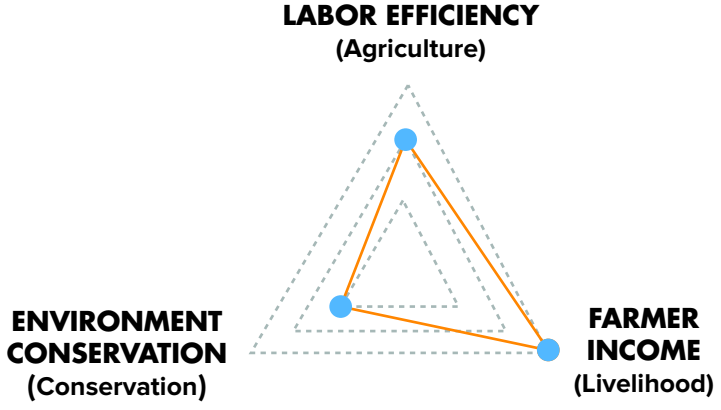


PALM IN WEST KALIMANTAN

Yield	2,106,869 tons
Land	1,478,133 ha
Smallholder farmers	127,463 farmers
Products	Palm kernel
Varieties	-

Known for its controversial palm sector industries, West Kalimantan is one of the provinces in Indonesia with the largest area of palm plantation. The monoculture nature of the industry has impacted the soil nutrients, groundwater pollution, and most of all loss of biodiversity due to the intensive deforestation activity for land expansion.
Smallholder farmers also plant palm trees in smaller land plots. Aside from managing farms individually, there are smallholder farmers who manage their palm plantations in partnership with palm companies under plasma model. In this model, the lands are owned by farmers but managed by companies. There are also cooperatives of smallholder farmers who own and manage their palm plantation together.

COMMODITY PERFORMANCE



The current farming practice of palm by smallholders in West Kalimantan shows that environment is poorly preserved. Farmers burn land to start a palm plantation – a common practice that heavily impacts biodiversity loss. The monoculture nature of palm plantation requires high use of fertilizers and pesticides which negatively affects soil and groundwater. In terms of labor efficiency, farmers rely on manual labor with limited machineries involved. Despite of this, palm has higher value and more price stability in the current market compare to other plantation crops.

FARMER INCOME

Commodity	Monthly income		
Palm	Low	Med	**High**

The income of palm farmers is relatively high since there is a competitive demand for the crop in the market. Since the rise of the global palm oil market, palm plantation becomes one of the most important commodities to the people in West Kalimantan. In recent years, independent smallholder farmers are inclined to convert their land into palm plantation because it brings economic benefits to them. The palm sector has the bigger market, greater longevity, and more stable value compare to other common commodities.

Although palm price is relatively stable, smallholder farmers face difficulties in maximizing their harvest due to the limited knowledge on modern farming and financial capacity to provide farming inputs (e.g., fertilizers and pesticides) as they are relatively expensive. The local government responds to this issue by providing training and assistance to registered farmers group.

Fresh palm fruit bunch

KEY CHALLENGES

- Lack of transportation to load and sell crops directly to the factory results in farmers being dependent on the middlemen.
- It is common practice for farmers to take loans from the middlemen, which can only be paid off by selling the harvests to the middlemen.

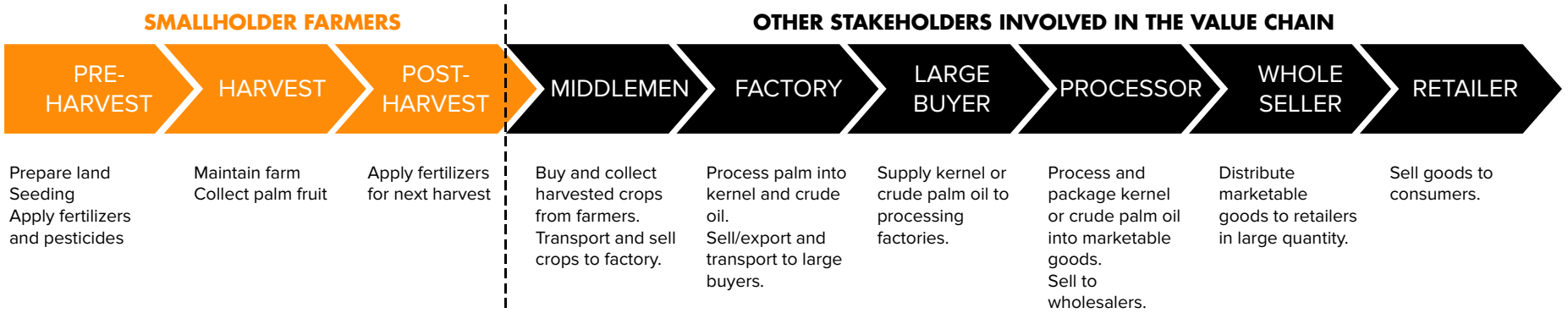
RECOMMENDATIONS

Government and NGOs: Support and assist farmers group to establish a cooperative that provides loans and pick-up services to improve farming activities.
Farmers groups: Commit to run the cooperative efficiently.

KOPERNIK

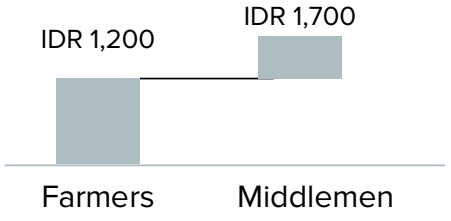
FARMER INCOME: THE VALUE CHAIN

The diagram below shows the links in the palm value chain in West Kalimantan. The middlemen buy and collect the harvested crops from farmers for IDR 1,200/kg. The middlemen then charge 20% higher to the factory to compensate for transportation cost. The price goes higher along the value chain as each player charges extra for the added value in the making process of palm-derived products.



