



Third RUBIS Multi-Stakeholder Workshop

**“Designing adaptive technical packages for
a sustainable rubber and food production
by smallholders in a context
of climate change ”**

**Yogyakarta,
November 28-30, 2023**

RUBber agroforestry Breeding Initiative for Smallholders (RUBIS)

Report

Activities with rubber sector stakeholders and program and objectives of the Third RUBIS Multi-Stakeholder Workshop (MSHW3)

**Yogyakarta
November 28-30, 2023**

Content of the document

- I. RUBIS Project**
- II. First RUBIS Multi-Stakeholder Workshop**
- III. Coordination with stakeholders**
- IV. Second RUBIS Multi-Stakeholder Workshop**
- V. Third RUBIS Multi-Stakeholder Workshop**
- VI. Miscellaneous**

RUBIS Project

RUBIS Project

Participatory approach with stakeholders of the natural rubber sector

1. Context

In Indonesia, rubber production system is facing socioeconomic, environmental and climate issues. Low rubber price and low productivity foster conversion of rubber plantations to more profitable crops such as oil palm and sugarcane.

Agroforestry is recognized as a sustainable solution playing a role on climate change mitigation (Abbas et al., 2017). Rubber-based agroforestry systems are a way of the agroecological intensification through income diversification, which limits risk associated with rubber price. Associated with food crops, rubber plantations contribute to the food sovereignty and safety.

2. The RUBIS Project

The Rubber agroforestry Breeding Initiative for Smallholders (RUBIS) is supported by the Agropolis Foundation (Montpellier, France) and the scientific consortium between CIRAD, IRRI and UGM. This project is organized in four workpackages (Figure 1).

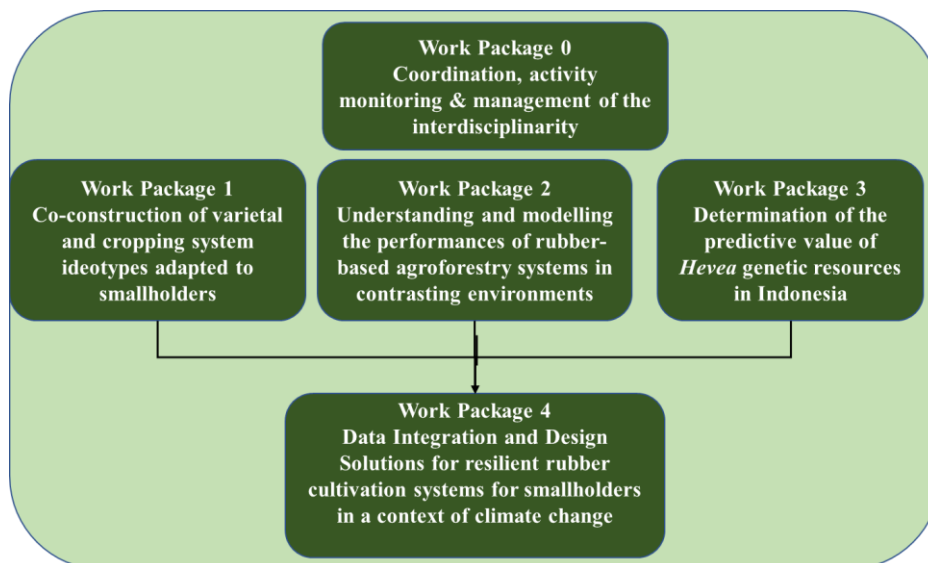


Figure 1. Workpackage organization of the RUBIS Project

WP1. Co-construction of varietal and cropping system ideotypes adapted to smallholders. This work package aims at identifying the representative of stakeholders and their typology in

Indonesia as well as socioeconomics constraints and stakeholders' demand. This statement should lead to a co-construction of solutions for resilient rubber-based cropping systems in Indonesia in a context of socioeconomics and environmental pressures.

WP2. Understanding and modelling the performances of rubber-based agroforestry systems in contrasting environments. Rubber agroforestry systems (RAS) are usually presented as more resilient than monospecific plantation to climate change due to improved ecosystem functions (water circulation, nutrient availability, biological control of pests etc.). However, the resilience of RAS depends on the sharing of resources (light, water, nutrient) between the rubber trees and the associated species. In particular, water can become a major limiting factor. This WP2 aims at 1/ characterizing the abiotic and biotic constraints on the performances of RAS in terms of productivity and provision of regulating ecosystem services, 2/ identifying the ecophysiological traits to be targeted by breeding programs (WP3).

WP3. Determination of the predictive value of Hevea genetic resources in Indonesia. This WP3 aims to characterize the rubber recommended clones in Indonesia and a new progeny for physiological parameters related to latex production, tolerance to abiotic and biotic stress as well as rubber and wood properties. These traits will be used to select rubber clones corresponding to the ideotype defined by socio-economic and agronomic issues raised in WP1 and WP2, as well as the most resilient rubber-based cultivation systems in a context of global changes.

WP4. Data integration and designing solutions for resilient rubber cultivation systems for smallholders in a context of climate change. This work package WP4 aims at integrating project data from WP1, WP2 and WP3, and designing both planting packages, experimental network and tools for further establishment and monitoring of on-farm trials. Data integration and solutions designing will follow a step-by-step process throughout the life of the project with all stakeholders.

3. A series of Multi-Stakeholder Workshops as part of the participatory approach

A participatory approach with all stakeholders has been initiated to guarantee the co-construction of solutions and facilitate the future support of national and local authorities by funding replanting programme with adaptive technical packages for smallholders (Figure 2).

The RUBIS Project organized several meetings and workshops with stakeholders :

- First RUBIS Multistakeholders Workshop (MSHW1)
- Second RUBIS Multistakeholders Workshop (MSHW2)
- Third RUBIS Multistakeholders Workshop (MSHW3).

The deliverables of this RUBIS Project are :

- A concept-note for Indonesian Authorities and actors to present the results of the participatory approach.
- A scientific position paper on rubber-based agroforestry systems

- Proposal RUBIS-ADAPT for the implementation of on-farm and on-station adaptation trials

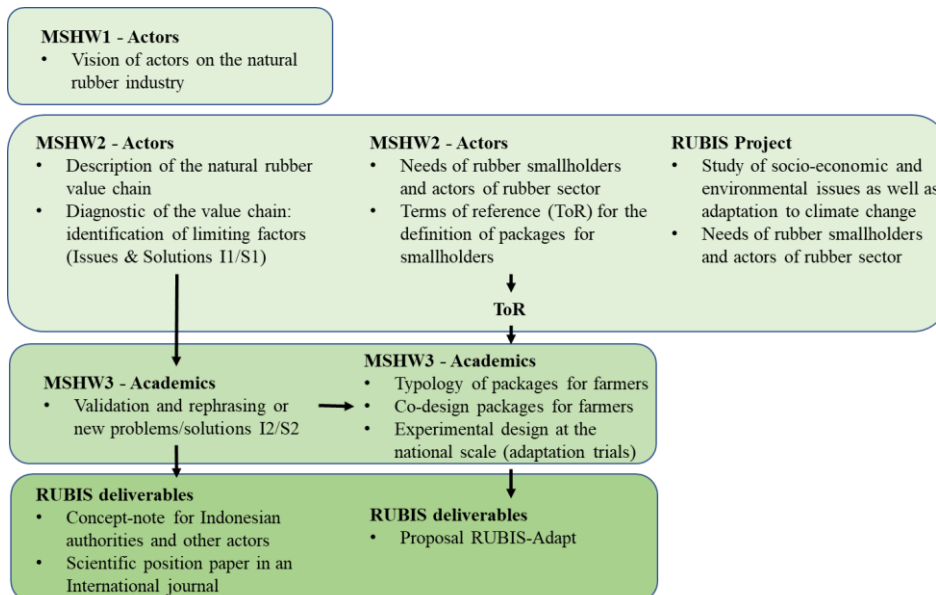


Figure 2. Integration of results from each multi-stakeholder workshop, and expected deliverables of the RUBIS Project.

RUBIS

Rubber agroforestry Breeding Initiative for Smallholders



First RUBIS Multi-Stakeholder Workshop

Challenges and Opportunities for Sustainable Natural Rubber Production in a Fast-Changing Socio-Economic and Climate Conditions in Indonesia

Resolution Tracks for a Better Future of Natural Rubber Industry

This First RUBIS Multistakeholders Workshop (MSHW1) was entitled *Challenges and Opportunities for Sustainable Natural Rubber Production in a Fast-Changing Socio-Economic and Climate Conditions in Indonesia, as well as Resolution Tracks for a Better Future of Natural Rubber Industry.*

This first hybrid workshop was organized by IRRI on 16/11/2022 (Figure 3) and hosted about 180 participants.



Figure 3. Organizing committee from IRRI and the eleven invited speakers from national and local authorities and organizations

The participants shared their visions for sustainable rubber cultivation and rubber industry sector in Indonesia. In that way, we create a process of communication between scientists & stakeholders, and establish a Multi-stakeholder Working Group to co-construct solutions.

Conclusions of the MSHW1

1. **Rubber smallholders play an important role in the rubber industry and make a significant contribution to the Indonesian economy.**
 - a. Problem of low rubber price and low productivity, due to large areas with old/damaged rubber plantations, and the worsening climate change effect.

- b. Improvement of rubber smallholder conditions requires the integration of many parties, including the government, rubber entrepreneurs, researchers, academics, and rubber farmers.
2. **Authorities and rubber organizations play an essential role in rubber sector**
 - a. The **Directorate of Seed**, Directorate General of Estate Crops, Ministry of Agriculture continues to improve the availability of high-quality planting material (establishment of rubber nurseries and support of input production for rubber nursery (fertilizer, seed, etc), as well as the strengthening of nursery operator institutions).
 - b. **GAPKINDO** has contributed to the formulation of a rubber industry sustainability standard through SNARPI (Sustainable Natural Rubber Platform of Indonesia) and plays an active role in International organizations (ANRPC, ITRC through the AETS scheme) to promote the remunerative rubber price, and maintain good communication with farmers.
 - c. **APKARINDO** (Association of Indonesian Rubber smallholders) and **UPPB** (Rubber Processing and Marketing Units) were established to strengthen rubber farmer institutions and to increase competitiveness in the national rubber industry.
 3. **New policies require alternative technologies and funding for smallholders**
 - a. The policy of prohibiting land burning during replanting led to White Root Disease (JAP) attack.
 - b. This policy is an obstacle for farmers who cannot afford land clearing.
 - c. Farmers expect to get support in terms of total land clearing, fertilizers, seeds, and herbicides.
 - d. Selection of intercrop species able to reduce the risk of disease attack is expected
 - e. Funding scheme for rubber replanting is required as the scheme for oil palm replanting (BPDPKS: Badan Penyandang Dana Peremajaan Kelapa Sawit/ Funding Agency for Oil Palm Replanting), which includes the increase of smallholders' capability.
 - f. The participation of researchers and academics (BRIN, Universities, Rubber Research Institute) is needed to support the development of innovation, technology, and policy recommendations based on research and scientific studies.
 4. **The RUBIS Initiative responds to the expectations of stakeholders for a sustainable rubber industry through a participatory and inclusive approach**
 - a. The RUBIS project, which has been started in 2021, focuses on four main topics, i.e., identification of practices, typologies, and needs for smallholder rubber plantations (WP1), monitoring and modeling of the Rubber Agroforestry System (RAS) to support sustainable agroforestry programs (WP2), development of new superior clones that are adaptive to the smallholding system (WP3), and integration of data and formulation of policies with stakeholders (WP4)
 - b. RUBIS is committed to continuing support for the development of smallholding plantations in Indonesia. RUBIS invites all stakeholders to participate through a working group involving the government, entrepreneurs, academics/researchers, and rubber farmers to formulate programs and policies needed for the development of the Indonesian rubber industry, especially for smallholder sector.

Coordination with stakeholders

The RUBIS coordinators, Fetrina Oktavia and Pascal Montoro, met several stakeholders of the natural rubber sector :

Ditjenbun (Directorate General of Estate Crops)

- June 30, 2022 – Mr Saleh Mokhtar (Director of Directorate of Seeds)
- March 27, 2023 - Mr Gunawan (Director of Directorate of Seeds), Mrs Ratna Ubandiyah (Head of Crop Division)

Estate Crop Agencies

- June 23, 2022 – Mr. Ir. Agus Darwa (Head of Estate Crop Agency) – Palembang, South Sumatra
- March 1, 2023 - Mrs Mugi (Head of Estate Crop Division) – Tebo, Jambi
- March 1, 2023 - Mr. Andi - Bappeda Tebo, Jambi

UPPB

- June 23, 2022 – Mr Jumirin Santoso (Head of UPPB South Sumatra)

Smallholders

- November 2021 WP1 farm survey in South Sumatra
- February 2022, WP1 farm survey in Jambi
- November 2022, WP1 farm survey in North Sumatra
- February 2023, Muara Enim District, South Sumatra
- March 2023, Tebo District, Jambi

GAPKINDO

- June 31, 2022 – Mr Erwin Tunas, Dr Uhendi Haris

Universitas Sriwijaya (UNSRI) - 24/02/2023

Prof. Ahmad Muslim, Plant pathologist, Dean Faculty of Agriculture

Prof Sabaruddin, Soil science, Head of international Office

Dr Erizal Sodikin, agronomy

Dr Mulawarman, nematology

Mrs Iswani, socio-economy, Head of research and community services

Mrs Wulan, socio-economy

Universitas Jambi (UNJA) - 28/02/2023

Prof. Dr. Sutrisno, Rector of UNJA

Prof. Dompok Napitupulu, Socio-economy

Dr Forst Bambang Irawan, Director of Centre of Excellence on Land Use Transformation System

Ms Gina Fauzia
Ms Mirawati Yanita

Universitas Sumatera Utara (USU) - 14/03/2023

1. Prof. Dr. Ir. Elisa Julianti, M.Si.
2. Dr. Lisnawita, SP., M.Si.
3. Ir. Revandy I.M. Damanik, M.Sc., Ph.D.
4. Ir. Diana Chalil, M.Si., Ph.D.
5. Dr. Rulianda P. Wibowo, SP., M.Ec.
6. Dr. Ir. Sarifuddin, MP.
7. Ir. Jonis Ginting, M.Si.
8. Dr. Nini Rahmawati, SP., M.Si.
9. Sri Fajar Ayu, SP., M.M.
10. R. B. Ibrahim Fatoni, S.Pi., MP.
11. Nursa'adah, S.ST., M.Agr.
12. Yustika Venawati, ST.

