RUBIS
RUbber agroforestry Breeding Initiative for Smallholders

RUbber agroforestry Breeding Initiative for Smallholders (RUBIS)

Kick-Off Meeting
11 January 2020

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RUBIS
RUbber agroforestry Breeding Initiative for Smallholders

Meeting agenda

France	Indonesia		
8:30-8:45	14:30-14:45	**Welcome to ZOOM videoconference system organized by IRRI**	
8:45-9:35	14:45-15:35	**Opening session**	Moderator: Ms Arini Wahyu Utami
8:45	14:45	Welcome speech: RUBIS project challenges	Mr Pascal Montoro, UMR AGAP, CIRAD
8:55	14:55	Introductory remarks: Agriculture-based solutions and participatory science	Ms Marie-Christine Cormier-Salem, Director of Agropolis Foundation
9:05	15:05	Introductory remarks: Biodiversity and food security in Indonesia	Mr Panut Mulyono, Rector of UGM
9:15	15:15	Introductory remarks: Improving smallholder rubber farmer income through agroforestry system	Mr Edy Suprianto, Director of IRRI
9:25	15:25	Introductory remarks: Addressing the resilience of plantation landscapes	Mr Alain Rival, CIRAD Regional Director for Southeast Asian island countries
9:35-11:20	15:35-17:20	**Workpackage session**	Moderator: Mr Thomas Wijaya
9:40	15:40	WP0 - Coordination, activity monitoring & management of the interdisciplinarity	Ms Siti Subandiyah, Biotec RC, UGM
10:00	16:00	WP1 - Co-construction of varietal and cropping system ideotypes adapted to smallholders	Ms Dwi Shinta Agustina, IRRI
10:20	16:20	WP2 - Understanding and modelling the performances of rubber-based agroforestry systems in contrasting environments	Mr Frédéric Gay, UMR ABsys, CIRAD
10:40	16:40	WP3 - Determination of the predictive value of *Hevea* genetic resources in Indonesia	Ms Fetrina Oktavia, Sembawa RC, IRRI
11:00	17:00	WP4 - Data integration and designing solutions for resilient rubber cultivation systems for smallholders in a context of climate change	Mr Pascal Montoro, UMR AGAP, CIRAD
11:20-11:25	17:40-17:50	**Conclusion**	Moderator: Mr Thomas Wijaya
11:20	17:40	Conclusion remarks from the RUBIS Project Advisory Committee	Mr Gede Wibawa, Member of the Advisory Committee

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Welcome speech: RUBIS project challenges

Pascal Montoro, CIRAD, RUBIS Project Leader

Ms Arini Wahyu Utami, moderator of this opening session,

Ms Marie-Christine Cormier-Salem, Director of Agropolis Foundation

Mr Panut Mulyono, Rector of UGM

Mr Edy Suprianto, Director of IRRI

Mr Alain Rival, CIRAD Regional Director for Southeast Asian island countries

Members of the Advisory Committee: Mr Gede Wibawa (IRRI), Mr Uhendi Haris (Gapkindo), Ms Hafiza (Directorate of Estate Crops), Dr Vincent Gitz (CIFOR)

Dear members of the RUBIS Project

Ladies and gentlemen,

It is my privilege to address you, on behalf of the RUBIS Project Coordination Team, and welcome the participants to this Kick-off meeting of the RUBIS Project.

We all worked together early in 2020 to draft and submit to the Agropolis Foundation a proposal entitled "RUbber agroforestry Breeding Initiative for Smallholders". As soon as our proposal was selected for funding, a coordination team including several members of our respective organizations Agropolis Foundation, CIRAD, IRRI and UGM have worked hard to make this project ready on time. I would like to specially thank: Prof Siti Subandiyah, Dr Fetrina Oktavia, Dr Arini Wahyu Utami, Prof Budiadi, Dr Thomas Wijaya, Dr Eric Penot, Ms Dwi Shinta Agustina, Dr Radite Tistama, Dr Frédéric Gay, Ms Océane Trevennec, Ms Claire Durot, Ms Florence Chazot, Mr Imade Yoga Prasada and Mr Matthieu Fargeas for preparing all legal and scientific documents, which should be signed by our respective managements soon.