Value added: **20%**

Price received by actors (per kg):



// WEST KALIMANTAN / PALM

LABOR EFFICIENCY: PRE-HARVEST

HOURS OF WORK

Commodity	Pre-harvest
Palm	5 hours/day

In the pre-harvest stage, farmers invest in intensive labor work as it involves land clearing, planting, regular fertilizing and weeding using simple tools. This requires farmers to work in the field approximately 5 hours a day during the pre-harvest stage. Palm requires high maintenance as it is monoculture farming. It needs to be regularly cleaned from weeds, dead branches, and protected from pests. Smallholders do not generally give the distance between one tree to the other, so they can fit more trees on the plot. This practice, unfortunately, makes pests spread faster.

A palm fruit bunch harvested in West Kalimantan

KEY CHALLENGES

Farmers are not equipped with sufficient knowledge to identify good quality seeds. Some farmers are fraud victims from buying poor quality palm seeds for the price of high-quality seeds.

Farmers tend to leave small distance between one tree to the other, which negatively affects the productivity of palm trees.

Fertilizer needs to be applied at least every three months; however, it is relatively expensive.

Farms left unmaintained are prone to plant disease and pest outbreak. However, some farmers do not regularly clean their farm as it is laborious.

RECOMMENDATIONS

Government: Support and facilitate farmers by providing adequate information regarding farming practice and farming inputs (seeds, fertilizers, pesticides), and deploy more trainers to support farmers' facilitation initiative.

Farmers: Establish a farmers group to be able to access subsidized fertilizers and other assistance from the local government, or substitute with organic fertilizers made of empty palm bunches.

LABOR EFFICIENCY: HARVEST

HOURS OF WORK

Commodity	Harvest
Palm	4 hours/day

In general, palm harvest occurs every 12 to 15 days. During this stage, the work is labor intensive which requires 4 hours a day of fieldwork. Harvesting palm consist of manually cutting down the palm bunch, picking up the oil palm loose fruit (*brondolan*) from the ground and mobilizing the harvested palm to the designated harvest collecting area. Even though some of the farmers hire workers to cut down palm bunches, some others do all the harvesting activity by themselves if the farm is less than 1 hectare. It is important to pick up all the ripe palm bunch at the right time as the condition of the palm fruit is best within 24 hours after harvesting period.

Palm fruit bunches in a collecting area

KEY CHALLENGES	RECOMMENDATIONS
Farmers often experience crop failure due to flooding, especially during rainy season. Overflowing water in the palm plantation causes the palm fruit to rot.	**NGOs, private palm company, farmers groups:** Foster and facilitate knowledge and technology transfer among stakeholder/parties.
Farmers have not maximized their harvest due to the traditional tools used.	**Government, NGOs and farmers group:** Assist farmers to identify and innovate alternative harvesting technique/tool that is less laborious and affordable.
Loose fruits fallen from the bunch need to be gathered then transported altogether with the bunch to the gathering point. However, picking them up one by one from the ground is very time-consuming and laborious.	

// WEST KALIMANTAN / PALM

LABOR EFFICIENCY: POST-HARVEST

HOURS OF WORK

Commodity	Post-harvest
Palm	3 hours/day

In the post-harvest stage, farmers are less involved in laborious work since crops are picked up directly by collectors.

The harvested fruits, or known as *Tandan Buah Segar* (TBS) (Fresh Fruit Bunch), are ready to be sold and processed. Each month, the local standard price of TBS is determined by a forum consist of local government, farmers representative, and company representatives. Since there are many middlemen and factories around West Kalimantan in the past few years, farmers believe that price monopoly rarely happens as the competition in the market is quite high. Some farmers have their harvest collected and purchased by the middlemen, while others with bigger plots of land may choose to sell directly to factories, especially when they have the mode of transportation.

Fresh fruit bunch being loaded on trucks to be dropped at the factory

KEY CHALLENGES

During peak harvesting time, or when the palm fruits supply is higher than the demand, some of the factories reject farmers who come with their palm fruits (who have been queueing for days with a truckload of harvest in front of the factory).

RECOMMENDATIONS

Factories and farmers: Establish a trading contract or a signed agreement that specifies the required amount of palm needs to be supplied by the farmers to the factories.

Government and NGOs: Facilitate the communication between factories and farmers and monitor the signed agreement.

ENVIRONMENT CONSERVATION

Commodity	Conservation Impact				Environment conservation value
	Air	Water	Soil	Biodiversity	
Palm	Low	Low	Low	Low	Low

As the palm sector is promising and becomes the livelihood to many farmers, a balance between environmental friendly practice and economic benefit need to be practiced. The current farming practice of palm by smallholder farmers in West Kalimantan shows that land is poorly preserved. From burning lands that heavily impacts biodiversity loss, to the intensive use of fertilizers and pesticides which negatively affects soil and groundwater. One initiative to protect the forest, slowing down the deforestation rate while maintaining the palm oil plantation is by enforcing certification. RSPO for instance, is a not-for-profit that gathers palm-related stakeholders including smallholder farmers, to develop and implement global standards for sustainable palm oil. Up until June 2017, in Indonesia, more than 110,000 farmers have been certified with plantation area of 190,064 hectares.

Palm factory waste management field

KEY CHALLENGES

The farmers we interviewed are not well informed about the certification, its significance, and process.

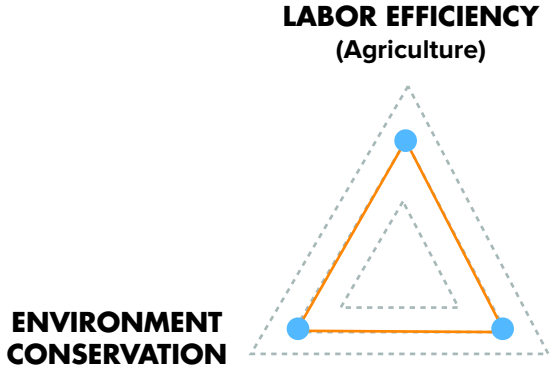
RECOMMENDATIONS

Government and NGOs:
Raise awareness and provide understanding regarding the importance of having the plantation certified to farmers.
Ensure palm companies are members of the certifying body (e.g., RSPO) and abide by all of its requirements.
Facilitate partnership between farmers and palm companies.