Conclusions of the meetings with stakeholders

- UNSRI, UNJA and USU want to join the RUBIS initiative
- Ditjenbun will allow releasing not yet recommended clones for on-farm adaptation trials to be conducted under RUBIS-ADAPT
- Ditjenbun will provide a letter to support RUBIS-ADAPT proposal to funding agencies
- The RUBIS-ADAPT proposal has to be presented to big companies to get CSR funds (Corporate Social Responsibility).
- Candidate farmers have been identified from farm surveys in South Sumatra, Jambi and North Sumatra provinces (RUBIS WP1 activity).

Second RUBIS Multi-Stakeholder Workshop

*Designing solutions for resilient rubber cultivation systems for
smallholders in a context of climate change*

*Identification of issues and solutions in the natural rubber value
chain and development of terms of reference for sustainable
adaptive technical packages for rubber smallholders.*

1. Context, objectives and program of the workshop

This Second Multi-Stakeholder Workshop (MSHW2) was held at the HEVEA Hall of the Indonesian Rubber Research Center in Sembawa on 7-8/11/2023.

The workshop was entitled *Designing solutions for resilient rubber cultivation systems for smallholders in a context of climate change. Identification of issues and solutions in the natural rubber value chain and development of terms of reference for sustainable adaptive technical packages for rubber smallholders.*

The aim of this workshop is to identify problems and solutions in the natural rubber value chain and to develop terms of reference for sustainable adaptive technical packages for smallholder plantations. This workshop will bring together 23 participants representing all stakeholders, including the Directorate General of Estate Crops and Seeds, rubber associations (GAPKINDO, APKARINDO, UPPB), farmers, rubber experts, private companies (RLU), academics (UGM, UNJA, USU, UNSRI) and then 10 researchers from IRRI as facilitators.

Organizing committee

**PANITIA PELAKSANA RUBIS MULTISTAKEHOLDER WORKSHOP
PUSAT PENELITIAN KARET**

Pengarah	:	Dr. Suroso Rahutomo Dr. Radite Tistama Dr. Lina Fatayati Syarif Dr. Risal Ardika
Ketua	:	Dr. Fetrina Oktavia
Sekretaris	:	1. Aprizal Alamsyah, S.Sos. 2. Intan Berlian, M.Sc.
Bendahara	:	Iman Satra Nugraha, S.E.
Seksi-Seksi		
1. Sekretariat dan Registrasi		
Koordinator	:	Andi Wijaya, M.Eng.
Anggota	:	M. Rizqi Darajat, S.Si. Martini Aji, M.Si. Andrea Akbar, S.P. Ana Marwiyah, S.E. Yanuar
2. Makalah dan Persidangan		
Koordinator	:	Sigit Ismawanto, M.Sc.
Anggota	:	Charlos Togi Stevanus, S.P. Sahuri, M.Si. Yoga Bagus Setya Aji, S.P. Hajar Asywadi, S.P.
3. IT Support System		
Koordinator	:	Aprima Putra Bradikta, S.Kom.
Anggota	:	Chakent, S.E. Panji Purwanto Ramdhan, S.T. Dina Eka Pranata, M.Tr.T.
4. Akomodasi, Transportasi dan Konsumsi		
Koordinator	:	Sayurandi, M.Si.
Anggota	:	Heri Supriyadi Rusiani, S.E. Dian Anggraini

Scientific committee

Name	Organization	Address
Pascal Montoro	CIRAD	Montpellier, France
Fetrina Oktavia	IRRI	Sembawa, Indonesia
Siti Subandiyah	UGM	Yogyakarta, Indonesia
Sophia Alami	CIRAD	Montpellier, France
Taryono	UGM	Yogyakarta, Indonesia
Yekti Purwestri	UGM	Yogyakarta, Indonesia
Andi Nur Chayo	IRRI	Sembawa, Indonesia
Shinta Agustina	IRRI	Sembawa, Indonesia
Eric Penot	CIRAD	Montpellier, France

List of participants

Participants	Organization / Position	Address
Arifin Pangaribuan	Ditjenbun-Perennial crop	Jakarta
Nur Achmadi	Gapkindo	Palembang
Gede Wibawa	Advisory Committee	Bogor
Wahyudin	Apkarindo	Tanggerang
Roizin	UPPB_National	Musi Banyuasin
Jumirin	UPPB_South Sumatera	Sembawa
Havizman, S.P, M.Si	Estate crop agency South Sumatera_Palembang	Palembang
Akbar Paripurna, S.P, M.Si	Estate crop agency_South Sumatera_Muara Enim	Muara Enim
Suratno	Estate crop agency_South Sumatera_Musi Rawas	Musi Rawas
Sahirul Pendi	Farmer_South Sumatera_Muara Enim	Muara Enim
Herman	Farmer_South Sumatera_Musi Rawas	Musi Rawas
Susanti	Estate crop agency_Jambi_Tebo	Tebo, Jambi
Desmarizal, S.P	Estate crop agency_Jambi_Merangin	Merangin, Jambi
Susisno	Farmer_Jambi_Tebo	Tebo, Jambi
Adi Nugroho	Farmer_Jambi_Merangin	Merangin, Jambi
Taryono	UGM	Yogyakarta
Wulan Sari	Unsri	Palembang
Marolop Jerimi Simarmata	RLU	Jakarta
Supriyadi	Smallholder	Tebo, Jambi

Pascal Montoro	Cirad	Montpellier
Fetrina Oktavia	IRRI	Sembawa
Dwi Shinta Agustina	IRRI	Sembawa
Andi Nur Cahyo	IRRI	Sembawa
Sigit Ismawanto	IRRI	Sembawa
Martini Aji	IRRI	Sembawa
Afrizal Alamsyah	IRRI	Sembawa
Iman Satra Nugraha	IRRI	Sembawa
Lina Fatayati Sarifa	IRRI	Sembawa
Charlos Togi Stevanus	IRRI	Sembawa
Risqi Darajat	IRRI	Sembawa
Andrea Akbar	IRRI	Sembawa

MSHW2 Program

Hari/Tanggal	Waktu	Materi	Topic	Fasilitator
Senin, 6 November 2023	13.00 - selesai	Kedatangan peserta	Participant arrival	Tim Sekretariat
Selasa 7 November 2023	08.30-09.00	Registrasi Peserta	Participant registration	Tim Sekretariat
	09.00-09.05	Menyanyikan lagu Indonesia Raya	National anthem	Yesi Ambarwati
	09.05-09.15	Kata Sambutan dan pembukaan Rubis Workshop II	Welcome address and opening RUBIS Workshop	Kepala Pusat Penelitian Karet, Dr. Suroso Rahutomo
	09.15-09.25	Doa	Pray	M. Rizki Darajat
	09.25-09.35	Foto Bersama	Photo session	Panitia
	09.35-10.20	Sesi 1. Pengenalan Rubis project dan Workshop Participatory Multi-stakeholder <i>Workshop II</i> Tea break	Session 1. Introduction of RUBIS project and Workshop Participatory Multi-stakeholder <i>Workshop II</i> Tea break	Koordinator Rubis project, Dr. Fetrina Oktavia Moderator: Dwi Shinta Agustina, Notulen : Eka Dina Pranata
	10.20-11.15	Sesi 2. Perkenalan Peserta	Session 2. Introduction of participants	Sigit Ismawanto/Andrea Akbar
	11:15-12:15	Sesi 3a. Pengembangan rantai nilai	Session 3a. Co-design of rubber value chain. FGD to define steps and actors of the value chain	Dr. Andi Nur Cahyo/Iman Satra Nugraha, S.E Notulen: Hajar Aswadi
	12.15-13.15	ISHOMA	Lunch break	Panitia
	13.15-13.30	<i>Ice Breaking</i>		Sigit Ismawanto/Andrea Akbar
	13:30-14:30	Sesi 3b. Pengembangan rantai nilai	Session 3b. Co-design of rubber value chain. FGD to organize steps of the value chain	Dr. Andi Nur Cahyo/Iman Satra Nugraha, S.E Notulen: Hajar Aswadi
	14:30-17:00	Kunjungan ke GATPD (Afdeling 3) dan <i>Tea Break</i>	Field visit with tea break	Martini Aji
8 November 2023	08:00-9:30	Sesi 4a. Identifikasi faktor pembatas dan solusi permasalahan pada perkebunan karet rakyat dan industri terkait	Session 4a. Identification of limiting factors and solutions along the value chain. World Café	Dwi Shinta Agustina, M.Sc/Charles Togi Stevanus Notulen: Andi Wijaya
	9:30-9:45	Tea Break		Panitia
	9:45-11:15	Sesi 4b. FGD identifikasi faktor pembatas dan solusi permasalahan pada value chain	Session 4b. Focus Group Discussion on identification of limiting factors and solutions along the value chain	Dwi Shinta Agustina, M.Sc/Charles Togi Stevanus Notulen: Andi Wijaya
	11:15-11:30		Break	
	11:30-12:30	Sesi 5. Ruang lingkup inovasi terkait faktor pembatas dan solusi	Session 5. World Café & 6-thinking hats on innovation tracks with regard to limiting factors and expected solutions of the value chain.	Martini Aji, Aprizal Alamsyah, Andrea Akbar, Hajar Aswadi, Andi Wijaya, Dina Eka Pranata Notulen: M. Rizki Darajat
	12:30-13:30	ISHOMA	Lunch break	Panitia
	13:30-14:00		Ice breaking	Sigit Ismawanto/Andrea Akbar
	14:00-17:00	Sesi 6. Penyusunan dan perancangan paket teknologi perkebunan karet rakyat	Session 6. Co-building of the basis of terms of reference for designing adaptive technical packages for smallholders	Iman Satra Nugraha, Afrizal Alamsyah, Dwi Shinta Agustina, Andi Nur Cahyo Notulen: Charles Togi S
	14:00-14:45	Step 6a. Diskusi untuk komponen paket teknologi perkebunan karet rakyat	Session 6a. Discussion to define packages components	Iman Satra Nugraha, Afrizal Alamsyah, Dwi Shinta Agustina, Andi Nur Cahyo Notulen: Charles Togi S
	14:45-16:00	Step 6b. World Café diskusi paket teknologi perkebunan karet rakyat	Step 6b. World Café on packages components	Iman Satra Nugraha, Afrizal Alamsyah, Dwi Shinta Agustina, Andi Nur Cahyo Notulen: Charles Togi S
16:00-16:45	Step 6c. Diskusi untuk melengkapi informasi kerangka acuan	Step 6c. Discussion to complete missing information for the packages terms of reference	Iman Satra Nugraha, Afrizal Alamsyah, Dwi Shinta Agustina, Andi Nur Cahyo Notulen: Charles Togi S	
16:45-17:00	Penutupan Workshop	Workshop closing	Dr Fetrina Oktavia	
Kamis 9 November 2023	9.00 - selesai	Kepulangan Peserta	Departure	Tim Sekretariat

1. Welcome address by Dr Suroso Rahutomo, Head of the Indonesian Rubber Research Institute (see Talk)

The current condition of natural rubber industry : rubber price, decrease in productivity related to ageing of rubber plantation, low adoption of technology, and Pestalotiopsis leaf fall disease. RUBIS Project RUBIS works on socio-economy, agronomy and breeding in order to develop some solutions to cope with the socio-economic situation of the rubber sector. The objective of this workshop is to develop the component of packages adapted to smallholders.

2. RUBIS Project and workshop introduction by Dr Fetrina Oktavia (see Presentation)

This activity consists of 4 sessions, namely:

- Development of innovation processes and value chains carried out using the *Focus Group Discussion method*.
- Identification of limiting factors and solutions to problems in smallholder rubber plantations and related industries with *the World Café method* and *Focus Group Discussion*.
- Innovation related to limiting factors and solutions of the innovation process with the *Six Hats Thinking method*.
- Preparation and design of community rubber plantation technology packages using *Focus Group Discussion method*.

3. Co-design of rubber value chain (Session 3)

This session aimed at elaborating a common vision of rubber value chain and of the interactive innovation process (Figure 4).

FGD activities in session III with the theme "The process of preparing innovations and rubber product value chain" obtained various information records starting from the production process of rubber finished goods which are arranged into a series of process links from the upstream to the downstream process, which successively includes:

- The rubber plant breeding program (Actor: PPK),
- Registration/release of superior varieties (Actors: Ministry of Agriculture),
- Development of seed source gardens (Actors: PPK, Seed Breeders),
- Propagation (Actors: Breeders),
- Certification of seed source gardens (Actors: BPSBTP, Ditjenbun),
- Plant cultivation (Actors: Farmers and large plantations),
- Post-Harvest Process (Actors: Farmers and tappers),
- BOKAR Marketing (Actors: UPPB, Farmer Groups, Cooperatives, Agents),
- Factory Processing (Actors: Crumb Rubber Factories)
- and Rubber Finished Goods (Actors: Factories).

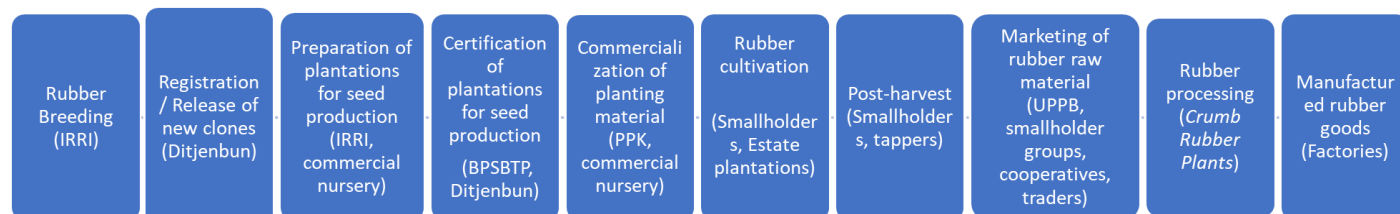


Figure 4. Value chain co-built by the participants of the MSHW2

4. Identification of limiting factors and solutions along the value chain (Session IV)

This session aimed at identifying limiting factors and solutions as experienced or wished by the stakeholders at the different steps of the value chain and at the interlink between these steps.