This project is the fruit of a long-term French-Indonesian collaboration especially between IRRI and CIRAD on latex physiology and genetics, but also between IRRI, ICRAF and CIRAD on rubber-based agroforestry systems, and more recently with UGM on omics technology and the development of new markers for latex production.

Today, the natural rubber socioeconomic and environmental issues question our research practices and directions, which have a slight impact on rubber cultivation. Many of you have experienced the difficulties to transfer the new technologies to smallholders, which account for 85% of the worldwide natural rubber production. In that respect, our previous scientific consortium will be expanded with socio-economy, agronomy and agroforestry disciplines.

The RUBIS Project will combine all relevant new technologies in a bid to create a three-level paradigm.

- The first shift is associated with the target of breeding program. Usually, conventional breeding programs are devoted to monospecific cropping system and the design of rubber clones for estate plantations and intensive production. Our target will be the smallholders.

- The second shift is related to the multidisciplinary approach integrating modern technology for the analysis and adaptation of complex cropping system to accelerating climate change.
- The third shift is associated with the participatory approach. These shifts were defined as crucial in the terms of reference of the Agropolis Foundation Call for Proposals. We thank Ms Marie-Christine Cormier-Salem, Director of Agropolis Foundation, who will introduce the concept of participatory science for agriculture-based solutions in her introductory talk. In this respect, we expect that the co-construction of solutions for smallholders through a participatory approach with stakeholders will facilitate the future support of national and local authorities by funding replanting program with "climate-smart packages" defined in the RUBIS Project.

Beyond the breeding for rubber smallholdings, there is a challenge to identify a better resilient rubber cropping system to global change. Recent conversion of agroforests into monospecific rubber plantation enabled an increase of NR production at the expense of the regulating ecosystem services provided by agroforests. In this context, rubber-based agroforestry system with rubber clonal material and efficient management practices appears as a more sustainable alternative. Dr Edy Suprianto, director of IRRI, will give us in his introductory remarks some directions for improving smallholder rubber farmer income through agroforestry system, and Mr Alain Rival, CIRAD Regional Director, to address the resilience of plantation landscapes. In addition, the conversion of part of the large surface of rubber monoculture into rubber-based agroforestry systems with food intercrops offers a huge potential for food production and therefore food security in Indonesia. Mr Panut Mulyono, Rector of UGM, will develop these aspects for Indonesia as well as the challenges for the preservation of the biodiversity.

There are a lot of expectations from this short 3-year project. Resolving long-term issues will necessitate to establish a so-called RUBIS Platform in Partnership managing further projects for studying and improving rubber and food production systems in a context of global change. This platform should develop scientific objectives such as modelling (phenotype-genotype, agronomic-environment, socio-economic parameters), developing decision-aid tools and concept-note for policy makers, as well as directing development impact for farmers and commodity chains. Tackling these new challenges for the resilience and sustainability of rubber cultivation is in accordance with the terms of the Global Platform for Sustainable Natural Rubber (GPSNR), and the Green Climate Funds (GCF), as well as the policy for Climate-Smart Agriculture established by the FAO. It will require the support of the Indonesian and EU authorities, which are particularly attentive to the sustainability of agriculture-based economy, food security, biodiversity, improvement of the smallholders' incomes and research excellence.

To conclude, the ambition of the RUBIS project is to contribute to the adaptation of rubber cropping systems and planting material for Indonesian rubber smallholders to fast-changing socioeconomic and environmental conditions. The RUBIS Project Coordination Committee wish you much success in your research, and we hope this 3-year project will be a unique experience to improve the interaction between scientific disciplines and the interaction between scientists and stakeholders.