RUBBER IN WEST KALIMANTAN

Yield	261,717 tons
Land	599,167 ha
Smallholder farmers	320,339 farmers
Products	Liquid latex in lumps or rubber sheet
Varieties	-

COMMODITY PERFORMANCE



Rubber is one of the commodities in Indonesia with the highest export value. Indonesia is the second biggest natural rubber producer in the world after Thailand. Its socio-economic value is considered high since majority of rubber plantation in Indonesia is owned by smallholder farmers (Gapkindo, 2017). Rubber has been planted in Sumatra and Kalimantan since over five decades ago. Rubber is sold in the form of locally processed natural rubber or known in local term as *bahan olahan karet rakyat (bokar)*. Unfortunately, the global price of rubber has experienced a sharp decrease in recent years, which directly affects smallholder farmers, and not to mention the involvement of middlemen in the trading process where more so often exacerbates the price received by farmers.

The current farming practice of rubber by smallholders in West Kalimantan shows that land is moderately preserved. Farmers plant other vegetation in between rubber trees, and apply a modest amount of fertilizers and pesticides. The labor efficiency is rather moderate as farmers spend approximately 3 hours every 3 days in the farm to tap rubber. The farmers' income is relatively unstable since farmers have limited information about the current price and low rubber quality produced by farmers.

FARMER INCOME

Commodity	Monthly income		
Rubber	Low	**Med**	High

The price of rubber has not been stable since its peak in the global market a decade ago. During its peak in 2005/2006, a kilogram of natural rubber lump harvested by local farmers was valued at IDR 30,000. Currently, farmers receive no more than IDR 8,000/kg of rubber lumps. Local farmers who see the little prospect in farming rubber are starting to convert their land into palm plantation, a commodity with a higher value market. Poor rubber quality is also a contributing factor to the low price. This is due to the farmers' poor practice of mixing the liquid with water, pebbles, and soil before leaving it to coagulate into rubber lumps to increase weight. The middlemen are aware of this practice which made them charge a low price for the contaminated rubber lumps. This common practice encourages the middlemen to apply the same price for uncontaminated rubbers.

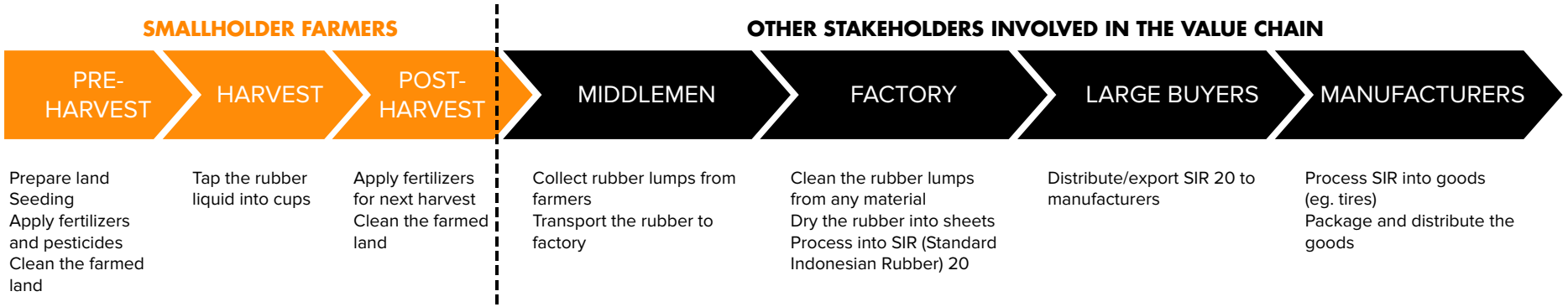
Natural rubber lumps are weighed down in a collecting site

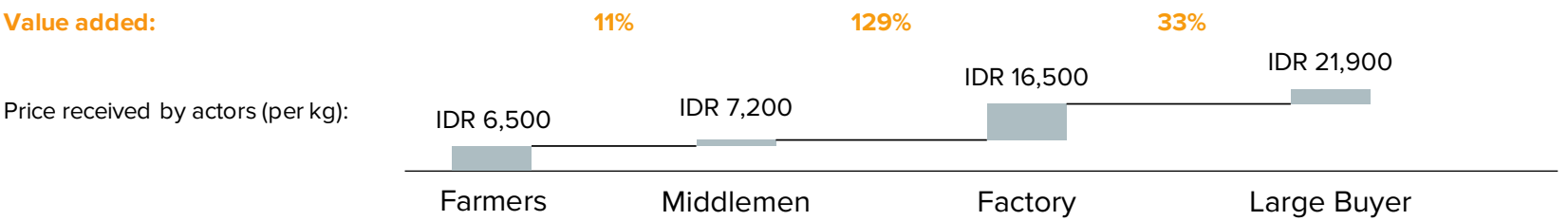
KEY CHALLENGES	RECOMMENDATIONS
Low rubber price in the market affects farmer income.	**Local government:** Enforce the regulation on rubber price to reach a fair price received by farmers.
It is common practice for farmers to take loans from the middlemen, which can only be paid off by selling the harvests to the middlemen.	**Local government, NGOs:** Support and assist farmers group to establish a cooperative that provides loans (micro-finance services) to improve farming activities. **Farmers groups.** Commit to run the cooperative efficiently.

KOPERNIK

FARMER INCOME: THE VALUE CHAIN

The diagram below shows how the value of rubber is added at each link from smallholder farmers to manufacturers. Middlemen charge 11% higher to the factory from the price they paid to farmers. The factory adds value by processing the rubber and charges 129% higher to large buyers. The same principle applies to the next chain in line, where the price is charged higher for the value added to processing the rubber.





// WEST KALIMANTAN / RUBBER

LABOR EFFICIENCY: PRE-HARVEST

HOURS OF WORK

Commodity	Pre-harvest
Rubber	4 hours/day

There are two types of rubber seeds that the local farmers grow: local seeds and prime seeds. Local seeds are preferable because they are more durable and immune to fungal diseases.
In the pre-harvest stage, farmers work around 4 hours a day in the field as it involves seeding, planting and maintaining the farm. Most farmers we interviewed apply the traditional method of planting, where there is no required distance between trees.
Now, many farmers receive training from the agricultural department on sustainable farming methods. However, farmers do wish to receive more regular training and continued monitoring.