FGD activities in session IV Identification of Limiting Factors and Solutions to Problems in People's Plantations and Related Industries are divided into 4 categories of problems, namely:

- plant breeding problems,
- production of superior planting materials,
- cultivation of rubber plants
- and downstream marketing of rubber.

The conclusions and solutions of each problem are shown in the following Table 3.

Table 3. Problems and solutions for smallholder and industrial plantations







No	Topic	Sub Topics	Problem	Solution
1	Plant Breeding	Human Resource Breeder	<ul style="list-style-type: none"> • The capacity of breeders needs to be increased • Lack of Breeder Human Resources 	<ul style="list-style-type: none"> • Awarding scholarships, education, training, research cooperation • Formal and informal education
		Breeding cycle	<ul style="list-style-type: none"> • A long time 	<ul style="list-style-type: none"> • Looking for new innovations/technologies for breeding, such as tissue culture, molecular marking technology, flowering induction, pollen storage
		Research Funding	<ul style="list-style-type: none"> • Lack / limited research funding for breeding 	<ul style="list-style-type: none"> • Allocation of research funds from the government • Looking for sources of collaborative research funding from third parties such as BPD Karet (CESS)
2	Production of Superior Planting Material	Clone availability	<ul style="list-style-type: none"> • The clone character has not been in line with the expectations of farmers • High-yielding seedlings are not available in farmers (entres and rootstock preparations) 	<ul style="list-style-type: none"> • The need for the selection of clones that are in accordance with the expectations of farmers, such as partly disease resistance, tapping grooves • The need for clone information according to agro-climatic characters • The presence of demplots in farmers • Create a clone suitability map • Building entres and rootstock gardens (garden planning) in rubber centers

				<ul style="list-style-type: none"> Clonal propagation technology, such as somatic embryo (SE)
		Breeding Human Resources	<ul style="list-style-type: none"> Lack of capacity of captive human resources (SOPs and regulations) 	<ul style="list-style-type: none"> Provide training and socialization to captives/farmer groups
		Regulation	<ul style="list-style-type: none"> Implementation of regulations that are not working because they are not in accordance 	<ul style="list-style-type: none"> Provision of sufficient allocation of funds and adequate human resources
		False seedlings	<ul style="list-style-type: none"> A lot of circulating seedlings 	<ul style="list-style-type: none"> Providing knowledge to farmers
3	Rubber Plant Cultivation	Cultivation of rubber plants	<ul style="list-style-type: none"> Many plants are affected by diseases Lack of knowledge of farmers about recommended cultivation techniques Difficulty obtaining fertilizer because it is expensive and scarce 	<ul style="list-style-type: none"> IPM (effective fungicide, disease-resistant clone) Providing BimTek to farmers (crop maintenance, disease control) Strengthening the technology transfer system to farmers The use of organic materials to become fertilizer Restoration of fertilizer subsidy regulations for rubber farmers Integration of plantations and livestock
		Replanting	<ul style="list-style-type: none"> Rubber replanting financing and TBM period needs No-burning technology 	<ul style="list-style-type: none"> Rubber and interstitial plant building package Sales of rubber wood for rejuvenation
4	Marketing and Downstream of rubber		<ul style="list-style-type: none"> Low rubber price 	<ul style="list-style-type: none"> Improving the chain system Quality system improvement Create regulations for rubber price guarantees
			<ul style="list-style-type: none"> Long supply chains Low raw rubber value-added Low bokar quality Low domestic rubber consumption EUDR policy 	<ul style="list-style-type: none"> Establishing an organized system (UPPB) Development of rubber finished goods MSMEs at the farmer level Quality control from the farmer level to the product Implementation of SNI bokar at the farmer level Strengthening the domestic downstream industry Government regulations are needed in order to prepare EUDR policies, such as land certification

5. World Café & 6-thinking hats on innovation tracks with regard to limiting factors and expected solutions of the value chain (Session V)

This session aimed at the formulation of the feelings and expression of the creativity of the stakeholders. The 6-thinking hats facilitation method was used in the session (see following table 4).

Table 4. Information related to the 6-thinking hats from Bono

6 thinking hats (Bono)	
White hat	 <ul style="list-style-type: none"> • Facts • Figures • Information
Black hat	 <ul style="list-style-type: none"> • Critical judging • Checking • Devils advocate
Red hat	 <ul style="list-style-type: none"> • Suspects • Opinions • Emotions
Blue hat	 <ul style="list-style-type: none"> • Thinking about thinking • Organization of the thinking process • Discipline and focus • Leadership
Yellow hat	 <ul style="list-style-type: none"> • Positive thinking • Concentrated on advantages • Call to action
Green hat	 <ul style="list-style-type: none"> • Creativity • New ideas • Change

Free expression of opportunities, risks, optimistic (positive points) and pessimistic feelings regarding the future of the rubber sector and the innovation pathways towards a profitable, equitable and sustainable sector.

Bono's hats facilitation approach: pessimistic (negative points), positive points (optimistic), creativity/new ideas, facts and organizational issues, opinion/emotions/suspicions

From this session, several conclusions can be drawn, namely:

- Intermediaries still play a big role so that prices in farmers are low. The level of trust of farmers in institutions. The information received is still low. Lack of socialization of bokar qualities. Changing habits is very difficult at the farmer level to improve yield quality.
- Sicom price monitoring. Price refers to sicom. Farmers should be open to pricing information. Quality will have an impact on competitiveness. Quality improvement must be carried out by farmers. UPPB must be strong to maintain prices as a means of shortening the market chain. Costs will affect prices such as transportation and transport labor. This will have an impact on the price. The government must provide guidance regarding improving the quality of results.
- The price of UPPB (institution) is higher at 11,300. Institutions shorten the market chain so that prices are higher. UPPB is open and transparent based on deliberation.
- UPPB's expectations are not as appropriate as on the ground.
- The role of institutions is the fastest solution and easy to touch by farmers. The facilities and infrastructure of the institution need to be improved so that the institution becomes more optimal.
- Prices at farmers depend on the mill. The price of factories with middlemen differs greatly. Long chains keep prices low. Why do some factories receive poor quality produce (dirty rubber)? The factory is responsible for this.

6. Co-building of the basis of terms of reference for designing adaptive technical packages for smallholders (Session VI)

Preparation and design of community rubber plantation technology package: emergence of first bricks (4) for terms of reference.

Technology package information for session 6 consists of 4 packages, namely production package, technology transfer package, financing package and regulation package.

1. Production improvement packages include:

- Superior clones: high productivity, disease resistance, and low frequency tapping
- Fertilizer: NPK fertilizer, organic fertilizer and dolomite
- Control of pests: pesticides (fungicides and insecticides), sulfur, dry control of tapping grooves
- Tools and Agricultural Machinery: Tapping Equipment, Stimulants, Chainsaw, Bush Cutter Freezer, Recommended Freeze/Latex Freezer, Digital Sitting Scale 500 kg
- Land clearing: heavy equipment rental assistance, manually

2. Technology transfer:

- Training on rubber crop cultivation (GAP training, grafting, pest control, fertilization according to recommendations, tapping, bokar processing, and postharvest)
- Marketing training
- Liquid smoke making training for latex coagulation
- Human resource management training
- Rubber finished goods training
- Comparative study training to finished goods established by smallholders MSMEs
- Traceability training
- Drone pilot training
- Assistance: introducing to institutions/stakeholders
- Officers/technology experts: Pusdiklat, plant training center, government, peyuluh, NGOs, and academics
- Method Technology Expert: Training, mentoring and visits, Field Schools and Digital Media, Demplot, Acceleration of Dissemination of Agricultural Products, Field Schools)

3. Financing

- Rubber BPDP collection
- KUR facility/soft credit
- Government assistance
- Sales of rubber wood
- Foreign aid (e.g. RUBIS, CIRAD, WWF, ICRAF)
- Partnership assistance (UPPB and spice rubber factory)
- Farmer self-help / farmer group (savings)
- CSR

4. Regulatory package

- Regulations to make rubber a national strategic commodity so that fertilizer subsidy regulations for rubber plants
- Regulation of fuelless opening through the help of mechanization
- Financing regulations for rubber farmers

Third RUBIS Multi-Stakeholders Workshop (MSHW3)

Designing adaptive technical packages for a sustainable rubber and food production by smallholders in a context of climate change

This third workshop will be held at UGM in Yogyakarta on 28-30/11/2023. The workshop is entitled *Designing adaptive technical packages for a sustainable rubber and food production by smallholders in a context of climate change*.

After the production of terms of reference by stakeholders during the MSHW2, the scientific participants and some representatives of the MSHW3 will co-design adaptive technical packages. This information will be used to generate deliverables of the RUBIS Project : a concept-note for Indonesian Authorities, a scientific position paper on the diagnostic of natural rubber value chain, as well as an R&D proposal for further applications such as the implementation of on-station and on-farm adaptation trials with adaptive technical packages (Figure 5).

The MSHW3 will aim at :

- Designing the typology and specification of adaptive technical packages for smallholders based on terms of reference including necessary control packages for further comparison of packages
- Setting up experimental design of adaptation trials (number of locations, number of replicate per package, number of on-farm and on-station trials, statistical model, etc.)

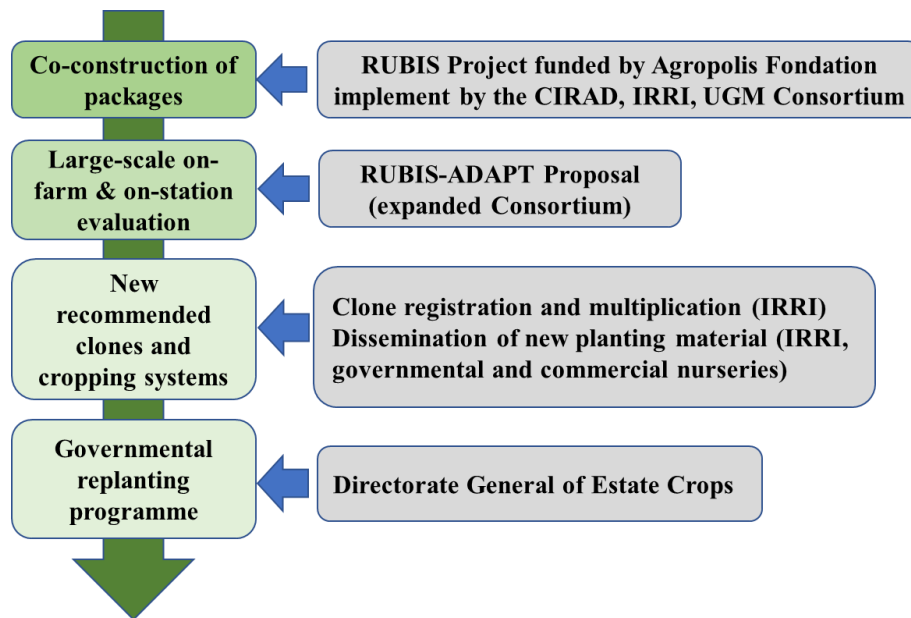


Figure 5. Steps from the co-construction of adaptive technical packages in the RUBIS Project to the implementation of replanting programme by the Ditjenbun.

List of participants

Gender	Degree	First Name	Family Name	Organization
Ms	M.Sc.	Dwi Shinta	Agustina	IRRI
Ms	Dr	Sophia	Alami	CIRAD
Ms	Dr	Yekti	Asih Purwestri	UGM
Mr	Dr	Panjisakti	Busunanda	UGM
Mr	Dr	Frédéric	Gay	CIRAD
Mr	M. Sc.	Sigit	Ismawanto	IRRI
Mr	Dr, HDR	Pascal	Montoro	CIRAD
Mr	M. Sc.	Andi	Nur Cahyo	IRRI
Ms	Dr	Fetrina	Oktavia	IRRI
Mr	Dr	Eric	Penot	CIRAD
Mr	M. Sc.	Muhammad	Risqi Darojat	IRRI
Ms	Pr	Siti	Subandiyah	UGM
Mr	Dr	Aris	Aris Hairmansis	BRIN
Mr	Prof.		Taryono	UGM
Mr	Prof.	Priyono	Priyono Suryanto	UGM
Mr	Ass.Prof.	Eka	Tarwaca Susila Putra	UGM
Mr	M.Sc.	Taufan	Alami	UGM
Mr	Dr	Suroso	Rahutomo	IRRI
Mr	Prof.		Sabaruddin	UNSRI
Mrs		Ratna	Kusbandiyah	Ditjenbun
Mr			Antarès	Ditjenbun
Mr	Dr	Uhendi	Haris	GAPKINDO
Mr	Dr	Andrianto	Ansari	UGM
Mr	Dr	Gede	Wibawa	ITS
Mrs		Syari	Wulan	UNSRI
Mr	Dr. Ir	Charloq		USU
Mr	Dr	Risal	Ardika	IRRI
Mr	S.P., M.Si.	Sahuri		IRRI
Mr	Prof.	Budiadi	Suparno	UGM
Mr	Dr		Widiyatno	UGM