Introductory remarks: Agriculture-based solutions and participatory science

Marie-Christine Cormier-Salem, Director of Agropolis Foundation

Dear colleagues, I am very pleased and honored to introduce the kick-off meeting of the RUBIS project, with preliminary remarks on Agriculture-based solutions and participatory science.

A few remarks on the context

Global agriculture policies are now facing major challenges: nourishing an increasingly urbanized world population that is expected to grow by nearly 2 billion by 2050, while responding to the major challenges of climate change, biodiversity loss, hunger, poverty, social equity and inclusion, among others Sustainable Development Goals (SDGs).
Agricultural, forestry and other land-use activities are among the main constraints or the main drivers of climate change and biodiversity loss. They are, or could be, the main solutions to meet the needs of SDGs, and this is precisely the vision that we defend.
Thus, more and more Science-Policy platforms and think-thanks (e.g., IDDRI, Belmont Forum, One Earth, FAO, etc.) advocate for a **transformative society** to face those multidimensional changes and global challenges.

Scientists play a key role in various reflections, discussions and actions which contribute to addressing the challenge of agro-ecological transition by promoting practices and solutions which conserve natural renewable resources and lead to more desirable socio-ecosystems. One way of achieving this (which is the ambition of Agropolis Fondation) is mobilizing research, higher education and training towards addressing the SDGs.

Today, our society is facing major crises (climate change, biodiversity loss, economic crisis, epidemics, etc.), the resolution of which will require the full and complete involvement of citizens. The Covid 19 crisis confirms the urgency of the challenges and reveals the interactions between the SDGs and the need of new paradigms, models, approaches, such as the “One heath” concept.
Working alongside researchers to reflect together on societal issues and devise solutions is the key to becoming a player in the decisions taken and thus taking action.

Given this context, and in order to effect transformative change, there appears to be a growing awareness towards agriculture-based solutions and participatory sciences.
What does this mean?

This awareness has 4 ambitions, not exhaustive, in line with the shifts mentioned by Pascal Montoro

1) Veer away from conventional or high-input agriculture towards a more sustainable-oriented model, for a stronger contribution to the agro-ecological transition;
2) Support scientific excellence and training to fill Knowledge-Action Gaps and co-design desirable solutions with stakeholders in agriculture;

3) Address the Sustainable Development Goals (SDGs) in a crosscutting perspective and not in silos[1];
4) Promote new and/or scale up good practices (nature-based solutions, ecological intensification, agroforestry, conservation agriculture) and approaches for addressing the complex interactions of SDGs that means: sustainability science[2], transformative science[3], integrated, interdisciplinarity or participatory science, problems-oriented approach and solutions-driven approach.

It is to meet these ambitions that, in 2019, Agropolis Fondation launched 2 complementary calls: Agriculture-Based Solutions/ABS and Innovative Co-learning/ICL for ABS. Those calls underscored the need to implement solutions that hinge on agriculture, particularly on agro-ecology, co-designed with stakeholders in order to address the nexus of SDGs, and which require questioning complex interactions of SDGs.

The RUBIS project was selected in the framework of the ABS call, and also meets the expectations of the ICL call, putting the participation of all the actors at the heart of its approach.

These approaches are not easy to put in place. They require building new collaborations across disciplines and/or stakeholders for co-learning, in order to trigger transformation (i.e. cross-learning between researchers from different disciplines, between academic and non-academic actors, between researchers and PhD students). In pursuing agro-ecological transition for tomorrow's agricultures, there are many aspects of knowledge that are chattered or bridled, limiting active engagement of actors for suitable implementation of the concepts. Knowledge system is not enough. Without a protracted learning system, including bottom-up knowledge sharing, the implementation gap will remain for a long time.

The Foundation seeks to encourage and mobilize a combination of disciplines, revisit their research practices and ways of building research projects, for co-learning and co-designing transformative actions with all stakeholders.

Those notions are very well addressed in the RUBIS project, notably in the WP 1 "Co-design, co-construction at diverse scales/ levels (variety, cropping system).