A smallholder farmer's rubber plantation in Sanggau, West Kalimantan

KEY CHALLENGES

Farmers have limited knowledge of pest management. Without proper treatment, rubber trees are easily exposed to diseases. One of them is *Jamur Akar Putih* (JAP), a fungal disease which farmers admit not to have the solution at the moment.

RECOMMENDATIONS

Government and NGOs: Provide support to farmers in the form of training on pest management.

LABOR EFFICIENCY: HARVEST

HOURS OF WORK

Commodity	Harvest
Rubber	3 hours/day

Rubber is usually harvested every three days, depending on the weather. During harvest, farmers spend time in the field up to 3 hours a day. The rubber trees should be given a day or two to gather the liquid before being tapped again. Farmers harvest the latex by making a diagonal incision in the tree and putting a small plastic cup or a coconut shell on the tree bark. It is left to coagulate for three to seven days. Afterwards, farmers can choose to sell it right away in the form of lumps or process it into rubber sheets. Farmers maintain their farm by applying fertilizers and pesticides, however modestly due to the high price.

Harvested rubber

KEY CHALLENGES

Weather is a determining factor for the success of rubber harvesting. If it rains, it will spoil the collected fluids. If it rains heavily, it will wash away the entire harvest. This would heavily affect farmers' earnings especially for those who rely on the plantation as their primary source of income.

RECOMMENDATIONS

NGOs and farmers: Assist farmers to identify and experiment with simple yet innovative technology ideas to address the weather issue. Also, strengthen farmers' financial capacity by farming commodities on demand as an alternative income source.

// WEST KALIMANTAN / RUBBER

LABOR EFFICIENCY: POST-HARVEST

HOURS OF WORK

Commodity	Post-harvest
Rubber	5 hours/day

Farmers invest most of their labor during post-harvest where it requires them to work on average 5 hours a day. The rubber lumps are collected from the shells, carried back to their homes, washed, and dried. Technically, dry and clean lumps have a higher value than wet lumps. However, farmers tend to sell the rubber lumps to the middlemen before reaching the sufficient dryness level to earn immediate income. Rubber sheets*, which is now produced only by a few farmers, is a value-added product that can be sold at a higher price than rubber lumps (IDR 1,000-2,000 difference, per kilogram). However, farmers prefer producing rubber lumps since the process of making them require less time and effort compared to producing rubber sheets.

*Rubber sheets are semi-processed product; cleaned and dried, leaving low moisture level, and ready to be processed again in rubber processing factories as commercial latex.

Rubber lumps at a collector's pool

KEY CHALLENGES	RECOMMENDATIONS
Farmers lack the means of transportation to carry their harvest to collector's pool. They rely on the middlemen to collect and buy the natural rubber.	**NGOs and farmers:** Encourage farmers to create a community initiative to have communal trucks for pick-up and drop-off service as community assets. Support farmers with access to market information and foster a two-way relationship between farmers and middlemen.
Farmers lack the information about the price dynamics in the market. They rely on the information given by the middlemen.	
Poor natural rubber processing practice by farmers (mixing rubber liquid with water, pebbles and soil to increase weight) has exacerbated the rubber price.	**Government, NGOs:** Raise awareness and provide understanding to farmers regarding the negativities of poor processing practice towards the price.

ENVIRONMENT CONSERVATION

Commodity	Conservation Impact				Environment conservation value
	Air	Water	Soil	Biodiversity	
Rubber	High	Med	Med	Med	Med

The current farming practice of rubber by smallholder farmers we interviewed shows that land is moderately preserved by planting other vegetation on the plot. However, more and more farmers are inclined to change the agroforestry system into a monoculture system to improve productivity. This transformation risks the loss of biodiversity. A survey conducted by World Forestry Center in four villages in Kalimantan identified 90 vegetation in agroforestry rubber plantations have benefit as medicinal plants. These plants are endangered if their habitat is changed into monoculture system. Furthermore, rubber plantation mixed with other vegetation has high capacity in carbon reserve, as much as 40% of secondary forest, thus play an important role in emission reduction.

Rubber plantation in Sanggau district, West Kalimantan

KEY CHALLENGES

Farmers have limited knowledge regarding the effects of a monoculture system on the environment.

RECOMMENDATIONS

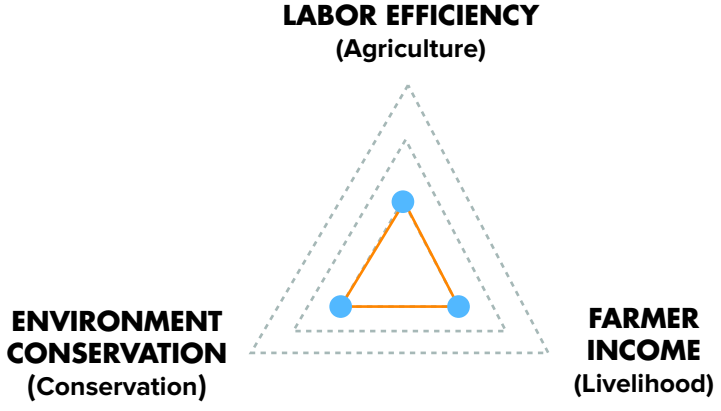
Government and NGOs: Develop a land management policy that is feasible to balance productivity while still preserving biodiversity.

RICE IN WEST KALIMANTAN

Yield	1,275,707 tons
Land	433,934 ha
Smallholder farmers	241,882 farmers
Products	Rice grains
Varieties	Local variety, prime seeds

West Kalimantan is dubbed as Indonesia's biggest 'rice barn' after Java island. Rice farmers in West Kalimantan, especially those of rural areas who practice swidden farming, store harvested grain for a year's worth of rice consumption. These harvests are not for sale as it is against the local tradition. This practice continues until now. Consequently, the government still needs to import rice from neighboring provinces to fulfill consumer demand, despite the province being the second largest rice producer in the country. To prevent this from continuing, a government-led initiative on food self-sufficiency encourages farmers to increase rice production both for self-consumption and for-profit to improve the livelihood of farmers.