Program of the MSHW3

Day 1	Arrival of participants	
Day 2		Speaker/Moderator/ Facilitator
8:00-8:30	Registration	
8:30-8 :45	Welcome speech	Directorate of Research UGM
8:45-9:45	Session 1. Presentation of materials and specific objectives of the MSHW3	Siti Subandiyah
8 :45-9:15	The RUBIS Initiative: objectives, outputs and perspectives	Pascal Montoro
9:15-9:25	Collective intelligence and facilitation tools used in the MSHW3	Sophia Alami
9 :25-9 :45	Question-answer	
9:45-10:30	Session 2 : Introduction of participants	Sophia Alami, Sigit Ismawanto
10:30-10:45	Tea break	
10:45-14:30	Session 3. Objectification of issues and solutions identified by MSHW2 participants at the level of the value chain to complete the terms of reference	Taryono, Dwi Shinta Agustina
10:45-12:15	S3a. World Café. Enrichment of the value chain and issues/solutions scheme	Sophia Alami, Andrijanto Ansari, Rizqi Darajat, Andi Nur Cahyo
12:15-13:15	Lunch break	
13:15-13:30	Energizer	Andrijanto, Valentina Dwi Suci Handayani
13:30-14:30	S3b. FGD. Validation of rephrased and new issues and solutions, and then identification of cross-cutting issues	Sophia Alami, Taryono
14:30-14:40	Short break	
14:40-17:00	Session 4. Identification of adaptive technical packages for smallholders	Eric Penot, Aris Hairmansis
14:40-14:50	S4a. Presentation of terms of reference from MSHW2 including types of packages	Dwi Shinta Agustina, Eric Penot, Aris Hairmansis
14:40-15:45	Parallel S4b1. FGD. Types of package and pre-design for rubber plantations (typology of clones, cropping systems, harvesting systems)	Eric Penot, Sigit Ismawanto
14:40-15:45	Parallel S4b2. FGD. Types of package and pre-design for associated food crops	Aris Hairmansis, Taryono
15:45-16:00	Tea break	
16:00-17:00	S4c. FGD. Aggregation of rubber and food crops package typologies	Eric Penot, Aris Hairmansis
Day 3		
8:30-11:30	Field visit - PIAT Agrotechnology Innovation Centre of Excellence – UGM	Taryono
11:30-12:45	Lunch break	
12 :45-13 :00	Energizer	Andrijanto, Valentina Dwi Suci Handayani
13:00-17:00	Session 5. Co-design of adaptive technical packages for rubber smallholders based on terms of reference written by stakeholders (including necessary control packages)	Eka Tarwaca Susila Putra, Pascal Montoro
13:00-13:10	S5a. Presentation of S4 focus group conclusions on types of package	Eric Penot, Aris Hairmansis
13:10-14:00	S5b. FGD. Validation of the typology of rubber-annual crop packages	Eka Tarwaca Susila Putra, Pascal Montoro
14:00-15:30	S5c. World café. Description of components for each package typology	Eka Tarwaca Susila Putra, Pascal Montoro, Sahuri, Yekti Asih Purwestri,
15:30-15:45	Tea break	
15:45-17:00	S5d. FGD. Validation of co-designed packages	Eka Tarwaca Susila Putra, Pascal Montoro
Day 4		
8:00-12:00	Field visit at the Bleberan Station	Taryono

12:00-13:00	Lunch break with farmers	
13:00-14:00	Back to Yogyakarta	
14:00-17:00	Session 6. Setting up an experimental design for adaptation trials	Frédéric Gay, Panjisakti Basunanda
14:00-14:15	S6a. Presentation of potential candidate farmers and experimental stations for rubber-food crops adaptation trials	Dwi Shinta Agustina, Fetrina Oktavia, Taryono, Yudishtira Nagraha, Aris Hairmansis
14:15-15:45	S6b. FGD. Participatory trial design to test adaptive technical packages and technology implementation	Frédéric Gay, Panjisakti Basunanda
15:45-16:00	Tea break	
16:00-16:45	S6c. World café. Multicriteria assesment of trials	Andi Nur Cahyo, Taufan Alam, Taryono, Yudishtira Nagraha, Aris Hairmansis
16:45-17:15	S6d. FGD. Validation and « arbitration » of the general scheme of trials	Frédéric Gay, Panjisakti Basunanda
17:15-17:30	Workshop conclusions – Closing remarks	Taryono, Yekti Asih Purwestri
18:00	Workshop dinner in town	
Day 5	Departure	

Miscellaneous

1. Common resources produced by the MSHW2
2. Introduction of the MSHW3

1. The rubber plant breeding program (Actor: PPK)
2. Registration/release of superior varieties (Actors: Ministry of Agriculture)
3. Development of seed source gardens (Actors: PPK, Seed Breeders)
4. Propagation (Actors: Breeders)
5. Certification of seed source gardens (Actors: BPSBTP, Ditjenbun)
6. Plant cultivation (Actors: Farmers and large plantations)
7. Post-Harvest Process (Actors: Farmers and tappers)
8. BOKAR Marketing (Actors: UPPB, Farmer Groups, Cooperatives, Agents)
9. Factory Processing (Actors: Crumb Rubber Factories) and Rubber Finished Goods (Actors: Factories).

II- Identification of limiting factors and solutions as experienced or wished by the stakeholders at the different steps of the value chain an at the interlink between these steps

Four categories of problems, namely

1. plant breeding problems,
2. production of superior planting materials,
3. cultivation of rubber plants
4. downstream marketing of rubber.

Table 1. Problems and solutions for smallholder and industrial plantations

No	Topic	Sub Topics	Problems	Solution
1	Plant Breeding	Human Resource Breeder	<ul style="list-style-type: none"> • The capacity of breeders needs to be increased • Lack of Breeder Human Resources 	<ul style="list-style-type: none"> • Awarding scholarships, education, training, research cooperation • Formal and informal education
		Breeding cycle	<ul style="list-style-type: none"> • A long time 	<ul style="list-style-type: none"> • Looking for new innovations/technologies for breeding, such as tissue culture, molecular marking technology, flowering induction, pollen storage
		Research Funding	<ul style="list-style-type: none"> • Lack / limited research funding for breeding 	<ul style="list-style-type: none"> • Allocation of research funds from the government • Looking for sources of collaborative research funding from third parties such as BPD Karet (CESS)
2	Production of Superior Planting Material	Clone availability	<ul style="list-style-type: none"> • The clone character has not been in line with the expectations of farmers • High-yielding seedlings are not available in farmers (entres and rootstock preparations) 	<ul style="list-style-type: none"> • The need for the selection of clones that are in accordance with the expectations of farmers, such as partylo disease resistance, tapping grooves • The need for clone information according to agro-climatic characters • The presence of demplots in farmers • Create a clone suitability map

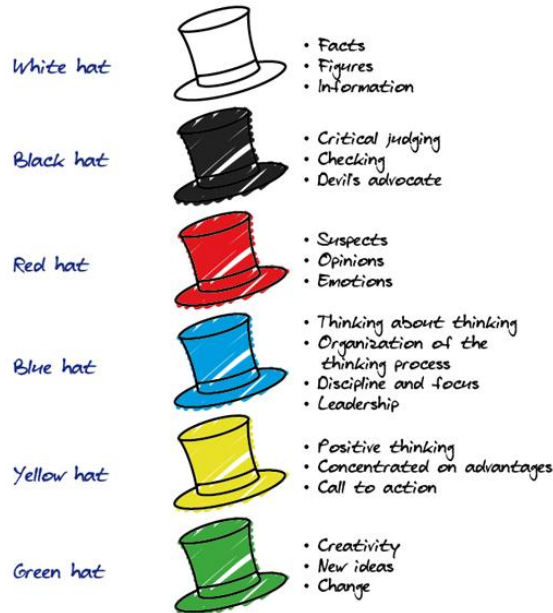
				<ul style="list-style-type: none"> • Building entres and rootstock gardens (garden planning) in rubber centers • Clonal propagation technology, such as somatic embryo (SE)
		Breeding Human Resources	<ul style="list-style-type: none"> • Lack of capacity of captive human resources (SOPs and regulations) 	<ul style="list-style-type: none"> • Provide training and socialization to captives/farmer groups
		Regulation	<ul style="list-style-type: none"> • Implementation of regulations that are not working because they are not in accordance 	<ul style="list-style-type: none"> • Provision of sufficient allocation of funds and adequate human resources
		False seedlings	<ul style="list-style-type: none"> • A lot of circulating seedlings 	<ul style="list-style-type: none"> • Providing knowledge to farmers
3	Rubber Plant Cultivation	Cultivation of rubber plants	<ul style="list-style-type: none"> • Many plants are affected by diseases • Lack of knowledge of farmers about recommended cultivation techniques • Difficulty obtaining fertilizer because it is expensive and scarce 	<ul style="list-style-type: none"> • IPM (effective fungicide, disease-resistant clone) • Providing BimTek to farmers (crop maintenance, disease control) • Strengthening the technology transfer system to farmers • The use of organic materials to become fertilizer • Restoration of fertilizer subsidy regulations for rubber farmers • Integration of plantations and livestock
		Replanting	<ul style="list-style-type: none"> • Rubber replanting financing and TBM period needs • No-burning technology 	<ul style="list-style-type: none"> • Rubber and interstitial plant building package • Sales of rubber wood for rejuvenation
4	Marketing and Downstream of rubber		<ul style="list-style-type: none"> • Low rubber price 	<ul style="list-style-type: none"> • Improving the chain system • Quality system improvement • Create regulations for rubber price guarantees
			<ul style="list-style-type: none"> • Long supply chains • Low raw rubber value-added • Low bokar quality • Low domestic rubber consumption • EUDR policy 	<ul style="list-style-type: none"> • Establishing an organized system (UPPB) • Development of rubber finished goods MSMEs at the farmer level • Quality control from the farmer level to the product • Implementation of SNI bokar at the farmer level • Strengthening the domestic downstream industry • Government regulations are needed in order to prepare EUDR policies, such as land certification

III- Formulation of the feelings and expression of the creativity of the stakeholders

Free expression of opportunities, risks, optimistic (positive points) and pessimistic feelings regarding the future of the rubber sector and the innovation pathways towards a profitable, equitable and sustainable sector.

Bono's hats facilitation approach: pessimistic (negative points) , positive points (optimistic) , creativity/new ideas, facts and organizational issues, opinion/emotions/suspicious

6 thinking hats (Bono)



From this session, several conclusions can be drawn, namely:

Intermediaries still play a big role so that prices in farmers are low.

The level of trust of farmers in institutions. The information received is still low. Lack of socialization of bokar qualities. Changing habits is very difficult at the farmer level to improve yield quality.

Sicom price monitoring.

Price refers to sicom. Farmers should be open to pricing information. Quality will have an impact on competitiveness. Quality improvement must be carried out by farmers. UPPB must be strong to maintain prices as a means of shortening the market chain. Costs will affect prices such as transportation and transport labor. This will have an impact on the price. The government must provide guidance regarding improving the quality of results.

The price of UPPB (institution) is higher at 11,300.

Institutions shorten the market chain so that prices are higher. UPPB is open and transparent based on deliberation

UPPB's expectations are not as appropriate as on the ground.

The role of institutions is the fastest solution and easy to touch by farmers.

The facilities and infrastructure of the institution need to be improved so that the institution becomes more optimal.

Prices at farmers depend on the mill.

The price of factories with middlemen differs greatly. Long chains keep prices low. Why do some factories receive poor quality produce (dirty rubber)? The factory is responsible for this.

IV- First bricks for terms of reference: Co-design of rubber plantation technology packages

4 packages, namely production package, technology transfer package, financing package and regulation package.

Production improvement package includes:

- Superior clones: high productivity, disease resistance, and low frequency tapping
- Fertilizer: NPK fertilizer, organic fertilizer and dolomite
- Control of pests: pesticides (fungicides and insecticides), sulfur, dry control of tapping grooves
- Tools and Agricultural Machinery: Tapping Equipment, Stimulants, Chainsaw, Bush Cutter Freezer, Recommended Freeze/Latex Freezer, Digital Sitting Scale 500 kg
- Land clearing: heavy equipment rental assistance, manually

Technology transfer package :

- Training on rubber crop cultivation (GAP training, grafting, pest control, fertilization according to recommendations, tapping, bokar processing, and postharvest)
- Marketing training
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- HR management training
- Rubber finished goods training
- Comparative study training to finished goods MSMEs
- Traceability training
- Drone pilot training
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- Method Technology Expert: Training, mentoring and visits, Field Schools and Digital Media, Demplot, Acceleration of Dissemination of Agricultural Products, Field Schools)

Financing package

- Rubber BPDP collection
- KUR facility/soft credit
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- Foreign aid (e.g. RUBIS, CIRAD, WWF, ICRAF)
- Partnership assistance (UPPB and spice rubber factory)
- Farmer self-help / farmer group (savings)
- CSR

Regulatory package

- Regulations to make rubber a national strategic commodity so that fertilizer subsidy regulations for rubber plants
- Regulation of fuelless opening through the help of mechanization
- Financing regulations for rubber farmers

The list of the authors of this collaborative work

Participants	Organization / Position	Address
Arifin Pangaribuan	Ditjenbun-Perennial crop	Jakarta
Nur Achmadi	Gapkindo	Palembang
Gede Wibawa	Advisory Committee	Bogor
Wahyudin	Apkarindo	Tangerang
Roizin	UPPB_National	Musi Banyuasin
Jumirin	UPPB_South Sumatera	Sembawa
Havizman, S.P, M.Si	Estate crop agency South Sumatera_Palembang	Palembang
Akbar Paripurna, S.P, M.Si	Estate crop agency_South Sumatera_Muara Enim	Muara Enim
Suratno	Estate crop agency_South Sumatera_Musi Rawas	Musi Rawas
Sahirul Pendi	Farmer_South Sumatera_Muara Enim	Muara Enim
Herman	Farmer_South Sumatera_Musi Rawas	Musi Rawas
Susanti	Estate crop agency_Jambi_Tebo	Tebo, Jambi
Desmarizal, S.P	Estate crop agency_Jambi_Merangin	Merangin, Jambi
Susisno	Farmer_Jambi_Tebo	Tebo, Jambi
Adi Nugroho	Farmer_Jambi_Merangin	Merangin, Jambi
Taryono	UGM	Yogyakarta
Wulan Sari	Unsri	Palembang
Marolop Jerimi Simarmata	RLU	Jakarta
Supriyadi	Smallholder	Tebo, Jambi
Pascal Montoro	Cirad	Montpellier
Fetrina Oktavia	IRRI	Sembawa
Dwi Shinta Agustina	IRRI	Sembawa
Andi Nur Cahyo	IRRI	Sembawa
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Andrea Akbar	IRRI	Sembawa

The collective intelligence facilitation protocole

General principles :

1. make interests converge rather than seek compromises ;
2. each session produces outputs that are the inputs for the following session==> ensuring an incremental construction of a shared vision by the stakeholders , and ending up with an

academic objectification in order to lead to experimental scenarios which respond to the stakes and embody the collective creativity

3. One common and red thread (the driver) : Problems and solutions as viewed and experienced by the stakeholders
 - A hierarchisation (structuration by themes and sub themes) and progressive enrichment with the vision of the stakeholders : innovation tracks, opportunities, risks...
 - a shared vision that will be completed and enriched by the academic vision (« objectification ») to build expérimental protocols under the shape of packages

What are the steps to achieve the objectives (expected results)

1. Drawing a common vision of the value chain and the innovation process : co-design a functional analysis of Rubber value chain. It makes it possible to identify the places in the value chain where improvements are relevant and expected (limiting factors and solutions) and which can be sources of value creation (following sessions 4 and 5)
2. **The limiting factors and solutions (as viewed and experienced by the stakeholders) in rubber smallholdings and industry at the level of the value chain. This will be structured by the facilitator in a participatory manner through a classification** into themes and sub-themes
3. **Innovation tracks with regard to limiting factors and opportunities, risks, new ideas as expressed by the stakeholders**
4. Selection by stakeholders of what they choose to focus on when establishing the terms of reference , paving the way to the definition of experimental packages (in MSHW3)
5. Terms of reference as designed by the stakeholders
6. After the workshop : validation = shared synthesis : validation of the results and further steps

RUBIS
Rubber agroforestry Breeding Initiative for Smallholders

**Rubber agroforestry Breeding Initiative for Smallholders
(RUBIS)**

**Third RUBIS Multi-Stakeholder Workshop
(MSHW3)**

**Designing adaptive technical packages for a sustainable rubber
and food production by smallholders in a context of climate change**


Pascal Montoro
Yogyakarta, November 28, 2023



RUBIS
Rubber agroforestry Breeding Initiative for Smallholders

Content of the presentation

1. Background information
2. RUBIS Initiative
3. Overview of RUBIS project activities
4. Participatory approach and Muti-Stakeholder Workshops



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RUBIS
 Rubber agroforestry Breeding Initiative for Smallholders

Socio-economic issues affecting natural rubber sector

Low farmers' income

- Low rubber price
- Low land and labour productivity in particular in Indonesia

Decrease in rubber production since 2017 affecting rubber processing plants

- Low productivity (old plantation, diseases, TPD, low quality of planting material, etc.)
- Conversion into more profitable crops (oil palm, sugarcane, etc.)
- Outbreak of a new disease in 2016 (Pestalotiopsis), and other leaf fall and root diseases
- Covid-19 pandemic from 2020

Evolution Of Rubber Price 2009 -2022

There is a concerning trend that the future of the Indonesian rubber industry may be in a long-term decline if existing condition & policy environment persists.