Participatory science, a scientific as well as a political issue

Allow me now to underline how participatory science is a scientific as well as a political (and ethical) issue and why the Foundation is keen to promote it.

Agropolis Fondation carries with other foundations (and gobal alliances) the values of inclusion, gender equity, resilience and diversity.

[1] Wang, C., Guan, D., & Cai, W. (2019). Grand Challenges Cannot Be Treated in Isolation. *One Earth, 1*(1), 24-26. doi:10.1016/j.oneear.2019.08.005

[2] Sustainability science is "problem-driven, interdisciplinary scholarship that seeks to facilitate the design, implementation, and evaluation of effective interventions that foster shared prosperity and reduced poverty while protecting the environment. It is defined by the problems it addresses rather than the disciplines it employs. It thus draws as needed from multiple disciplines of the natural, social, medical and engineering sciences, from the professions, and from the knowledge of practice ». (Harvard Univ., 2008)

[3] "A specific type of science that does not only observe and describe societal transformation processes, but rather initiates and catalyses them. Transformative science aims to improve our understanding of transformation processes and to simultaneously increase societal capacity to reflect on them", Schneidewind U., M. Singer-Brodowski, K. Augenstein, F. Stelzer, 2016, Pledge for a Transformative Science: A Conceptual Framework. Wuppertal Papers No. 191. Wuppertal Institut, p. 6.

These values guide our calls for proposals and eligibility criteria.

Therefore, the Foundation, together with other French national partners, is contributing to a scientific platform on co-construction of knowledge (called CO3) and will launch its 3rd call for proposals this week, focusing on participatory approaches to promote agro-ecological transition.

Participatory research refers to "forms of production of scientific knowledge in which civil society actors participate, [...] actively and deliberately"(https://www.science-ensemble.org/pdf/charte-francaise-des-sciences-et-recherches-participatives.pdf). More precisely, the goal is to promote participative research co-constructed between researchers (academics or belonging to research organizations) and actors rooted in the territories (as smallholders, associations, local authorities, enterprises), pursuing a double purpose of knowledge production and action.

The aim is to combine different forms of knowledge in order to provide a response to a research issue rooted in the experience of the actors, with a view to action. These knowledge co-construction practices thus enable the production of relevant scientific results that can be directly appropriated by socio-economic actors and/or civil society. These collaborations must be effective at all stages of the research project, from the co-construction of the research question upstream to the dissemination of results downstream, including the definition of research protocols, data collection and analysis.

Beyond the strong injunction to make participation[4], I would like to point out that these approaches are, on the one hand, more ethical and fair:

- a new ethic of relations between Science and Society is taking shape, and the many qualifiers that can be grouped under the expression "Participatory Sciences" take on their full meaning: it is no longer a question of extracting the observations or knowledge of citizens in order to feed the researcher's database, but rather of co-constructing with all the stakeholders the research projects

In the other hand, these approaches are more scientifically relevant and a guarantee of results or effective transformative actions:

- the progress of the participatory project is characterized by permanent collaboration between all stakeholders, leading to a better understanding of the phenomena thanks to knowledge sharing, and the joint development of solutions. The concertation of all stakeholders and their effective involvement in the project are a prerequisite for effective societal acceptance and for efficient, sustainable, responsible innovation (or new practices by all actors, acceptability of practices and knowledge (cf. task 44 of RUBIS project: sharing and dissemination of co-constructed solutions).

To sum-up, the co-design of solutions with stakeholders, are obviously a scientific issue, but moreover, a political challenge.

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[4] CORMIER-SALEM M.-C., 2014. *Participatory governance of Marine Protected Areas: a political challenge, an ethical imperative, different trajectories. Senegal case studies*. SAPIENS, vol 7(2) 13 p. http://sapiens.revues.org/1541
CORMIER-SALEM M.-C. 2017. L'injonction du participatif dans la gouvernance des deltas ouest-africains : enjeux scientifiques, défis politiques. In : M.C. Cormier-Salem, M.M. Diakhaté, L. Descroix Eds, *Sciences participatives et gouvernance des patrimoines et territoires des deltas*, Dakar, L'Harmattan, Actes du colloque PATEO/ PRCM : 9-30.