COMMODITY PERFORMANCE



The current farming practice of rice by smallholders in West Kalimantan shows that land is poorly preserved. As an intensified crop, farmers routinely apply fertilizers and pesticides to maintain productivity especially rice of a prime seed variety. In terms of labor efficiency, farmers rely on manual labor and some machinery during cultivation. Rice gives a low contribution to the farmers' income since the rice harvest is mostly for self-consumption and not for sale.

FARMER INCOME

Commodity	Monthly income		
Rice	Low	Med	High

As previously mentioned, the rice commodity gives a low contribution to the farmers' income since it is mostly for self-consumption. The harvest is stored inside a barn for food reserve to be consumed in case of emergency (e.g. shortage of rice in the market).
Prior to the recent rice field plotting program by the national government, local farmers practiced (and many are still practicing) swidden farming. For the Dayak tribe, rice farming is seen as a culture and a form of effort to suffice one's household rather than an income-generating activity. Interestingly, it is common for farmers to purchase packaged rice, usually distributed from Java island, in the market for daily consumption and as they also prefer the taste and texture. For this reason, the local government has attempted to assist farmers to self-suffice with the rice they grow by subsidizing prime seed variety, similar to those farmed in Java.

Rice seedling

KEY CHALLENGES

Farmers are still reluctant to sell their crop for financial gain as it is perceived as going against the local tradition.

RECOMMENDATIONS

Government and NGOs: Develop a business plan suitable for farmers that can improve their livelihood but at the same time respecting the local tradition, for example, develop a scheme where a certain proportion of the harvest is for sale, and the rest is to be reserved.

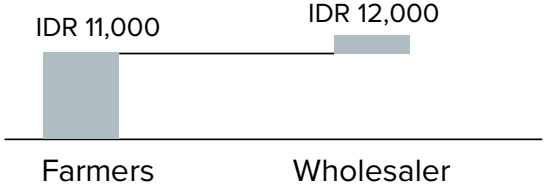
KOPERNIK

FARMER INCOME: THE VALUE CHAIN

The rice value chain in West Kalimantan has fewer stakeholders involved. The diagram below shows that farmers sell rice to wholesalers, local government (for rice reserve), and their neighbors. The wholesalers charge IDR 12,000/kg of rice when sold to the retailers in the market.

Value added: **9%**

Price received by actors (per kg):



// WEST KALIMANTAN / RICE

LABOR EFFICIENCY: PRE-HARVEST

HOURS OF WORK

Commodity	Pre-harvest
Rice	3 hours/day

Recently, farmers are introduced to a prime seed variety farmed with modern technique (Hazton, *jajar legowo*) on permanent farmland, which can be harvested up to 4 times a year – increasing yield. In the pre-harvest stage, farmers are involved in activities such as plowing, seedling, smoothing, and planting which requires them to work on average 3 hours a day. The farmers we interviewed admitted that the dry season could cause crop failure, particularly when they only rely on rainwater to nourish their paddy fields since there is no irrigation system.

Prime seed variety in rice field

KEY CHALLENGES	RECOMMENDATIONS
The government-subsidized farming inputs do not address the farmers' needs, i.e., farmers need fertilizers but given seeds instead.	**Government and farmers group:** Discuss and draft farming needs together with farmers in order to provide the appropriate farming materials.
The lack of irrigation system poses a risk to crop failure which directly affects farmers' food security and income.	**Government:** Build a sustainable irrigation system that waters the farm evenly. **NGOs:** Assist farmers to identify alternative irrigation that is appropriate to the land's topography.
Harmful pests are tough to exterminate, causing farmers to use pesticide more than required which negatively affects the crops, soil, and water.	**Government and NGOs:** Support and encourage farmers to use organic-based pesticides.

LABOR EFFICIENCY: HARVEST

HOURS OF WORK

Commodity	Harvest
Rice	6 hours/day

Farmers invest much of their manual labor (on average 6 hours a day) during harvesting as they still use traditional harvesting tools. The farmers we interviewed are members of farmers groups that regularly receive technical assistance from the local government. This includes a technical assistant that guides and monitors their farming activities, subsidized farming inputs, and machinery to improve productivity. However, farmers still prefer to use traditional tools such as *ani-ani*, a small knife, to cut each stalk which is very time consuming and requires more people to work on the farm in order to maximize harvest. Extra hires also mean further cost that farmers need to spend.

Rice fields in West Kalimantan

KEY CHALLENGES	RECOMMENDATIONS
Farmers have not maximized their harvest due to the traditional tools used.	**Government:** Actively assist and monitor the farming practice to ensure farmers apply the appropriate harvesting method using machinery suitable for farmers to maximize harvest.

// WEST KALIMANTAN / RICE

LABOR EFFICIENCY: POST-HARVEST

HOURS OF WORK

Commodity	Post-harvest
Rice	4 hours/day

In the post-harvest stage, farmers work around 4 hours a day to thresh and mill rice. Farmers we interviewed store their crops in a barn. They sell rice to neighbors and sometimes package rice in small plastic bags then sell to the nearest local market. The government encourages farmers to sell their crops to improve the economy, and at the same time to avoid importing rice from other provinces. To support this initiative, the local government purchases rice from smallholders to start the business cycle and also to reserve rice stock.

Rice storage

KEY CHALLENGES	RECOMMENDATIONS
Rice still needs to be supplied from Java to fulfill food demand.	**Government and farmers groups:** Encourage farmers to sell their crops so that the region can be self-sufficient in rice provision. Strengthen the current initiative of farmers group -local government transaction and also collaborate with other stakeholders to develop new markets with high demand.
Currently, there is no training for marketing and management of rice crops.	**Government, NGOs:** Provide post-harvest management skills in the form of regular training and monitoring.