Gabungan Petani Kecil Indonesia
 Rubber Association of Indonesia
 www.gppindo.org

Productivity (kg/ha/y)

Country	Productivity (kg/ha/y)
Indonesia	~1100
Malaysia	~1500
Thailand	~1800
Vietnam	~1700

RUBIS
Rubber agroforestry Breeding Initiative for Smallholders

Climate and environmental issues


Climate change is changing precipitation, temperature, and wind patterns

- Flooding and dry season (higher frequency and intensity of El Nino / La Nina)
- Higher mean temperature
- Wind damage
- Diseases

- Already impacts rubber production and threaten the survival of plantations
- Questions the evolution of areas suitable for rubber plantations
- Adaptation of rubber sector to climate change

Environmental issues

- Deforestation (in some countries)
- Loss of biodiversity
- Pollution – Waste of rubber factories



RUBIS
Rubber agroforestry Breeding Initiative for Smallholders

What impact will the European Union Deforestation Regulation (EUDR) have on the rubber industry?

EUDR – Tackling deforestation and forest degradation in supply chains

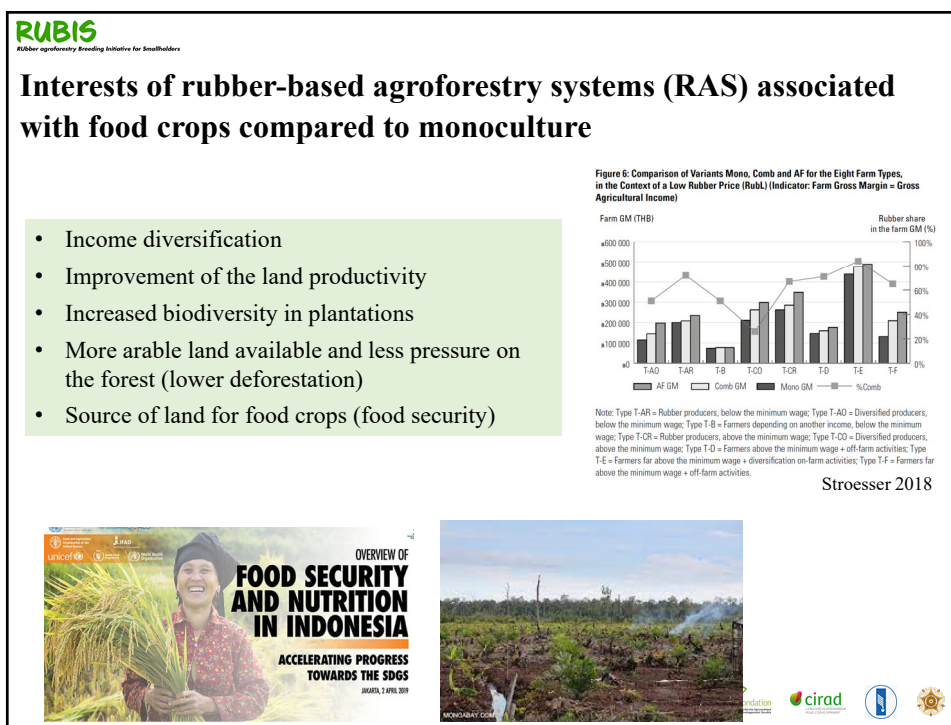
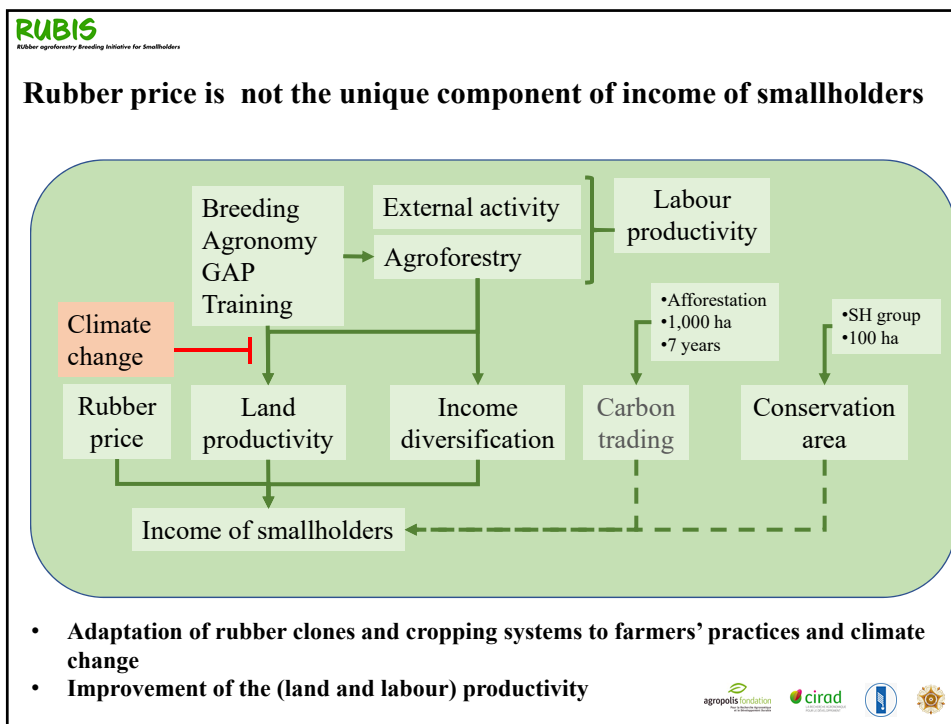
The EU's new Deforestation Regulation requires companies trading in **cattle, cocoa, coffee, oil palm, rubber, soya and wood**, as well as products derived from these commodities, to conduct extensive diligence on the value chain to ensure the goods do not result from recent (post 31 December 2020) deforestation, forest degradation or breaches of local environmental and social laws. Companies should consider now the impact of the EUDR on their supply chain due diligence to prepare for the new obligations that apply from 30 December 2024.

Definition of the deforestation

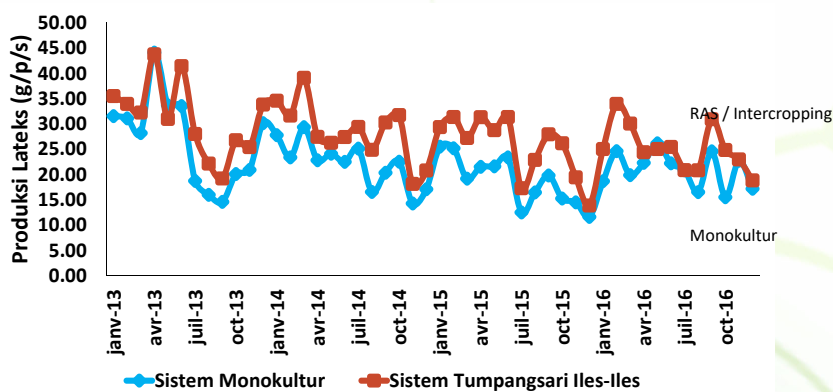
- Deforestation is defined in Article 2 (3) as “conversion of forest to agricultural use.”
- “If the woody vegetation has or is expected to surpass more than 10% canopy cover of tree species with a height or expected height of 5 m or more, it should be classified as “forest”, based on the FAO definition. E.g. young stands that have not yet but are expected to reach a crown density of 10 percent and tree height of 5 m are included under forest, as are temporarily unstocked areas, whereas the predominant use of the area remains forest.”

- **What about converting the low-productive jungle rubber?**
- **About 14% of exportation to EU (direct or through other countries (India, China, etc.)**
- **Similar regulation from other consumer countries (USA, UK, Japan)**
- **Traceability**





Comparison of the rubber monoculture and RAS



Sumber : Sahuri, 2019

RUBIS
MULTI-STAKEHOLDERS WORKSHOP

RUBIS

Rubber agroforestry Breeding Initiative for Smallholders

Rubber-based agroforestry systems as sustainable solution


Rubber agroforestry Breeding Initiative for Smallholders (RUBIS) promotes the resilience of smallholders facing socioeconomic and climate issues through the development of:

- **Efficient Rubber-based Agroforestry Systems (RAS)**
 - Income diversification
 - High productivity of plantations
- **Food intercrop**
 - Food security
 - Land use optimization & overcome deforestation
- **Sustainable agriculture**
 - Low chemical inputs, soil fertility
 - Ecosystem services (biodiversity, carbon sequestration, water cycle)

RUBIS
Rubber agroforestry Breeding Initiative for Smallholders

Content of the presentation

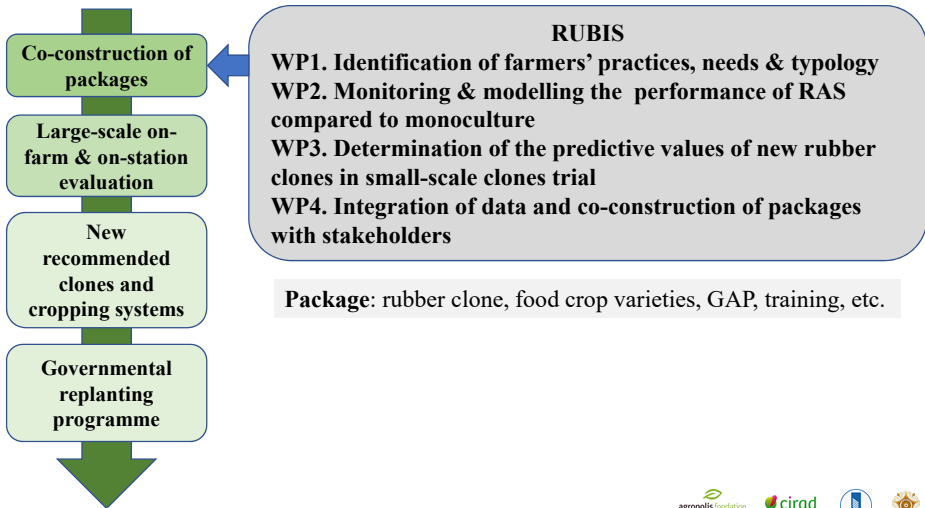
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RUBIS
Rubber agroforestry Breeding Initiative for Smallholders

RUBIS (2021-2024)

RUBIS funded by Agropolis Foundation and co-partners (CIRAD, IRRI, UGM)




