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FINDING WHAT WORKS

PROTECTING HARVEST: RUBBER TAPPING RAIN GUARD

EXPERIMENT RESULTS

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EXECUTIVE SUMMARY

Collected latex in a coconut shell

Rubber smallholders in West Kalimantan face difficulties harvesting rubber during the wet season as rainwater can spoil, or wash away, the collected liquid latex. This has a significant impact on farmers' incomes. An affordable and simple technology is therefore needed to protect latex harvesting from rain,

In collaboration with a rubber farmer in Sanggau, West Kalimantan, we tested the efficiency of two prototype rubber tapping rain guards as a means of protecting the latex harvest during the wet season.

We compared the latex yield collected from trees with rubber rain guards, to trees without the rain guards, over a 50-day data collection period. The result showed the rain guard does indeed protect collected liquid latex from rain.

The yield from trees with the rain guards, was almost double the yield from the trees that did not have the rain guards installed.

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OVERVIEW OF THE RUBBER COMMODITY

Natural rubber is an essential raw material used for a wide variety of products; from tires to medical devices, clothes and toys. Natural rubber is derived from a liquid called latex, which is extracted from the bark of rubber trees through a tapping process. Of the several types of rubber trees the most common is *Hevea brasiliensis, a* common variety in tropical countries.

Southeast Asia contributes to around 80 percent of global rubber production[1], with Indonesia being the second largest rubber producer in the world, after Thailand. Of the total rubber production in Indonesia, 83 percent comes from smallholders.[2]

Press processed rubber sheet

[1] Gapkindo
[2] Estate Crop of Statistics Indonesia.

ABOUT THE PROJECT

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CONTEXT

Rubber is one of Indonesia's largest export commodities. According to the National Bureau of Statistics, in 2018, Indonesia exported 2.74 million tonnes of crumb rubber* with a value of US$3.83 million (IDR 53.7 billion).[3] The socio-economic value of rubber is considered high in Indonesia since the majority (84.8 percent) of rubber plantations are owned by smallholders.

West Kalimantan is the fifth largest rubber producing region in Indonesia[4] with approximately 320,000 rubber smallholders[5], many people depend on rubber cultivation for their livelihoods. According to *Gabungan Perusahaan Karet Indonesia (Gapkindo)*, 91 percent of West Kalimantan farmers' income comes from rubber cultivation. Sanggau regency, where the most production of rubber in the province, holds approximately **106,933 hectares of rubber plantations are owned by smallholders**.[6]

*Processed natural rubber used as raw material for several products such as tire, gloves, hose, etc

[3] https://databoks.katadata.co.id/datapublish/2019/10/31/berapa-luas-lahan-karet-Indonesia
[4] https://databoks.katadata.co.id/datapublish/2019/10/30/inilah-10-provinsi-penghasil-karet-di-Indonesia
[5] Statistic of Kalimantan Barat Province. Indonesia's National Bureau of Statistics, 2017
[6] Kalimantan Barat in Figures 2019, Statistics Indonesia.

CONTEXT

Smallholder rubber farmers in West Kalimantan find difficulties to harvest during rainy season

In 2018, Kopernik conducted an Unmet Needs research project in Sanggau, West Kalimantan to understand the challenges and needs of smallholder rubber farmers. We found that weather has a very high impact on the harvest yield of rubber. Rubber smallholders find it especially difficult to harvest during the rainy season, (from October to December), due to heavy rainfalls that spoil or wash away the collected latex. In this experiment, we partnered with Akhmad Tanzi, an innovative and enthusiastic smallholder in Sanggau who manages two plantations with total area of 6 hectares.

PROJECT DESIGN

Kopernik's intervention focused on the harvest stage, to protect collected latex from rainfall

	Pre-harvest	**Harvest**	Post-harvest
Steps	• Production of planting materials; • Nursery and clones; • Land preparation and planting; • Intercropping; • Mulching, shading and white washing.	• Marking tapping area; • Tapping; • Latex handling.	• Recovering tapping area; • Latex storing; • Latex processing; • Transporting to factory; • Processing to finished product.