Most of the smallholders (95%) in the rubber-based agroforestry system are not organized. Isn't it a risk of forgotten actors? Lack of representativeness?

The RUBIS project is supported by the Foundation because it is a scientifically excellent project and because it meets our values/visions and ambitions. The expectations are equal to these requirements and I wish it every success.

Introductory remarks: Biodiversity and food security in Indonesia

Panut Mulyono, Rector of UGM

Assalamulaikum wr wb

The honourable,

Mr Pascal Montoro of the UMR AGAP – CIRAD
Ms Marie-Christine Cormier-Salem, Director of Agropolis Foundation
Mr Alain Rival, CIRAD Regional Director for Southeast Asian Island countries
Mr Edy Suprianto, Director of Indonesian Rubber Research Institute (IRRI)
Mr Gede Wibawa, Member of the Advisory Committee
Prof. Siti Subandyah of UGM
Mr Frédéric Gay, UMR Absys, CIRAD
Ms Fetrina Oktavia, Sembawa RC – IRRI

Facilitators of the program:

Ms Dwi Shinta Agustina
Mr Eric Penot
Ms Arini Wahyu Utami
Ms Yekti Asih Purwestri
Mrs Julie Leclercq
Mr Thomas Wijaya
Mr Budiadi

Ladies and gentlemen:

Indonesia is blessed with its geographical location and natural richness. Located along the equator, Indonesia is a home for different kinds of species both animal and vegetations. Indonesia's biodiversity abundance is well recognised, promising substantial resources for the life of people.

Forestry, among other things, is what Indonesia is rich with, both natural and plantation based. In specific, Indonesia has the largest plantation area of natural rubber, in South-East Asian countries producing 92% of the worldwide natural rubber production. In Indonesia, rubber plantations covers 3.67 Million hectare and about 20-30% of surface are rubber-based agroforestry plantations.

Apart from the fact that Indonesia's a promising land for natural rubber, problems do exist. Seedling problems and quality of tapping are to name a few, causing a shorter cycle of plantation. Researchers and practitioners have been working hard to address these issues. A different approach has been introduced: rubber-based agroforestry systems or RAS, which is proven to be better than monoculture system in term of income.

This matter requires different parties to collaborate in a participatory approach. In addition to scientists, such collaboration also require participations of farmer communities and other stakeholders. I am glad to see how big institutions such as CIRAD, Indonesian Rubber Research Institute (IRRI) and Universitas Gadjah Mada (UGM) are working hand in hand to address this issue. This certainly is not an instant process. I understand that a long and winding

road has been taken with enduring support from reputable institutions such as SEARCA and LPDP.

I personally congratulate each and every one of you for your tireless effort. I am aware that SEARCA-Agropolis Project 1803-004 has launched a Dual Degree PhD program between the Study Program of Biology at UGM and SupAgro Monpellier Univ. in France. Another good news is that QTLs for latex production and tolerance to drought has been identified. Thanks to the availability of 2 PhD scholarships from SEARCA and LPDP taking place at the Postgraduate Study Program of Agricultural Science at UGM.

Now, with the continuing collaboration among CIRAD, IRRI and UGM, focus of research on latex physiology, genomics and genetics will be strengthened. The new collaborations will also bring additional disciplinary fields such as participatory breeding, social component of rubber-based agroforestry, rural social science, and rubber and wood technology. Beyond the scientific impact, this research collaboration will co-design the solutions for different stakeholders of rubber commodity chain in Indonesia.

Being an agroforestry system, this collaboration will also focus on the management of food intercrops. This way, this collaboration will kill two birds with one stone: improving rubber production and contributing to food security. We are aware that this is not going to be easy but with good collaboration, I am optimistic we can make significant progress. I wish everybody the best of luck. Thank you!