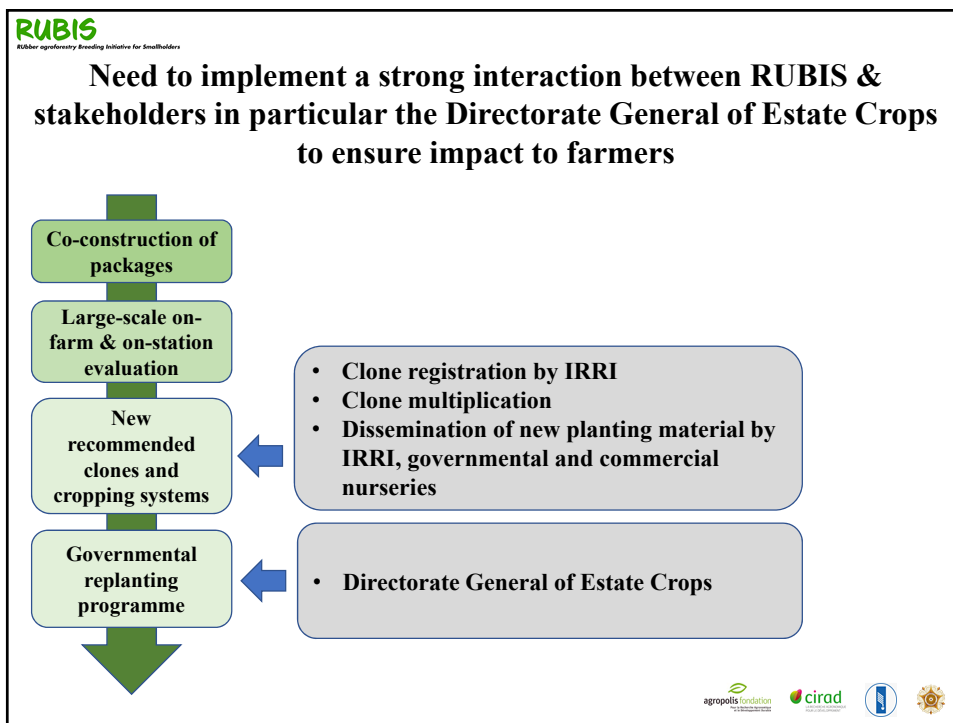
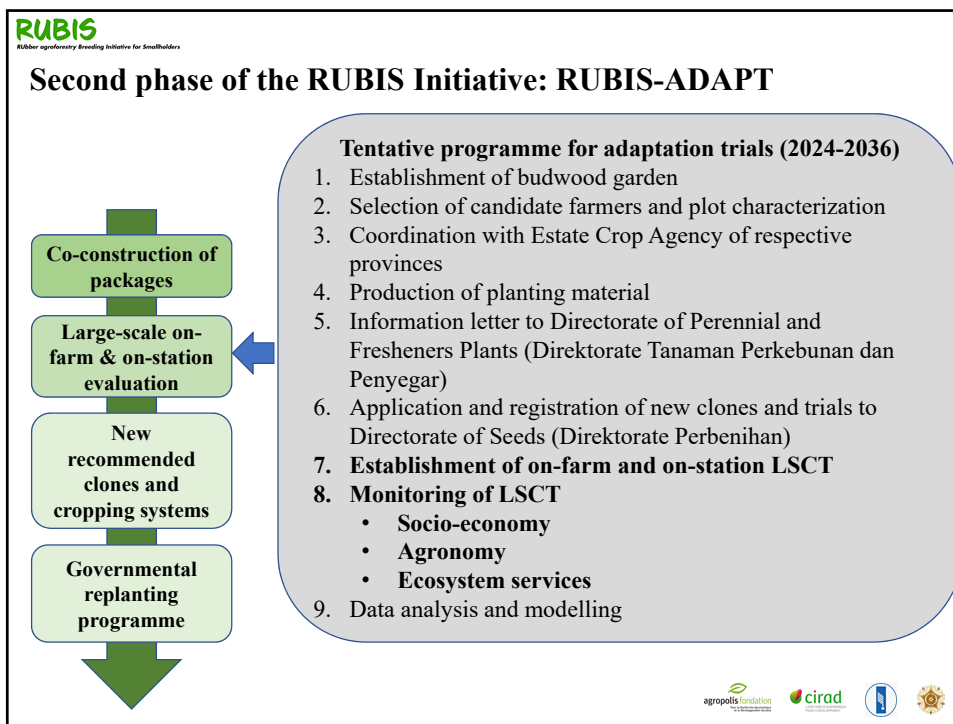
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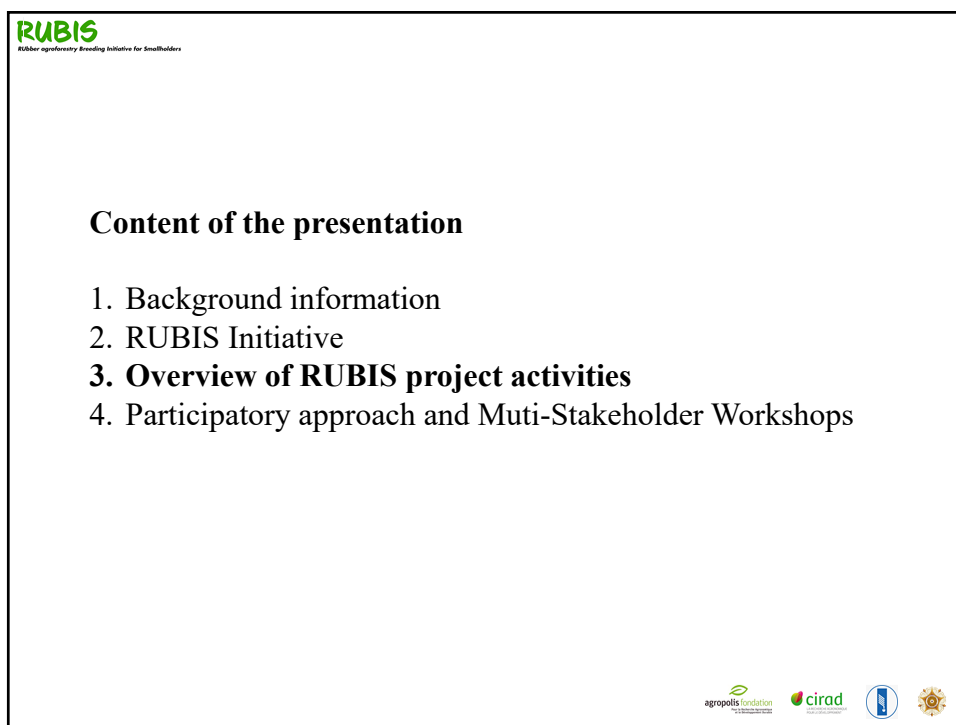
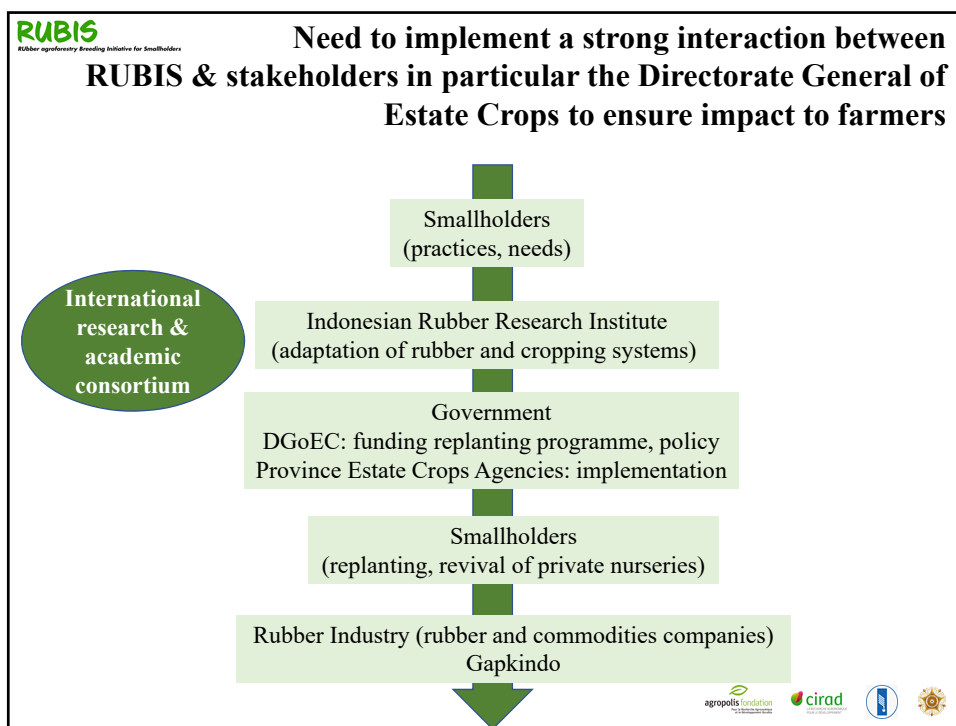
- WP1. Identification of farmers' practices, needs & typology
- WP2. Monitoring & modelling the performance of RAS compared to monoculture
- WP3. Determination of the predictive values of new rubber clones in small-scale clones trial
- WP4. Integration of data and co-construction of packages with stakeholders

Package: rubber clone, food crop varieties, GAP, training, etc.

The flowchart on the left shows a vertical sequence of four green boxes connected by downward arrows: 'Co-construction of packages', 'Large-scale on-farm & on-station evaluation', 'New recommended clones and cropping systems', and 'Governmental replanting programme'. A large green arrow points downwards from the bottom box. A blue arrow points from the 'Co-construction of packages' box to the 'RUBIS' box.







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Main RUBIS Project activities

WP1

- Farm survey in South Sumatra, Jambi and North Sumatra provinces (300 farmers)
- RUBIS International Workshop on the Resilience of Rubber-based Agroforestry Systems in the Context of Global Change. E3S Web of Conferences (10.1051/e3sconf/202130501001)

WP2


- Double row with wide spacing RAS associated with shade-tolerant rice varieties from BRIN
- Literature analysis on RAS associated with food crops
- Training on Biofuntool and trial to monitor soil health in monoculture and RAS

WP3

- Multidisciplinary phenotyping of a biparental population using early selection methods for latex production potential, disease resistance, TPD tolerance, wood production, drought tolerance
- Genetic analysis of agronomic and physiological traits using high-density map and high-quality genome sequence of clone PB 260

WP4

- First RUBIS Multi-Stakeholder Workshop (Hybrid, Sembawa, 16/11/2022)
- Coordination with stakeholders (2022-2023)
- Second RUBIS Multi-Stakeholder Workshop (Sembawa, 7-8/11/2023)
- Third RUBIS Multi-Stakeholder Workshop (Yogyakarta, 28-30/11/2023)



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WP1 Socio-Economy Team



Dwi Shinta Agustina, IRRI



Fetrina Oktavia, IRRI



Afrizal Alamsyah, IRRI



Abi Pratiwat Siregar, UGM



Bénédicte Chambon, CIRAD



Eric Penot, CIRAD



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Activity 1.2 Identification of the stakeholders' demand and need, and local knowledge

Focus Group Discussion (FGD)
Estate crops and farmers group




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Activity 1.2 Identification of the stakeholders' demand and need, and local knowledge

Interview with smallholders
KOBOTOOLBOX Application




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Activity 1.2 Identification of the stakeholders' demand and need, and local knowledge


Rubber Intercropping system at smallholder's level in Muara Enim and Musi Rawas




Rubber intercrop with vegetables



Rubber intercrop with pineapples




Rubber intercrop with oil palm nursery (wide row spacing)





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Activity 1.2 Identification of the stakeholders' demand and need, and local knowledge

Rubber Intercropping system at smallholder's level in Merangin District



Rubber intercrop with paddy



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Activity 1.2 Identification of the stakeholders' demand and need, and local knowledge

Rubber Intercropping system at smallholder's level in Merangin District, Jambi



Rubber intercropping with jernang (rattan species, fruit harvested)



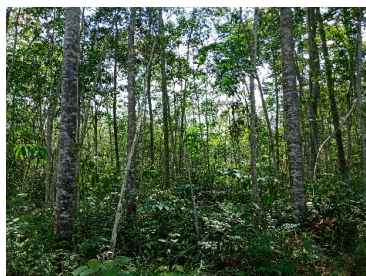
Rubber intercropping with porang

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Activity 1.2 Identification of the stakeholders' demand and need, and local knowledge

Rubber Intercropping system at smallholder's level in Muaro Bungo District, Jambi



Rubber Agroforestry system with Meranti in Sepunggur Village, Muara Bungo (RAS project in 1996)



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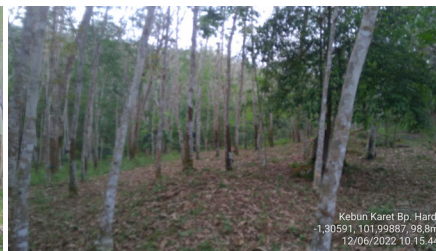
Rubber agroforestry Breeding Initiative for Smallholders

Activity 1.2 Identification of the stakeholders' demand and need, and local knowledge

Rubber Intercropping system at smallholder's level in Tebo District, Jambi



Rubber with Gaharu



Rubber with Pulai

- One farmer's group (Gapoktan Sari Mulyo) rubber plantation area get the certification from German foundation, named FSC (Standard Forest Stewardship) : 600 ha
- There is a partnership of smallholders with rubber wood factory

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Activity 1.2 Identification of the stakeholders' demand and need, and local knowledge

Langkat and Deli Serdang District



- All respondents implementing **agroforestry**, and the most likely associate plant is **durian**. This is because they benefited from the fruits, which have a relatively stable price and permanent buyers.
- Plants associated with rubber: durian, coconut, papaya, and palm tree.



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Farm survey - Age of Respondents

Age (years)	No. Respondents (persons)	Percentage (%)
29 – 39	23	15.9
40 – 50	52	35.9
51 – 61	48	33.1
>61	22	15.1
Total	145	100