Rubber tapping is the process of collecting latex from a rubber tree by making a diagonal incision into the bark and collecting the latex sap in a small plastic cup or a coconut shell attached to the tree trunk.

It is common practice to harvest the latex sap from a tree once every three days, and to leave the rubber to coagulate for three to seven days before removing it from the collection vessel. Rubber trees should be given a day or two to recover before being tapped again.

KEY CHALLENGE

During the rainy season, rainwater washes away the collected latex over the container.

Source: Interview with farmers

PROJECT DESIGN

Rainguard to protect latex harvest during rainy season is developed through a co-design process

Co-design process with the rubber farmer

The rainguard idea generated from our partner experiment that tested a rain guard that he made from a cotton cap and tied using a used inner tube.

Source locally available material to used in developing rain guard.

Test several design with the farmer as well as making minor adjustment.

Prototype A *Prototype B*

Two final prototypes to be tested during wet season:

- Prototype A: hood made from **transparent** PVC plastic
- Prototype B: hood made from **opaque** PVC plastic

The fastener is made from **used inner tube.**

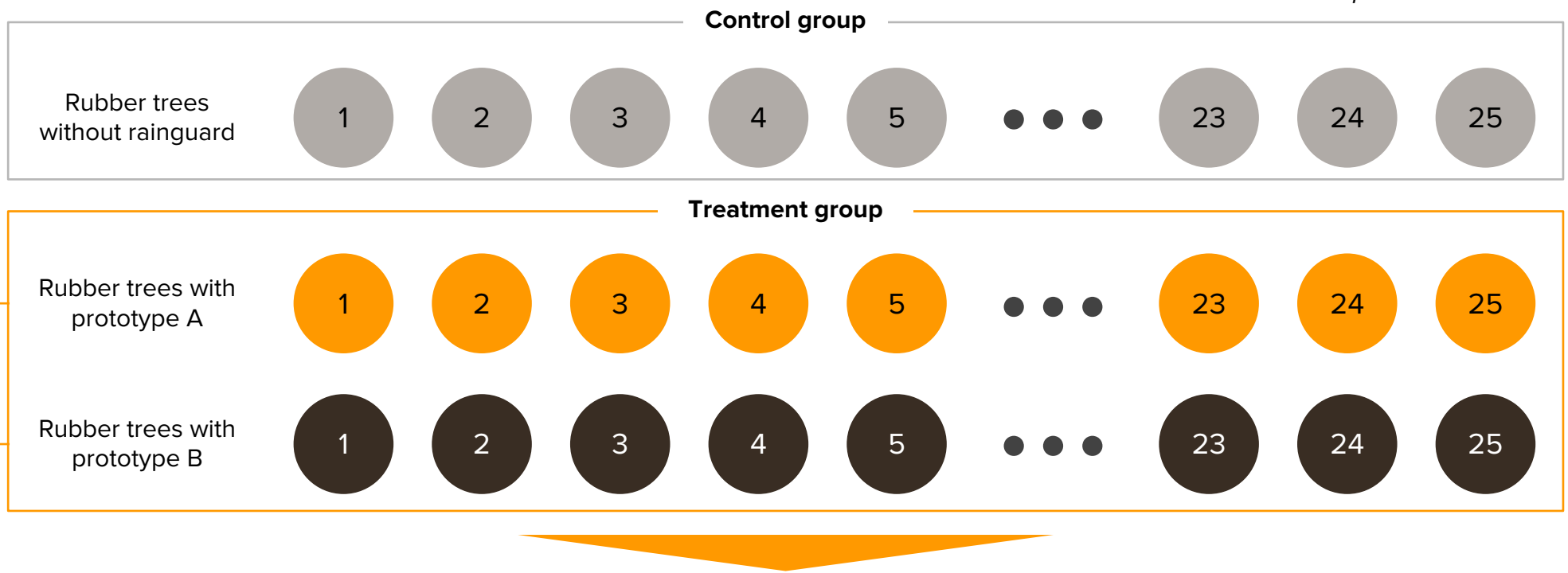
METHODOLOGY

We hypothesized that rain guards will protect latex harvest from rain and tested our hypothesis by comparing latex yield from the control and treatment groups