Wasalamualaikum wr wb

Introductory remarks: Improving smallholder rubber farmer income through agroforestry system

Edy Suprianto, Director of Indonesian Rubber Research Institute

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RUbber agroforestry
Breeding Initiative for Smallholders

Improving Smallholder Rubber Farmer Income through Agroforestry System

Indonesian Rubber Research Institute (IRRI)
Jl. Raya Palembang – Pangkalan Balai Km 29
Sembawa, South Sumatra

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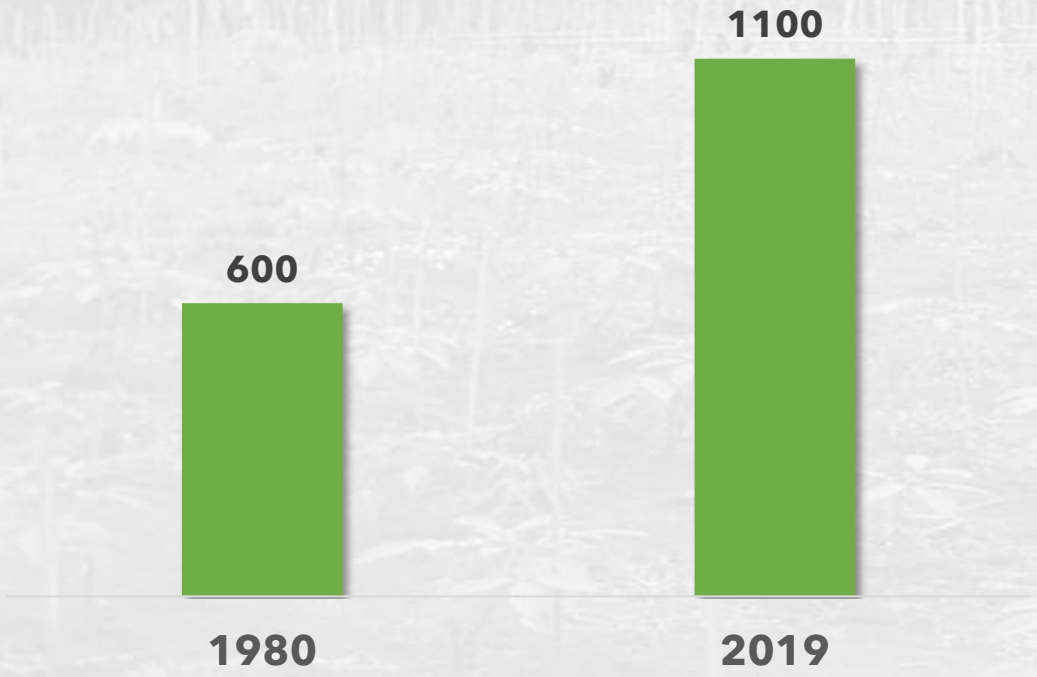
LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT

Rubber Smallholders in Indonesia

Rubber productivity (kg/ha/year) in smallholder has been increased double since 1980



- Development of rubber smallholders started at **1969**
- The use of **non-superior** rubber seedlings and **lack of Good Agriculture Practices** (GAP) knowledge in rubber smallholder leads to the **low productivity**
- Government of Indonesia is supporting smallholders by providing certified planting material and this resulted in improving national rubber productivity

Current situation of rubber smallholders in Indonesia

Area and Number of Farmers

3.12 Million Hectars

2.2 Million Farmers

Productivity

~1.1 ton/ha/year or 110 kg per month

Land ownership

~1.25 ha

Farmer need at least 2 ha or 3 ha even better to be able to support their basic need

Price of farmer's rubber

Rp 9.434 -11.320/kg

Total income

~Rp 1.8 million per month, while minimum wage is about Rp2.4 million per month

Role of IRRI to support rubber smallholders

Development of **superior rubber planting material** through systematic breeding program

Providing **rubber planting material** for smallholders at affordable price

Research and development on **intercropping system** between rubber and other economic crops