ENVIRONMENT CONSERVATION

Commodity	Conservation Impact				Environment conservation
	Air	Water	Soil	Biodiversity	
Rice	Med	Low	Low	Med	Low

As previously mentioned, farmers are introduced with a new variety of rice, prime seed – a government-led initiative to increase yield. Many farmers are growing this variety since the seeds, fertilizers, and pesticides are government subsidized. However, growing this type of rice requires regular application of pesticide and fertilizer that makes it fall into the low environmentally friendly spectrum. Concerns are raised related to soil saturation, pest resistance and the extinction of non-target organism. Prior to the introduction of the new variety, although low in yield and hard in texture, the local variety farmers plant is more resistant towards unpredicted weather, and pests, eliminating the needs of using fertilizer and pesticide.

Milled rice

KEY CHALLENGES

Farmers are overwhelmed with pests and are unable to control the outbreak especially rats that can cause significant crop failure.

RECOMMENDATIONS

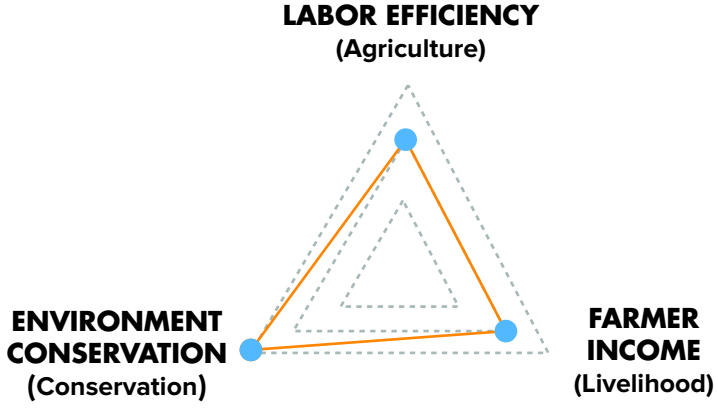
Government and NGOs: Support farmers with training on pest management and control as an early intervention.
Collaborate with agricultural research centers (e.g., universities) to identify and experiment with interventions that may solve pest-related issues faced by farmers.

COCONUT IN WEST KALIMANTAN

Yield	87,664 tons
Land	107,006 ha
Smallholder farmers	77,713 farmers
Products	Fruit, copra, husk, leaf
Varieties	Local variety, hybrid coconut

Coconut is one of the prime commodities of West Kalimantan, especially in Kubu Raya district. In 2017, coconut production reaches 87,664 tons. Coconut is considered a traditional plantation, having been grown by local people for decades. Most farmers grow coconut along with other vegetation in the plantation including areca nut trees and banana trees. Almost all parts of a coconut tree have economic value and can be processed into a variety of value-added products. The husk, for instance, is used as fuel for farmers who produce palm sugar. However, the most common products sold by smallholder farmers in West Kalimantan are raw coconuts and copra since these are the only markets that farmers have access to.

COMMODITY PERFORMANCE



The current farming practice of coconut by smallholders in West Kalimantan shows that land is well preserved. As a resilient type of plant, coconut trees do not require an intense application of fertilizer and pesticide. The labor efficiency is relatively moderate as farmers depend on manual labor especially during harvesting which is time-consuming. Coconut gives a modest contribution to the farmers' income since farmers sell them to the middlemen who charge their product at a low price. Moreover, farmers tend to sell the unprocessed product such as raw coconuts, which have less added value in the market.

// WEST KALIMANTAN / COCONUT

FARMER INCOME

Commodity	Monthly income		
Coconut	Low	**Med**	High

In West Kalimantan, coconut is a traditional commodity where the land plots are mostly owned and managed by smallholders. There are villages where coconut farming is the main source of livelihood.

As previously mentioned, the income of coconut farmers in West Kalimantan is relatively moderate. Since coconuts are sold in the form of unprocessed fruits, there is not much potential value that the farmers could add into their harvest. Although other parts of the trees such as the leaves, sap, and husks can be processed as value-added products, farmers do not have access to the right market.

Similar to rubber and palm, coconut farmers often take loans from the middlemen where loans are paid off by selling their harvest to the middlemen. In the coconut value chain, farmers who do not own means of transportation find it easier to sell their harvest to the middlemen as they come to pick-up and buy the coconuts on site.

Coconut tree seedlings

KEY CHALLENGES

Farmers lack access, knowledge, and entrepreneurial skills to maximize the economic value of their harvest.

RECOMMENDATIONS

Government and NGOs: Provide training support on entrepreneurial skills. Assist farmers in developing a feasible business module/plan, and monitor their activities.

Farmers: Commit to following the training and in conducting the business plan.

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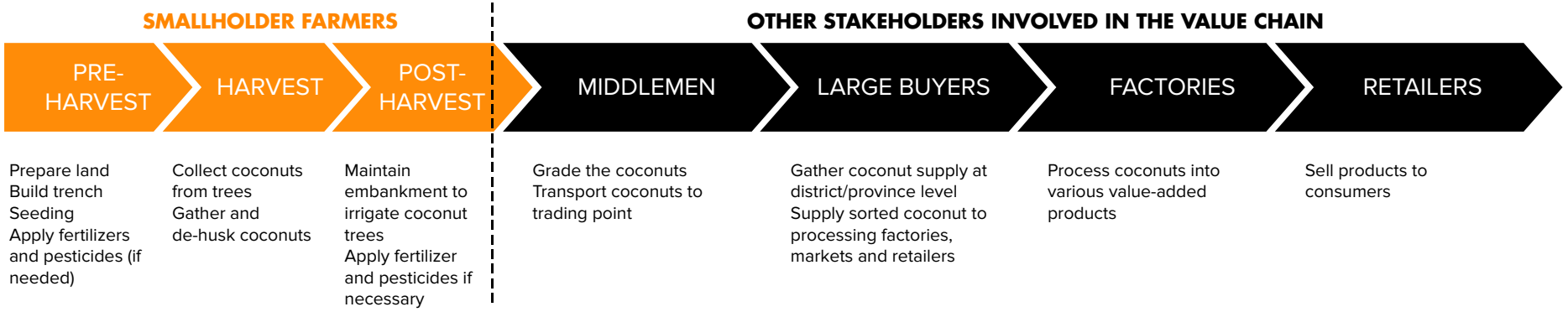
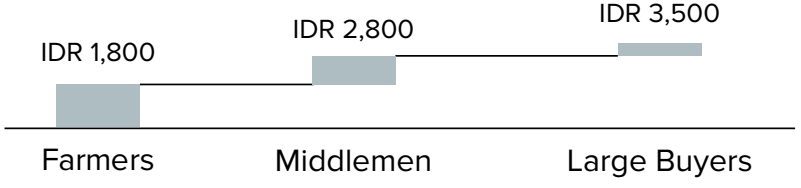
FARMER INCOME: THE VALUE CHAIN

The value chain below shows that raw coconut is sold by farmers to the middlemen at IDR 1,800/kg. More so than often, the middlemen purchase coconuts at the same price however per unit, which decreases farmers' income since one coconut can weigh more than one kilogram.