Prototype A

Prototype B

Illustration of plantation area



We then measured the weight of collected latex from all three groups every 10 days over a 50 day-period.

TIMELINE

The experiment was conducted from August 2019 to February 2020

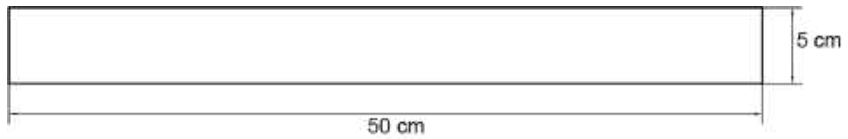
	Research and Development		Implementation		Closing
	Research	**Development**	**Construction**	**Data Collection**	**Reporting**
					
Activities	• Identify local partner; • Initial discussion with rubber farmer.	• Source locally available material; • Co-design process of rain guard.	• Create 50 rain guards; • Install rain guards.	• Collect latex and price data; • During rainy season.	• Evaluation • Data analysis • Reporting
Timeline	August - September ‘19		October ‘19 - January ‘20		January - February ‘20

THE EXPERIMENT

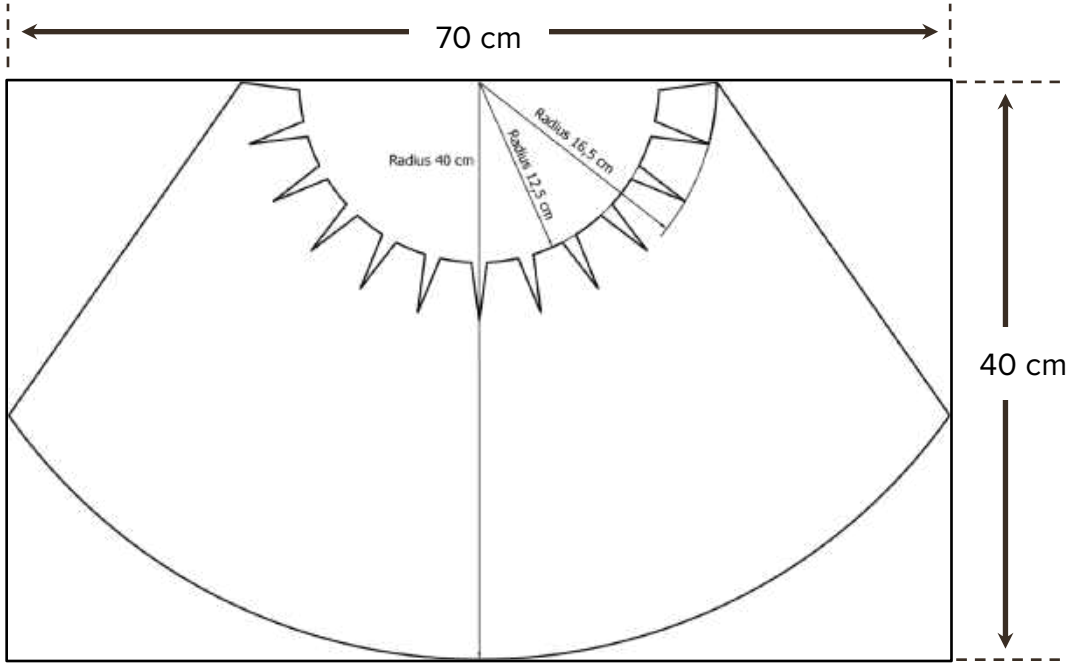
RUBBER RAIN GUARD DESIGN

PVC plastic and used inner tube are used as the main components of the rain guard