MILESTONE
of Rubber Planting Material

1910 - 1935	1935 - 1960	1960 - 1985	1985 - 2010	2010 - 2014
G-I (Selected seedling)	**G-II** Tjir I Tjir 16 GT 1 LCB 479 LCB 1320 PR 107	**G-III** AVROS 2037 BPM 1 PR 228 PR 255 PR 261 PB 5/51 RRIM 600	**G-IV** BPM 24 BPM 107 BPM 109 PB 260 PB 330 PB 340 RRIC 100	**G-V (Fifth Generation)** **Latex Clone** IRR 220, IRR 118, IRR 112, IRR 104,BPM 24, PB 260, PB 330 dan PB 340 **Latex Timber Clone** IRR 230, IRR 5, IRR 39, IRR 42, IRR 119 dan RRIC 100 **Root Stock Clone** AVROS 2037, GT 1, PB 26, PB 330, BPM 24 dan RRIC 100

PRODUCTIVITY(ton/ha/year)

0.5	0.5 – 1.0	1.0 – 1.5	1.5 – 2.0	2.0 – 2.5

Recommended clone: IRR 200 SERIES

	IRR 220	IRR 230	PB260
Clone group	Latex	Latex-timber	latex
Tapping opening (year)	4	4	4,5
Yield (kg/ha/y) : ▪ 5 y tapping ▪ 10 y tapping ▪ 15 y tapping	2191 10 511 20 423 32 865	2095 9 080 17 370 31 422	2063
Timber Volume 20 tahun (m^3)	0,61	0,76	0,58
No PVT	603/LB.320/A.8/1/ 2014	604/LB.320/A.8/1/ 2014	

By using recommended clones with productivity 2 ton/ha/year will be enough to support farmer livelihood

Development of Double Row Spacing to Improve Land Productivity and Income of Rubber Smallholders