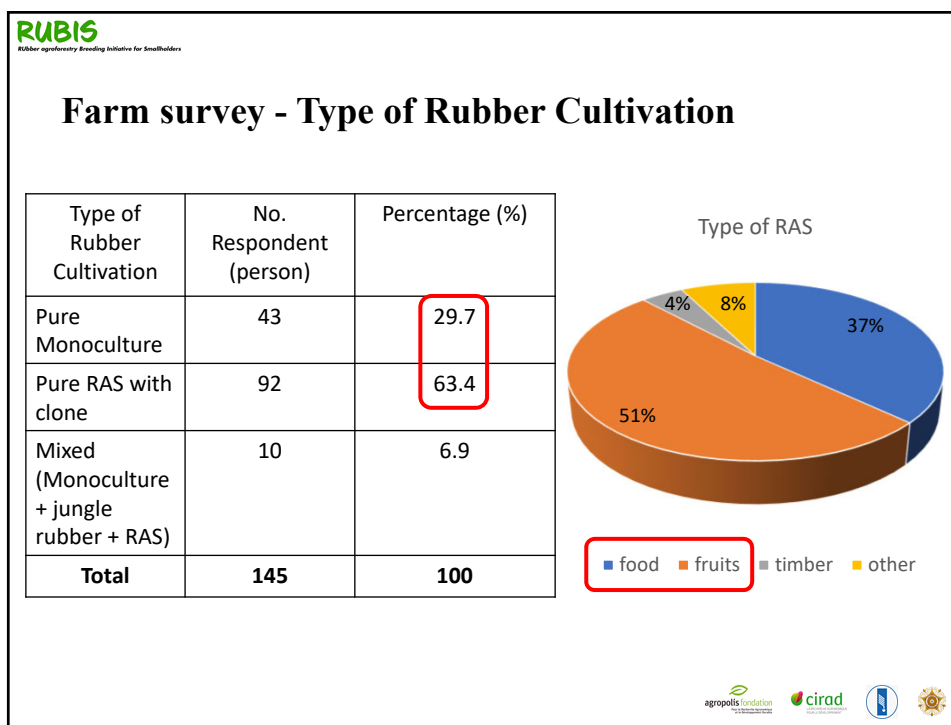
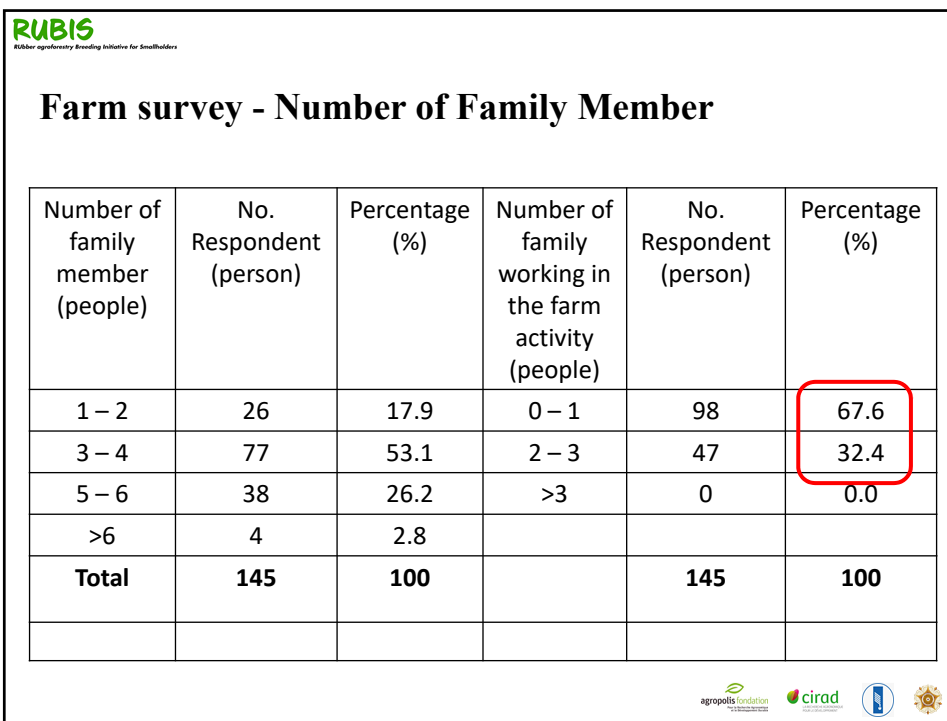
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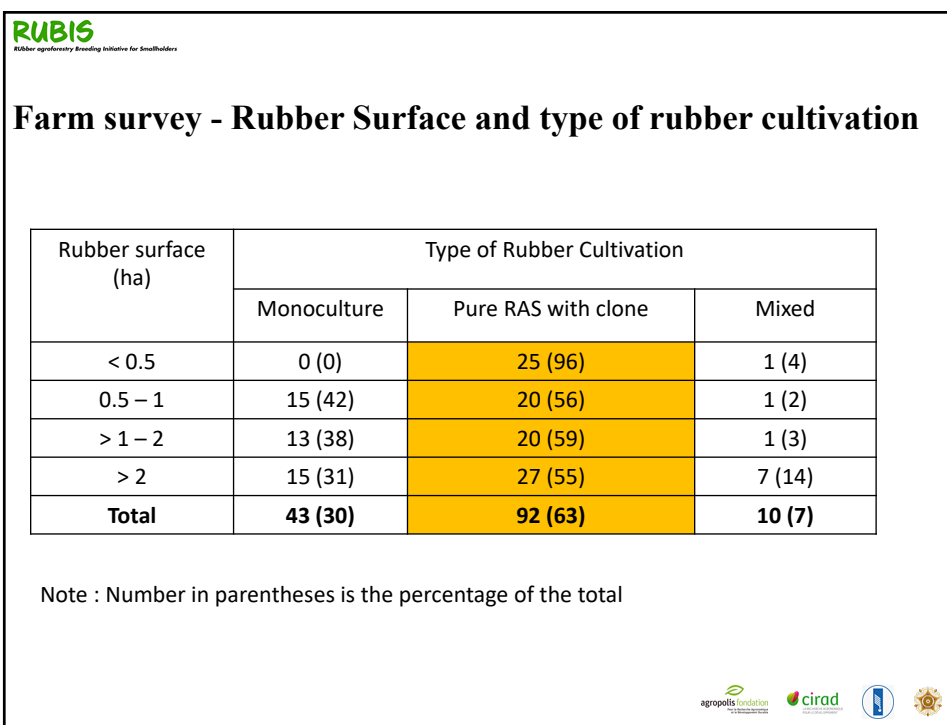
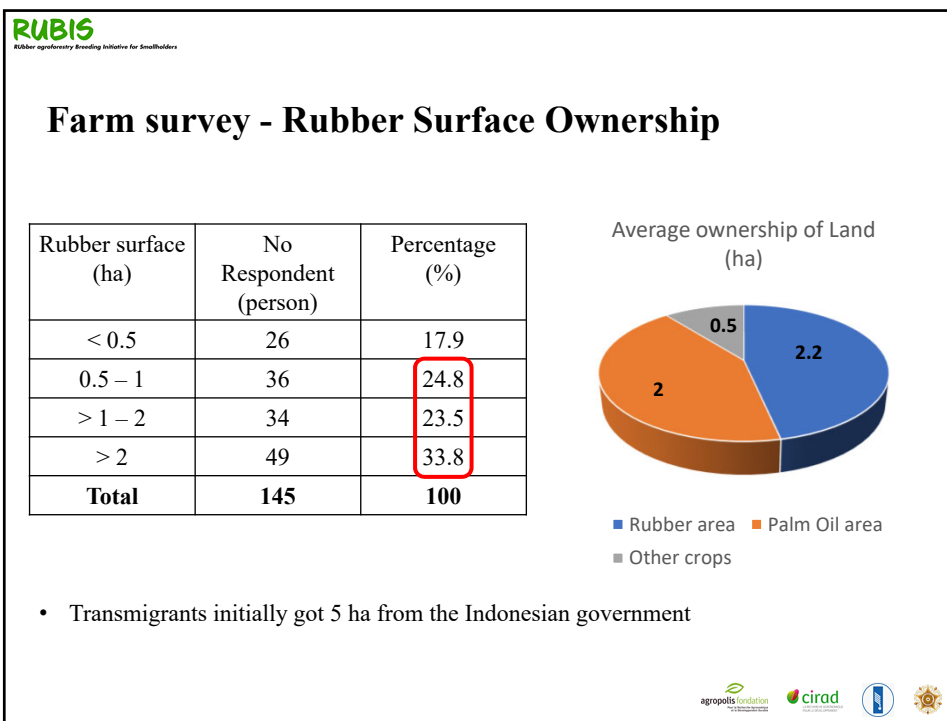
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Farm survey - Education Level of Respondents

Education Level	No. Respondents (persons)	Percentage (%)
Never go to school	4	2.8
Not complemented elementary school	7	4.8
Complemented elementary school	22	15.2
Primary school	31	21.4
Senior high school	74	51.0
University	7	4.8
Total	145	100

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Typology based on rubber producing area

Rubber Producing Area (ha)	Total rubber area (ha)	On-farm income (Rp/year)			Off-farm income (Rp/year)	Total Income (Rp/year)	Total expenses (Rp/year)
		Rubber Income	Non-Rubber Income	Rubber + Non-rubber income			
< 0.5 ha	0.24	7,491,985	20,180,923	17,582,446	19,194,000	26,441,215	17,932,985
0.5-1 ha	0.89	16,228,389	51,312,857	26,205,889	15,297,333	32,579,778	20,793,222
1-2 ha	1.85	26,422,338	18,100,000	31,745,868	32,454,667	46,064,103	33,384,809
>2 ha	4.39	52,161,786	25,397,444	61,491,459	23,876,923	74,160,847	48,574,286

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Typology based on Level of Diversification

Level of Diversification	Total rubber area (ha)	On-farm income (Rp/year)			Off-farm income (Rp/year)	Total Income (Rp/year)	Total expenses (Rp/year)
		Rubber Income	Non-Rubber Income	Rubber + Non-rubber income			
Rubber income 100%	2	33,183,927	-	33,189,135	-	33,189,135	20,960,490
Rubber income <50%	2	15,764,117	41,792,880	37,531,242	32,593,000	61,975,992	43,238,992
Rubber income 50-70%	2	31,486,526	17,243,750	38,747,053	19,600,000	51,126,000	33,806,105
Rubber income 71-99%	3	42,851,683	5,476,714	45,407,483	7,943,000	50,702,817	33,538,200


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WP2 Agronomy Coordination Team

Andi Nur Cahyo, IRRI Radiate Tistama, IRRI Frédéric Gay, CIRAD Risal Ardika, IRRI Siti Subandiyah, UGM



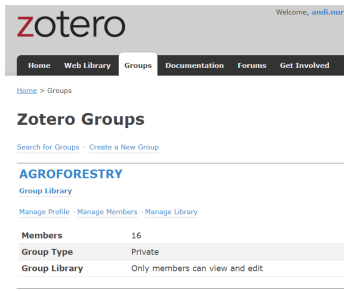
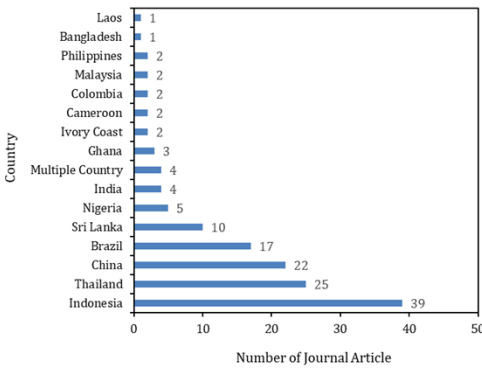
Yekti Asih Purwestri, UGM




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Activities of RUBIS WP2

Drafting a review paper about rubber agroforestry systems associated with food crops
 Collection of 415 references, reports, Master-PhD thesis, etc.
 Stored in Zotero Group Online Library

Country	Number of Journal Article
Laos	1
Bangladesh	1
Philippines	2
Malaysia	2
Colombia	2
Cameroon	2
Ivory Coast	2
Ghana	3
Multiple Country	4
India	4
Nigeria	5
Sri Lanka	10
Brazil	17
China	22
Thailand	25
Indonesia	39



Double row with wide spacing system during immature and mature periods



RUBIS
MULTI-STAKEHOLDERS WORKSHOP

Recommended clones and associated crops for RAS



References : Budi et al., 2008 ; Sahuri et al., 2019


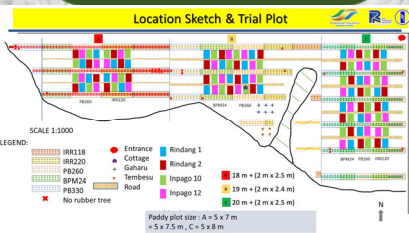
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RAS Karet dan Padi Ladang

2021 : Percobaan RAS 5 klon karet (IRR 118, IRR 220, PB 260, BPM 24 and PB 330) dengan 4 varietas padi tahanan naungan (Rindang 1, Rindang 2, Inpago 10 dan Inpago 12)

- 2022-2023 : Penyiapan *concept note* tentang *rubber agroforestry system*

Location Sketch & Trial Plot


SCALE 1:1000

LEGEND:

- IRR118
- IRR220
- PB260
- BPM24
- PB330
- Entrance
- Cottage
- Gubaru
- Tembusu
- Road
- Rindang 1
- Rindang 2
- Inpago 10
- Inpago 12
- No rubber tree

Paddy plot size: A = 5 x 7 m
= 5 x 7.5 m, C = 5 x 8 m

18 m = (2 m x 2.5 m)
19 m = (2 m x 2.4 m)
20 m = (2 m x 2.5 m)




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WP3 team

Breeding, genetics and genomics
Fetrina Oktavia, Indonesian RRI
Sigit Ismawanto, Indonesian RRI
André Clément-Demange, CIRAD
Vincent Leguen, CIRAD
David Lopez, CIRAD
Pascal Montoro, CIRAD

Latex physiology
Sigit Ismawanto, IRR
Martini Aji, Indonesian RRI
Junaidi, Indonesian RRI
Imron, Indonesian RRI
Gilles Chaix, CIRAD
Eric Gohet, CIRAD ABSys
Albert Flori, CIRAD, ABSys
Tri Rini Nuringtyas, UGM
Pascal Montoro, CIRAD



Genotyping platform
Pierre Mournet, CIRAD
Aurore Manez, CIRAD
Ronan Rivallan, CIRAD
Hélène Vignes, CIRAD



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WP3. Agronomic and physiological traits associated with latex and wood production

<p>Girth at 150 cm Soil Moisture Content Weather data Every month</p>	<p>Latex Yield S2d3 2021 S2d1+Et 2.5% 12x/y2022</p>	<p>Latex Diagnosis Every April</p>	<p>Dry Cut Length (DCL) Every 3 month S2d3 2021 Every month S2d1+Et 2.5% 12x/y 2022</p>

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WP3. Collection and preservation of strains for major pathogens (Colletotrichum, Corynespora, and Pestalotiopsis) for conducting bioassays

<p>3 strain of <i>C. cassicola</i> isolates</p>	<p>3 strain of <i>Colletotrichum</i> isolates</p>	<p>3 strain of <i>Pestalotiopsis</i> isolates</p>

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Performance of 8 control rubber clones and 189 genotypes from the biparental population PB 260 x SP 217

Head of table of the classification of clones and genotypes according to various agronomic and physiological variables