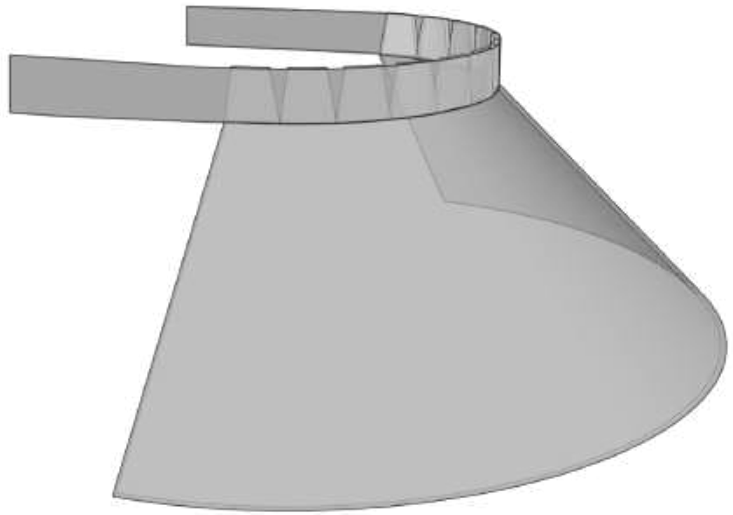
1. **Used inner tube (fastener)**



2. **PVC plastic 0.5 mm (hood)**



The top section of the hood is glued on with the fastener as shown below



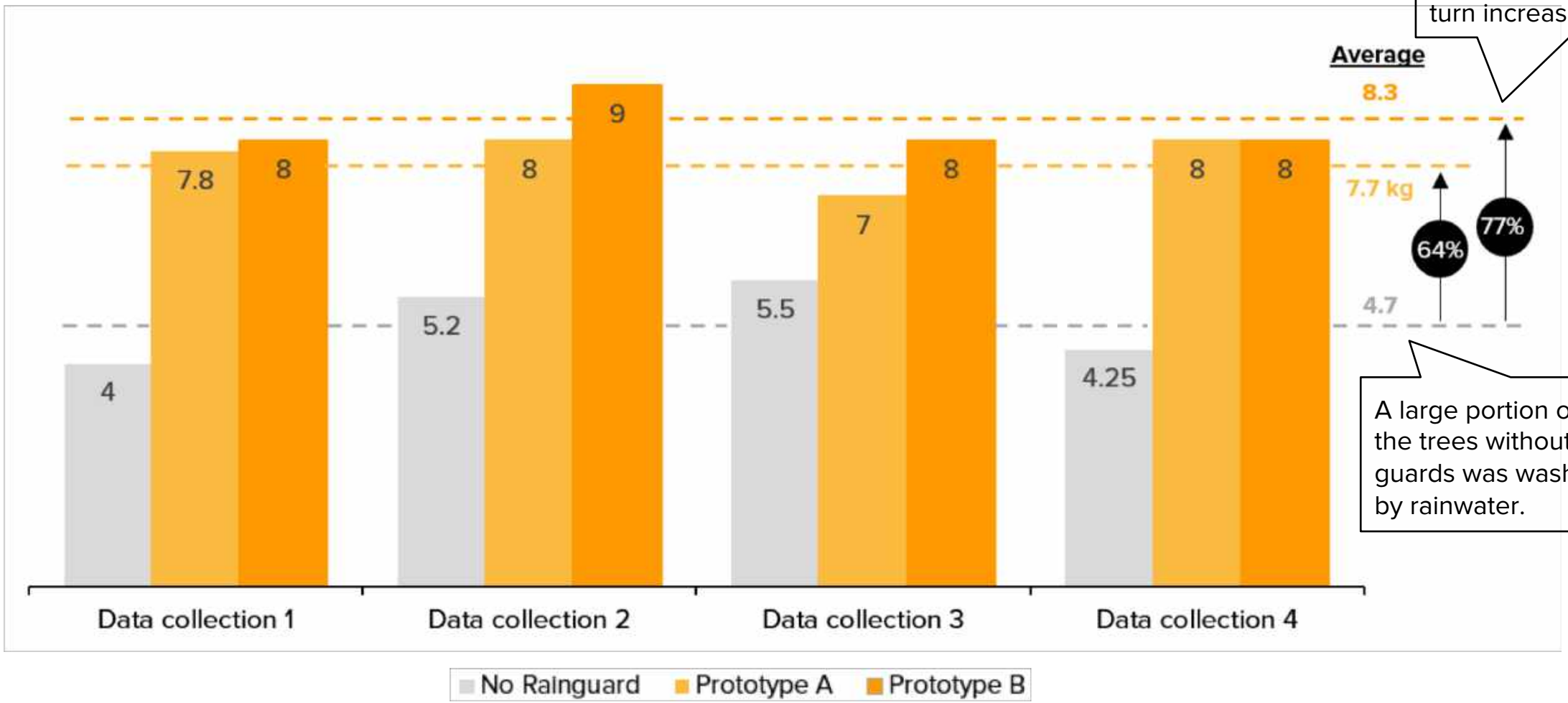
Final design

PERFORMANCE

Rainguard increased latex yields by up to 77 percent

Collected latex comparison

Kg (N=75 trees)



Both rain guards protected the latex from rainwater by diverting water flow from to the latex container, which in turn increased latex yields.

A large portion of latex from the trees without the rain guards was washed away by rainwater.

ECONOMICAL ANALYSIS

Prototype B is 323% cheaper than prototype A, it is more affordable for smallholders farmers

Prototype A

Prototype B

PVC
(8 rain guards can be produced from one sheet)

- Clear PVC sheet.
- IDR 150,000/ Sheet
- Difficult to find locally
- need to be purchased on minimum of 50m quantity

- White PVC sheet.
- IDR 34,000/ Sheet
- Widely available in the area
- Can be purchased per meter

Tools and Other Materials
(for both prototype)

Scissor : IDR 32,000/ 2 pcs

Glue* : IDR 62,000/ 2 pcs

Used inner tire** : IDR 0

Total Cost
(400 trees)

