

# Cyclical or permanent smallholder rubber agroforestry systems with or without slash and burn

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## Introduction

Rubber is an important tree crop in Indonesia (covering 3.5 million ha), most of it (83%) is “jungle rubber” managed by smallholders. This low input system combines profitability and environmental protection. Two basic options exist for rejuvenation: **SLASH-and-BURN** based cyclical systems (**CRAS**, Photo 1) or by **GAP**-planting in permanent agroforests (**PRAS**, Photo 2)



Photo 1: Slash and burn based cyclical rubber agroforestry systems (CRAS)



Photo 2: Gap replanting (without burn) in permanent rubber agroforestry systems (PRAS)

As part of the ASB program a survey was started to better understand farmers interest in and constraints to use PRAS. We set out to characterize PRAS choices at landscape, village/household, field, patch/gap and tree level.

Photo 3: Discussion with farmer collecting clonal seedling for *sisipan* (inter-planting)



## Results

- \* the local name for gap replanting is **Sisipan**
- \* most gap planting uses natural gap (88% of responses), rather than (partly) man-made gaps (12%)
- \* part of the PRAS farmers (24 %) also plant rubber after slash-and-burn on forest or bush fallow land
- \* if gap space allows (100-200 m<sup>2</sup>), farmers may use selective light burning and plant horticultural crops such as: chilly, tomato, soja bean.
- \* some farmers *sisipan* young rubber between very old rubber trees (5-10 trees/group) and then overexploit these by tapping all panels to kill the trees slowly. Two to three years after, they hope that the old rubber trees will die and can be replaced by the new generation of *sisipan* trees.
- \*The most important tree plant by farmers (88%) for gap planting is rubber (*Hevea brasiliensis*) followed by coffee (*Coffea robusta*) and cinnamon (*Cinnamomum burmanii*) (9%).

There are three ways of obtaining rubber planting material:

- a) by preparing, one year before planting, in a small portion of land near the house, where the rubber seeds are collected from their rubber garden,
- b) by transplanting small/young rubber seedlings (1-2cm of stem diameter and 1m height) from the existing rubber garden to the gap,
- c) by buying big and high seedling stumps (3-5cm stem diameter and 2-2.5m height) at the village market. Before planting, normally during the wet season, the planting material is soaked in a river or pond for about 10-14 days, to stimulate bud growth.

The choice of planting materials is closely related to the risk of pest damage (wild pigs, deer, monkeys) and to the competitiveness of rubber to its surrounding vegetation. The bigger and higher the planting materials, the higher the chance of success. Farmers hope that the high seedling stumps grow faster and can be tapped earlier than the smaller planting materials.

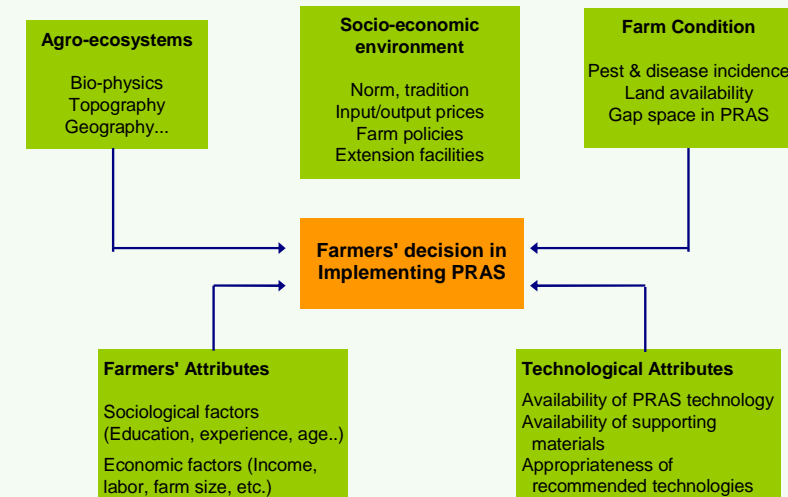
- \* The goal of 'sisipan' is to hide the plant from pest damage, especially wild pigs and monkeys. Average number of trees planted in a natural gap range between 50 - 100 trees ha<sup>-1</sup> year<sup>-1</sup> while for an artificial gap it may reach 1000 trees ha<sup>-1</sup> year<sup>-1</sup>
- \* Individual fencing, using bamboo or woods, is the way to protect the plants from pests, especially for those planted in clean weeded rows.