GEN	TPD		GIRTH		YIELD				CARBON SOURCE AND ENERGY				CLONAL TYPOLOGY			PESTALOTIOPSIS				
	DCL2252	G21	G22-21	Y21	Y22-21	TSC21	TSC22	TSC21-22	Suc21	Suc21-22	PI21	PI22	PI22-21	Suc Load	Met	ET stim	NewTypo	PE-FO	PE-212	PE-GT
AV2037	4	2	2	1	2	6	5	5	5	3	4	3	3	H	M	H	H-M	1	#N/A	#N/A
GT1	3	1	1	2	3	2	4	2	6	6	2	2	4	H	ML	VH	H-ML	4	#N/A	#N/A
IRR112	3	2	3	4	4	6	4	6	6	4	5	5	4	H	M	H	H-M	2	#N/A	#N/A
IRR39	3	4	5	3	5	4	3	5	6	6	2	4	5	H	ML	VH	H-ML	2	4	4
PB260	5	4	2	6	4	4	5	2	1	1	6	6	1	L	H	VL	L-H	4	4	4
PR261	4	1	1	1	2	6	3	6	3	3	5	3	2	M	ML	H	M-ML	4	2	4
RRIC100	3	3	1	4	4	4	2	5	4	4	2	4	5	H	ML	VH	H-ML	4	#N/A	#N/A
SP217	2	6	4	5	6	5	4	4	4	4	4	6	6	H	M	H	H-M	#N/A	#N/A	#N/A
G001	6	5	2	4	3	5	6	2	1	1	3	2	3	L	M	L	L-M	3	3	2
G002	6	3	3	4	2	2	1	4	3	3	5	3	2	M	MH	L	M-MH	1	1	1
G003	2	4	3	5	4	3	3	4	1	2	5	6	4	L	MH	VL	L-MH	3	4	4
G004	1	2	2	5	3	3	3	4	2	3	2	3	4	L	ML	M	L-ML	3	3	1
G005	4	3	3	1	3	3	4	4	4	5	2	3	4	M	M	M	M-M	4	1	1
G006	4	3	3	3	5	4	3	5	3	3	3	6	6	L	M	L	L-M	1	4	3
G007	6	4	2	1	1	4	5	3	2	3	2	3	5	L	ML	M	L-ML	1	2	3
G009	6	6	6	3	4	3	3	4	4	3	1	1	2	M	L	VH	M-L	3	3	4
G010	5	2	3	3	1	2	5	1	3	3	5	1	1	M	M	M	M-M	2	#N/A	#N/A
G012	4	3	2	2	3	4	4	5	5	6	2	3	4	H	ML	VH	H-ML	4	1	2
G013	5	4	5	4	2	2	5	1	3	3	4	3	1	L	M	L	L-M	3	3	1

➤ Selection of genotypes according to the terms of reference and specifications co-designed during the MSHW2 and MSHW3

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Development of high-throughput analysis of latex diagnosis for further monitoring of adaptation trials



Training of Application of NIRs for latex diagnosis
 26-30 Sept 2022

- Develop the NIR for latex diagnosis through combine NIR and latex diagnosis of latex samples data of SSCT-1 and PT2 trial
- A significant correlation has been established between NIRs spectra and the total solid content in latex





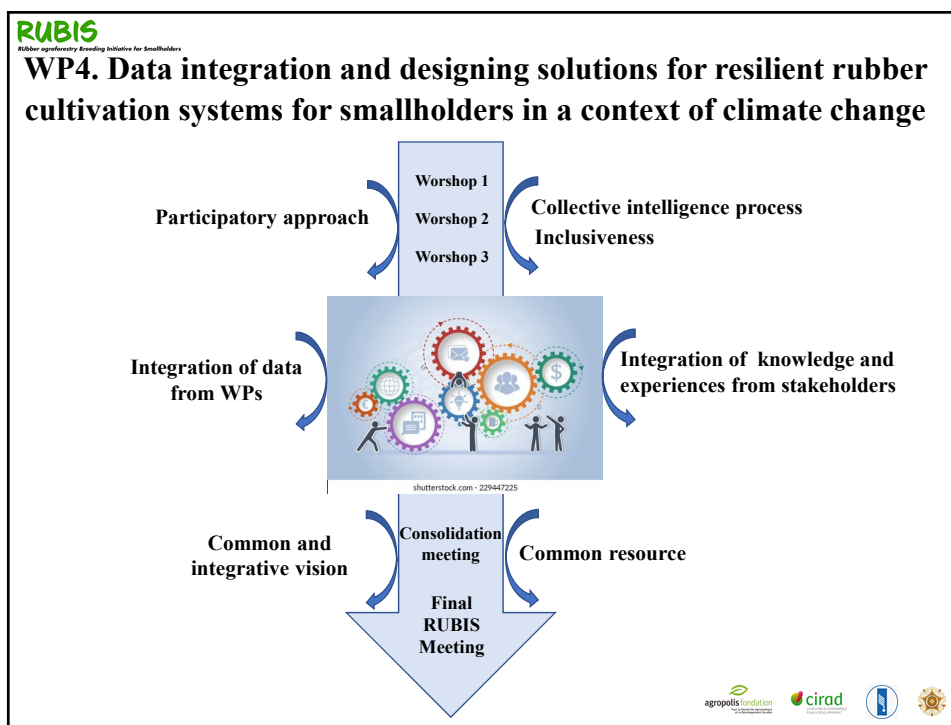
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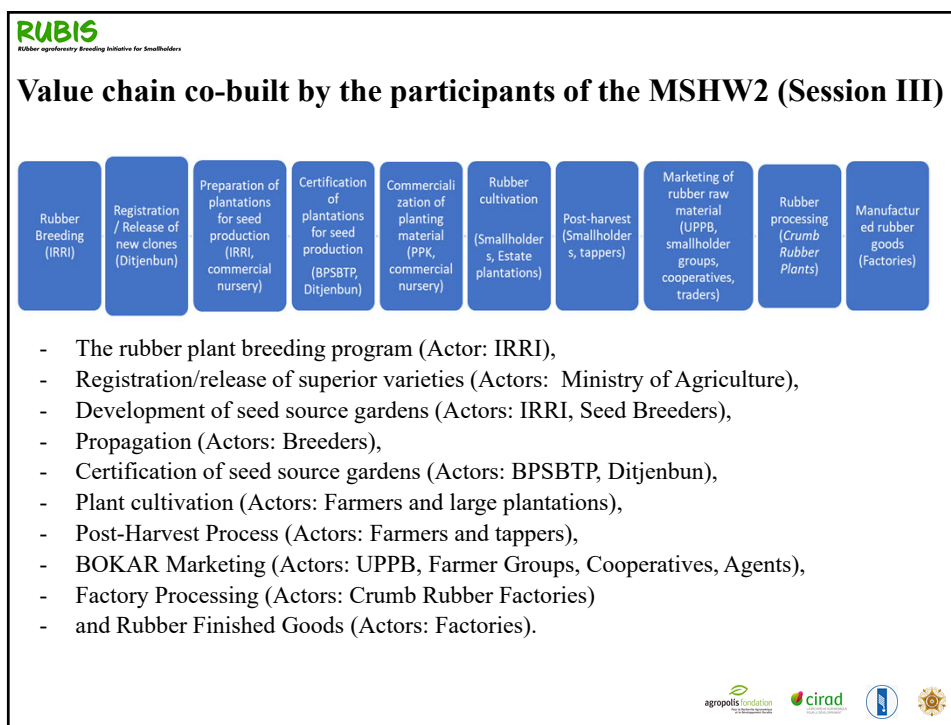
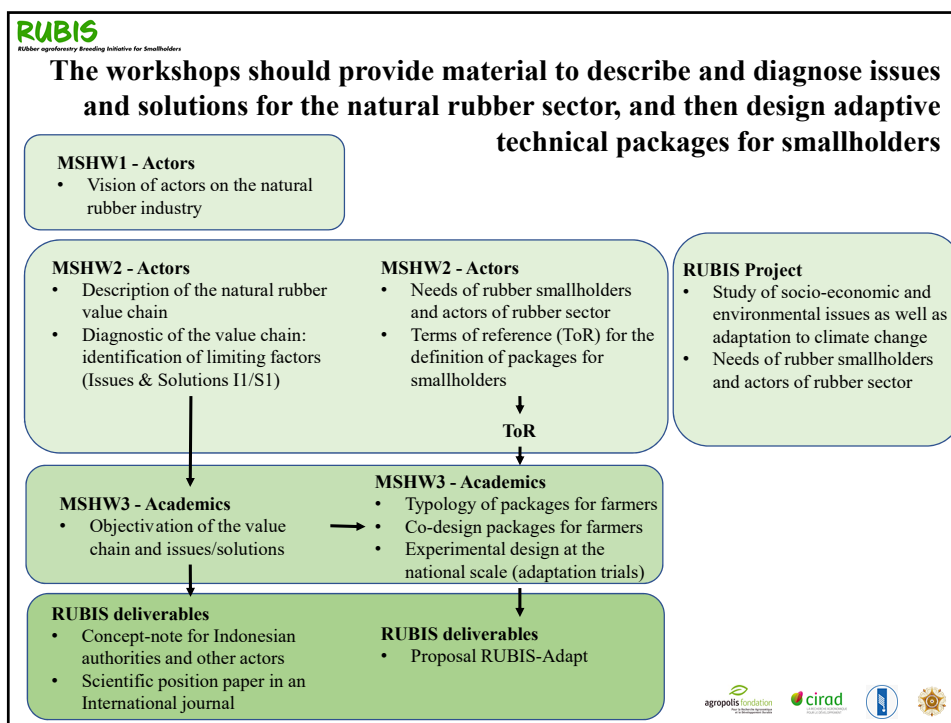
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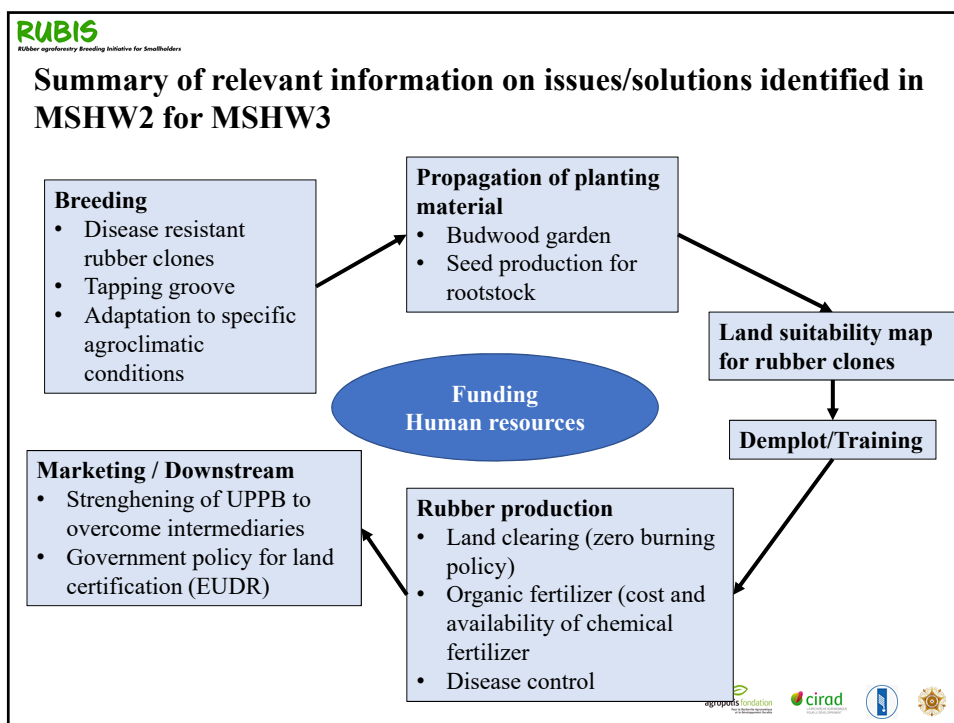
Content of the presentation

1. Background information
2. RUBIS Initiative
3. Overview of RUBIS project activities
4. **Participatory approach and Multi-Stakeholder Workshops**

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Considerations for defining package typology

MSHW2	Rubber	Associated crops
Four packages <ul style="list-style-type: none"> • Production improvement • Technology transfer • Financing • Regulatory package 	<ul style="list-style-type: none"> • Cropping system (monoculture, single row (SR) and double row (DR) RAS, partial conversion of existing monoculture into RAS) • Harvesting system (high to low tapping intensity): d1, d3+ET, d6/d7+ET 	<ul style="list-style-type: none"> • Commodities • Subsistence vs industrial products • Local practices and market • Shade adapted crops and varies for single row RAS • Other crops and varieties for double row RAS
MSHW2 discussion <ul style="list-style-type: none"> • Not great interest in food crops for Sumatra smallholders • Partial conversion of rubber plantation with oil palm 	<div style="border: 2px solid blue; border-radius: 50%; padding: 20px; width: fit-content; margin: 0 auto;"> <p>Local practices and markets as a focal point for defining package types?</p> </div>	
WP1 farm survey RAS+food crops (37%) RAS+fruit trees (51%)		

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Tentative list of package components for on-station and on-farm adaptation trial

1. Land clearing methods
2. Planting material (rubber, food crop seeds, etc.)
3. Crop management (cropping system, fertilizers, food crop rotation, other associated, etc.) crops, etc.)
4. Training
5. Funding
6. Etc.

The map shows the island of Sumatra and parts of neighboring regions. Callouts indicate the following locations:

- North Sumatra Province**
 - Sungei Putih RC
 - Langkat district
 - Deli Serdang
- Riau Province**
 - Sei Kijang Riau Station
- Jambi Province**
 - Merangin
 - Bungo
 - Tebo
- South Sumatra Province**
 - Sembawa RC
 - Muara Enim District
 - Musi Rawas
 - Muara Enim, South Sumatra

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MSHW3 Program

Day 1 – Tuesday 28 November

- Session 1. Presentation of materials and specific objectives of the MSHW3
- Session 2 : Introduction of participants
- Session 3. Objectification of issues and solutions identified by MSHW2 participants at the level of the value chain to complete the terms of reference
- Session 4. Identification of adaptive technical packages for smallholders

Day 2 – Wednesday 29 November


- Field visit - PIAT Agrotechnology Innovation Centre of Excellence – UGM
- Session 5. Co-design of adaptive technical packages for rubber smallholders based on terms of reference written by stakeholders (including necessary control packages)

Day 3 – Thursday 30 November


- Field visit at the Bleberan Station
- Session 6. Setting up an experimental design for adaptation trials

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ACKNOWLEDGEMENTS




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 Pour la Recherche Agronomique
 et le Développement Durable




LE GRAND PLAN
 D'INVESTISSEMENT



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 LA RECHERCHE AGRONOMIQUE
 POUR LE DÉVELOPPEMENT



Indonesian Rubber Research Institute







Universitas Gadjah Mada

Project Advisory Committee

- Dr Gede Wibawa, IRRI
- Dr Vincent Gitz, Dir FTA, CIFOR
- Mr Gunawan, Directorate of Seeds
- Mr Uhendi Haris, Gapkindo
- Mrs Alexia Hofmann, AFD

TERIMA KASIH - THANK YOU - MERCI

NOTES

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