IDR 7,594,000

IDR 1,794,000

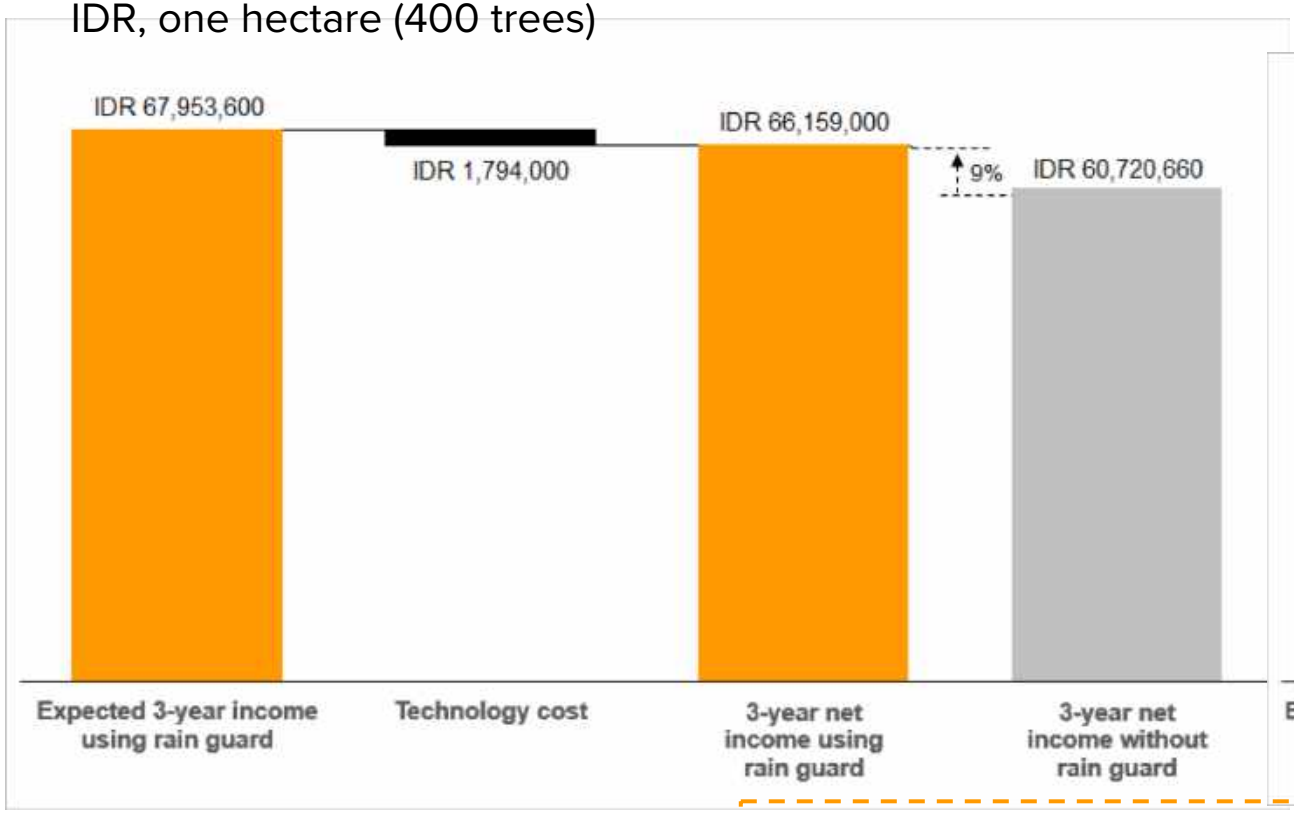
*'Polychloroprene Contact Adhesive. **Are widely available in local motorbike workshop (bengkel)*

ECONOMICAL ANALYSIS

The use of rubber rain guards can increase farmers' income by 9 percent in a three-year timeframe and 56 percent in a 9-month of rainy season