Value added: 56% 25%

Price received by actors (per kg):



// WEST KALIMANTAN / COCONUT

LABOR EFFICIENCY: PRE-HARVEST

HOURS OF WORK

Commodity	Pre-harvest
Coconut	5 hours/day

In general, farmers spend a moderate amount of work and time on the farm to build a trench, seedling, and plant coconuts. This requires farmers to work around 5 hours a day during pre-harvest. It takes approximately 4-8 years for coconut trees to bear fruits and ready to harvest, depending on the type of seeds, soil condition, and farm maintenance.

The farmers we interviewed plant local and hybrid coconut variety. The hybrid variety is a premier type usually subsidized by the government to increase productivity. To ensure the water source required for growing the trees is sufficient, farmers dig the trench along the field to irrigate the trees.

Coconut plantation

KEY CHALLENGES	RECOMMENDATIONS
Subsidized coconut seed is not compatible with local soil condition.	**Government:** Conduct thorough research regarding the topography of the targeted area involving farmers' input, before commencing the subsidy program.
Farmers do not have deep trenches because digging the trench with good depth is labor-intensive, especially if the farm area is large.	**Government:** Support farmers with agricultural machinery to effectively build deeper trenches.
Unpredictable weather causes the pistil of the coconut to come off early, reducing coconut yield.	**NGO and farmers groups:** Collaborate with agricultural research centers (e.g., universities) to identify and experiment with interventions that may solve weather-related issues.
Farmers have little knowledge of how to increase coconut productivity.	**Government:** Support farmers by allocating more agricultural trainers to guide them in maximizing coconut productivity.

LABOR EFFICIENCY: HARVEST

HOURS OF WORK

Commodity	Harvest
Coconut	5 hours/day

During harvesting, farmers work up to 5 hours a day as coconut picking is done manually. Coconuts are harvested 3 to 4 times a year. Farmers yield approximately 2,000 units/ha from each harvest.

Farmers still use traditional tools to harvest – a machete and a sickle. They carve nooks in the tree bark to be used as stepping areas when climbing the tree. When farmers are on top of the tree, they cut the bunch of coconuts and throw it to the ground. The climbing activity is generally done by male farmers or hired workers, whereas female household members are responsible for gathering the harvest into a pile.

A farmer cutting open young coconut

KEY CHALLENGES	RECOMMENDATIONS
Harvesting coconut is laborious and time-consuming. Some farmers cannot maximize their harvest since they cannot afford to hire extra workers.	**Government, NGOs and farmers groups:** Assist farmers to identify and experiment alternative harvesting techniques that are less laborious and affordable.
Farmers are prone to injury during the harvesting process.	**Government, NGOs and farmers groups:** Raise awareness regarding the importance of safety at work, and provide safety equipment such as helmets, pads, gloves, and ropes.

// WEST KALIMANTAN / COCONUT

LABOR EFFICIENCY: POST-HARVEST

HOURS OF WORK

Commodity	Post-harvest
Coconut	2 hours/day

In the post-harvest stage, farmers usually process coconuts into copra or sell them as raw coconuts which do not require heavy labor work (2 hours a day).
Coconuts that are poor in quality are dried and sold in the form of copra. As previously mentioned, farmers sell directly to middlemen where they come to pick up the products at the plantation using trucks.
Aside from copra and raw coconuts, the husks and the leaves are also sold to be processed into household crafts. However, there is no stable market for these products, which is why farmers focus on selling coconuts and copra only.

Halved coconuts being dried into copra

KEY CHALLENGES	RECOMMENDATIONS
Farmers lack access to market information. They depend on the information given by the middlemen.	**NGOs and farmers groups:** Assist farmers on ways to better access market information especially the market demands of other value-added products. Foster a two-way relationship between farmers and middlemen.
Many farmers are still tied to debt with the middlemen. This requires farmers to only sell their harvest to the middlemen to pay off their debt.	**Government, NGOs and farmers groups:** Help farmers to access alternative micro-finance institution. Establish a farmers' cooperative that provides loan and savings services.

ENVIRONMENT CONSERVATION

Commodity	Conservation Impact				Environment conservation value
	Air	Water	Soil	Biodiversity	
Coconut	Med	High	High	High	High

Coconut in West Kalimantan is considered as an environment-friendly plantation. This is because most farmers are not using intensive chemical substances. Trees are left to grow naturally. The organic way still gives satisfactory yield; thus this practice continues. Additionally, land burning is also minimal as this plant is easy to grow without disrupting the surrounding environment.

However, for post-harvest processing, farmers usually leave coconut husks piling up beside their houses. Farmers do not know what to do with them and burn them in the open space, hence polluting the air.

Environment surrounding coconut plantation

KEY CHALLENGES

Farmers have limited knowledge and skills on how to manage coconut waste.

RECOMMENDATIONS

NGOs: Provide farmers with technical support on how to recycle waste and make it into good use such as biomass fuel, coconut briquette, and coco peat.