Planted and re-growing plants in traditional smallholder rubber garden (local name)

Existence of non-rubber plants in traditional smallholder rubber garden (%)	Types of vegetation		
	Fruit trees	Timber and bark producer	Food crops
1. 76 – 100	-	-	-
2. 51 – 75	Jengkoi, petai, duren	-	-
3. 26 – 50	Cempedak, Duku, Kopi, Kayu Manis	Medang, Bambu, Sekubung,	-
4. 0 - 25	Kabau, Rambutan, Salak, Manggis, Nangka, Mangga, Kemiri, Pinang, Jambu, Sirsak, Ampelam, Langsat/Rambe, Bedaro, Kapaung, Kepayang, Kakao, Kelapa, Asam kandis	Sungkai, balam, meranti, kelat, klukup, kawang, rotan, leban, kompas, sesam, mang/mahang, pulai, nibung, terap, irak, pelangas, mupul, tempinis, kayu, balik angin, semantung, petaling, mersawa, sengon, cengking, semambu, simpur, plajau, jelutung, kolm, tembesu, sitinjau, tenuli, merpuy, mepagar, kemenyan, prempung, jati, medang senduk, siancing, pening pening, berangan babi, kayu buluh, terentang, merbung, kayu ubi, irok-irok, jerangkang, salam	Cabe, Tomat, Katu, Terung, Pisang, Jagung, Kacang kacangan, Kedele, Ubi

\* More than 80 local trees are maintained within PRAS systems

\*) Research funds for this survey were obtained from the Australian Centre for Institute Agriculture Research (ACIAR) via the Alternative to Slash-And-Burn program



## Key reasons to choose PRAS

Order of determinant factors influencing farmers to practice *sisipan*.

No.	Description	Percentage
1	PRAS is farmers' effort to increase the land productivity and to keep the continuity of income from the existing rubber and other trees.	99
2	PRAS is practice to minimise risks such as: those due to pest (wild pigs, monkeys, deer) damage.	74
3	PRAS is done to rationalise the family labor shortage (due to limited capital to hire labor and limited family labor, unavailability of cheap inputs of production at village level and extensive upkeep of plants in <i>sisipan</i> )	58
4	PRAS is old tradition technology that is transferred from father to son, and easy to be adopted by farmers in relatively small scale farming. No special time has to allocated to practice <i>sisipan</i>	56
5	PRAS just needs very little cash money and may be adapted to the limited availability of farmers' capital.	51
6	Farmers with enough land and resources prefer CRAS based on slash and burn	16
7	Other reason/factor	8



Photo 4: Bamboo shafts are used to protect *sisipan*-rubber from pig damage

## Conclusion

PRAS systems are much more common than we had realized.

At the landscape level, PRAS is closely related to the availability of land for paddy rice production. Upland rice can not be grown in a PRAS system, as it needs an open area and benefits from slash and burn practices (increase of pH, soil minerals such as P, Mg and K).

PRAS, at village level, is influenced by land shortage, accentuated by: protected forest, private plantation and transmigration projects. Socio economic factors such as distance to road, extension facilities and technological attributes such as the appropriateness of recommended rubber technologies and availability of planting material could not be analyzed at this stage, due to limitation of the design of study.

The relation between age of farmer and length of experience in implementing PRAS indicates that older farmers tend to practice PRAS just recently, while younger farmers tend to have longer experience in PRAS. This might be affected by limited land availability at village level faced by younger farmers, while the older farmers did not experience such condition in the past.

PRAS at farmers level is usually associated with more than two factors. The main factors are continuity of income from rubber or other trees and the risk of pest damage (wild pigs, monkeys, deer).

At gap and tree-level further research is in progress to test how more productive rubber germplasm can be introduced in the context of PRAS systems.