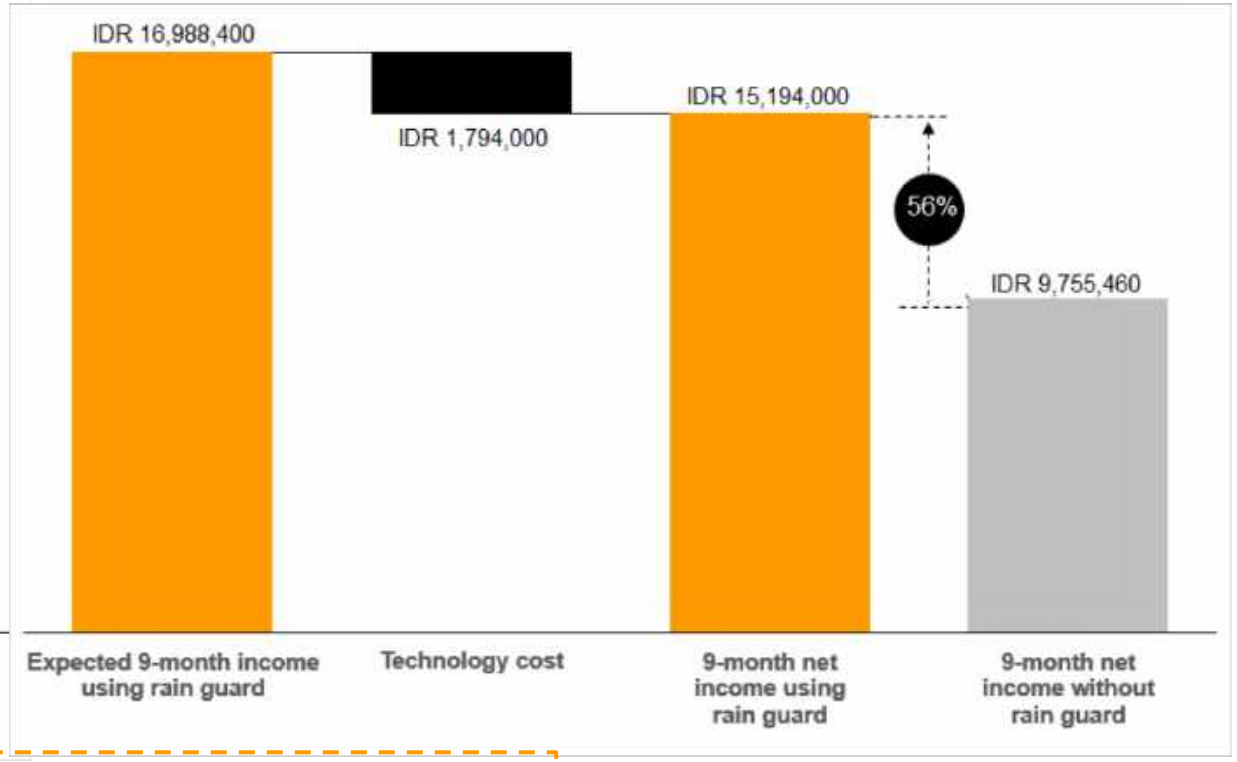
Three-year net income projection

IDR, one hectare (400 trees)



9-month net income projection (only rainy season)

IDR, one hectare (400 trees)



Due to the uncertainty of the climate change and rainy season, the use of rubber rain guard could be significantly beneficial for farmers

SUMMARY OF THE KEY FACTORS

Prototype B shows the biggest promise with more affordable material cost and its capability of protecting collected latex

✓ = Bad
✓✓ = Moderate
✓✓✓ = Good

Key Aspects	No Rainguard (Control Group)	Prototype A (Treatment Group 1)	Prototype B (Treatment Group 2)
	Current practice.	*Rainguard using clear PVC plastic material.*	*Rainguard using white-colored PVC plastic material.*
Price/Availability Material needed to construct the rainguard considering price and availability at the local market	✓✓✓	✓ Clear PVC plastic is not available in small quantities	✓✓
Performance The capability and effectiveness in protecting the collected latex	✓ Does not provide protection for the latex at all	✓✓✓	✓✓✓
Durability Life expectancy of the rainguard as it is exposed to harsh conditions such as rain and direct sun light.	—	✓✓✓	✓✓✓ PVC is resistant against harsh weather conditions
	4	7	8
			RECOMMENDED

CONCLUSION

CONCLUSION

The results of this experiment indicate that the rain guard can protect collected latex during the wet season. The use of rain guards can increase latex yields by up to 76 percent, allowing farmers to harvest more latex in the wet season and potentially increasing their income by 9 percent in three-year period and 56 percent in 9-month of rainy season.

NEXT STEPS

Based on the results of this experiment, Kopernik will:

- Identify a more efficient method to produce the rain guards, for instance, using a laser cutter or molding knife to cut the PVC; and
- Disseminate the result to rubber farmers and other relevant stakeholders.

TESTIMONIAL

“I’m grateful to have had the opportunity to make the rain guards with Kopernik, I have always wanted to make one but I didn’t know what materials to use.

“The rain guards work really well and I am very satisfied with the results; they are easy to make and increase latex yield in the rainy season. I am sure other farmers will benefit from using these rain guards.” - Akhmad Tanzi, rubber farmer

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Type of dry latex sold at the market

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