The key findings provide us with a better understanding of current agricultural practices in the three provinces and their impact on farmers' livelihood and the environment. This allows us **to suggest, design and experiment potential solutions in the next step towards sustainable agriculture that is in favor of all stakeholders involved, in particular, the smallholder farmers.**

	PHASE 1: DESK-BASED RESEARCH	PHASE 2: FIELD VISIT
Description	The team conducted **desk-based research** to explore the overall **agricultural sector and livelihood** in Papua, West Papua, and West Kalimantan. The research covered the **demographic, environment, social, and economic** situation of the three provinces.	The team traveled to each area to **visit smallholder farmers, business owners, and other important actors** in the value chain of the selected commodities to identify the farmers' challenges in agricultural work.
Outcome	Gained an **in-depth understanding of the agricultural livelihood sector.** Identified and mapped common commodities cultivated by smallholder farmers, to be visited in the next phase of the research.	Obtained relevant data to better understand the activities and challenges that farmers faced in the commodity value chain, and how these affect their livelihood and the environment.

// METHODOLOGY / COMMODITY IDENTIFICATION INDEX

SELECTION CRITERIA

A number of criteria were applied in selecting commodities to ensure suitability for this research. Data on staple crops, horticulture, and plantation were collected. These datasets were narrowed down using prevalence factor listed below to produce the Commodity Identification Index (CII).

Selection criteria

Type of commodities
Staple crop
Horticulture
Plantation

Prevalence factors	Description
Social	Number of farmers
Economic	Monetary value of each commodity
Environment	Plantation

Output

Commodity Identification Index

THE FORMULA

To construct a Commodity Identification Index (CII), we integrated several indicators into a single index, on the basis of the multidimensional aspects of the commodities' impact on society, economy, and environment.

Commodity Identification Index Formula

$$CII_i = \frac{Soc_i + Eco_i + Env_i}{3}$$

Commodity Identification Index Indicators

Aspect	Variable	Weight	Variable	Calculation	Challenge
Social	Number of farmers	33%	Number of farmers	Total farmers in each commodity	Data availability on total farmers
Economics	Commodity monetary value	33%	Total yield (tonnes)	Total yield (Tonnes) * Commodity price (IDR)	Some commodities are bound to international price
			Commodity price (IDR)		
Environment	Green house conversion	33%	Farm area (ha)	Farm area (ha) * GHG Equivalent (CO_2 - eq.)	Defining green house gas equivalent on each type of commodities
			Green House Gas Equivalent (CO_2 - eq.)		

// METHODOLOGY / COMMODITY MAPPING

SELECTION CRITERIA

By using the Commodity Identification Index as a selection tool, the commodities were prioritized based on the number of smallholder farmers and top yield per commodity in each district. The mapping process generated the intended locations for our research.

Commodity Mapping Process

Commodity selection tool	Consideration point in selecting location	Output
Commodity Identification Index	Number of farmers by location Top yield by location	**Featured commodities and location**

SELECTION CRITERIA

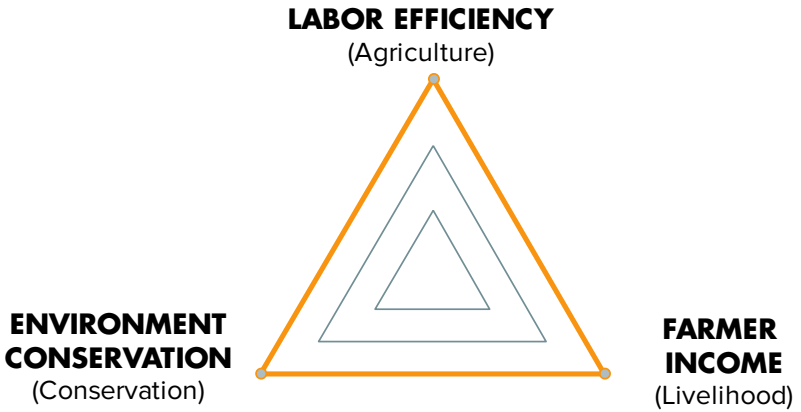
Depending on the need for field assistance in each area, we sought partnerships with local actors such as NGO, local authorities, and community organizations. After selecting possible local partners in the three provinces, we conducted an assessment based on the prevalence factor, including but not limited to: characteristics, the scale of work, and network.

Selection criteria

Prevalence factors	Description
Social	NGO, Local authorities, community organization
Economic	Village, Regency, and National coverage
Environment	Past experiences to assist foreign NGO, widespread of the local contacts

// METHODOLOGY / RESEARCH FRAMEWORK

By employing a qualitative approach, this study was based on a framework we developed drawing on Packard's initiative on agriculture, livelihood, and conservation. The parameters we used to address each of the initiatives respectively are (i) labor efficiency, (ii) farmer income, and (iii) environment conservation. The chosen commodities were analyzed based on the three parameters to identify farmers' challenges and to provide potential solutions in improving farmers' competitiveness in the value chain.



Parameters	Variable observed	Value		
		Low (1)	Medium (2)	High (3)
Labor Efficiency	The investment of manual labor in each stages of production (based on hours/day)	Labor intensive (>4.1 hours of labor/day)	Medium usage of labor (3-4.1 hours of labor/day)	Less dependent on manual labor (<3 hours of labor/day)
Farmer income	Farmers income /month/ha	< IDR 1,000,000/month/ha	IDR 1,000,000-2,000,000/month/ha	> IDR 2,000,000/month/ha
Environment conservation	• Air (land burning practice) • Soil (chemical fertilizer usage) • Water (chemical pesticide usage) • Biodiversity (variety of crops in the farm)	High practice of burning land, using chemical substances, and monoculture plantation	Moderate practice of burning land and using chemical substances, and planting more than one variety of crops	Low (no) practice of burning land using chemical substances, and planting various type of crops

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// ABOUT KOPERNIK

KOPERNIK CONDUCTS EXPERIMENTS IN ORDER TO FIND WHAT WORKS AND WHAT DOESN'T TO ADDRESS PROBLEMS FACED BY THOSE LIVING IN POVERTY. WE PLACE UTMOST IMPORTANCE ON WORKING TO ACHIEVE THE SDGS FOR, AND WITH LAST MILE COMMUNITIES.

OUR VISION

Finding what works to reduce poverty in the last mile

OUR MISSION

A world where disadvantaged people living in the last mile can realize their full potential and enjoy a dignified life, free of poverty

OUR WORK

Through rapid prototyping and experimentation, we work directly with last mile communities, and in collaboration with our partners from the development, public and private sectors to reduce poverty

Authors of this report:

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