Rubber + upland rice

Rubber + maize

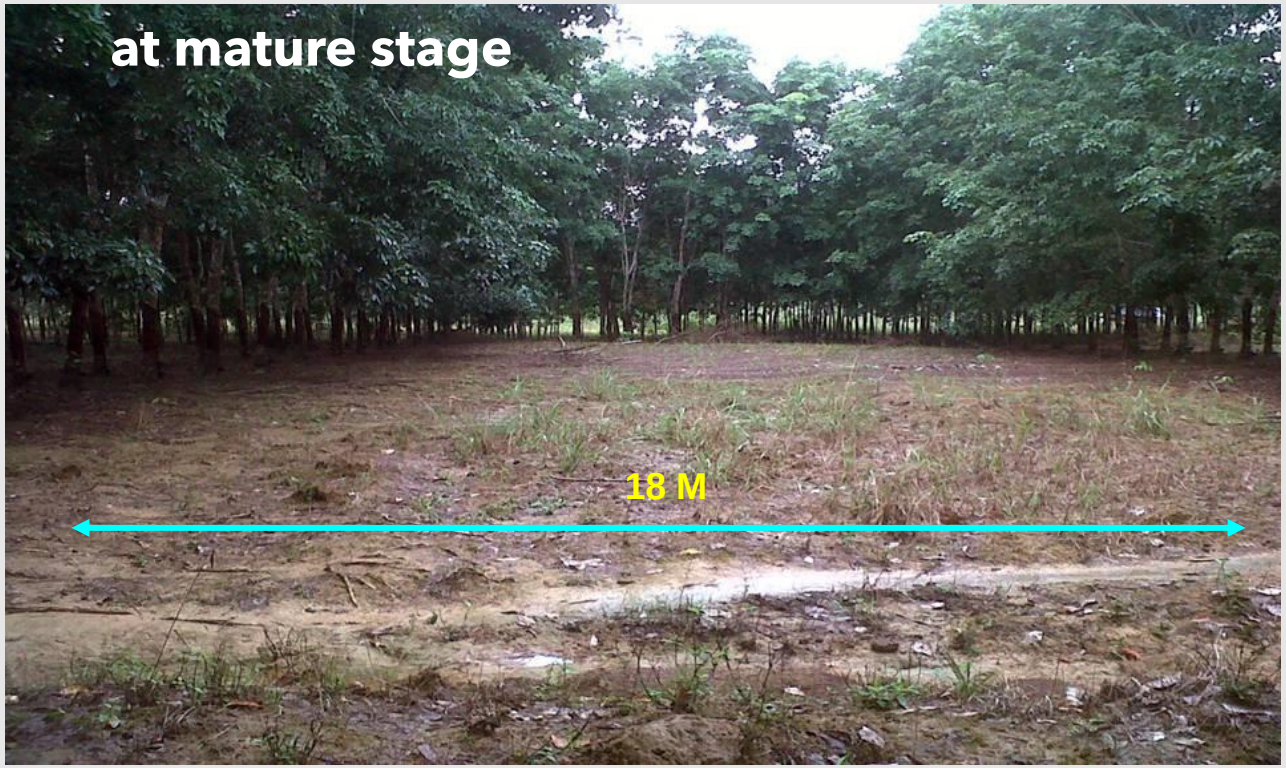
Rubber + sugarcane

Rubber + oil palm

Rubber + chili

Rubber + banana

Double row system on intercropping (18 m + 2 m) X 2.5 m



Economy analysis of intercropping between rubber and various economic crops

Intercropping system	Revenue to Cost Ration (R/C)	
	1st Year	2nd Year
Rubber + rice + corn + cowpea	1.05	1.04
Rubber + rice + soybean + cowpea	1.16	1.08
Rubber + curly chilli	1.93	1.72
Rubber + small chilli	1.96	1.81
Rubber + watermelon	2.22	2.15
Rubber + banana + pineapple	2.40	2.40

Intercropping

- Rubber intercropping system with other economic crops can increase land productivity and rubber productivity, hence the sustainability of smallholder production.
- The study showed that intercropping treatment significantly increase the growth of rubber trees and reduces unproductive plant phases. Rubber trees in the intercropping treatment were ready for tapping five months earlier than in the monoculture rubber trees (Sahuri, 2020).
- Intercropping treatments had no effect on latex yield per tree per tapping but yield per hectare was greater in the intercropping treatments than monoculture rubber trees due to the number of trees that could be tapped was significantly higher.
- Development of rubber intercropping system with other economic crops for smallholders should consider **land suitability**, **local knowledge about adapted crops**, **storage and processing capacity**, as well as **market (supply and demand) availability**.

Closing remarks

- IRRI has been experienced and has supported technologies to improve smallholder rubber farmer income through preparing of superior planting materials and development of intercropping planting system between rubber and other economic crops.
- Development of rubber intercropping system for smallholders should consider **local knowledge about adapted crops**, **advisory and technical assistance on GAP**, **storage and processing capacity**, as well as **market (supply and demand) availability**.
- The **role of Government** in improving farmers' income is very much needed, especially for the **institutional aspects** of the farmer and **financial support**.
- Hopefully **RUBIS project** could fulfill the gaps on what we still don’t know and still be improved of the current systems

RISET PERKEBUNAN NUSANTARA
PUSAT PENELITIAN KARET

Thank You

Inovasi untuk Negeri

Sembawa – Sumatra Selatan

Balit Sungei Putih – Sumatra Utara

Balit Teknologi Karet - Jawa Barat

Balit Getas - Jawa Tengah

TABLE 5: INDONESIAN SMALLHOLDERS, PRODUCTION AND PRODUCTION AREAS PER REGION

Smallholders (2017)	Area (ha)				Annual production (ton)	Number of smallholders
	Immature	Productive	Damaged (unproductive)	Total		
Jambi	55,090	306,602	18,238	379,930	262,546	214,168
South Sumatra	94,586	686,692	14,900	796,178	908,445	466,492
West Kalimantan	57,148	287,962	7,654	352,764	215,741	264,328
Indonesia	398,284	2,653,080	64,340	3,115,704	2,638,071	2,253,496

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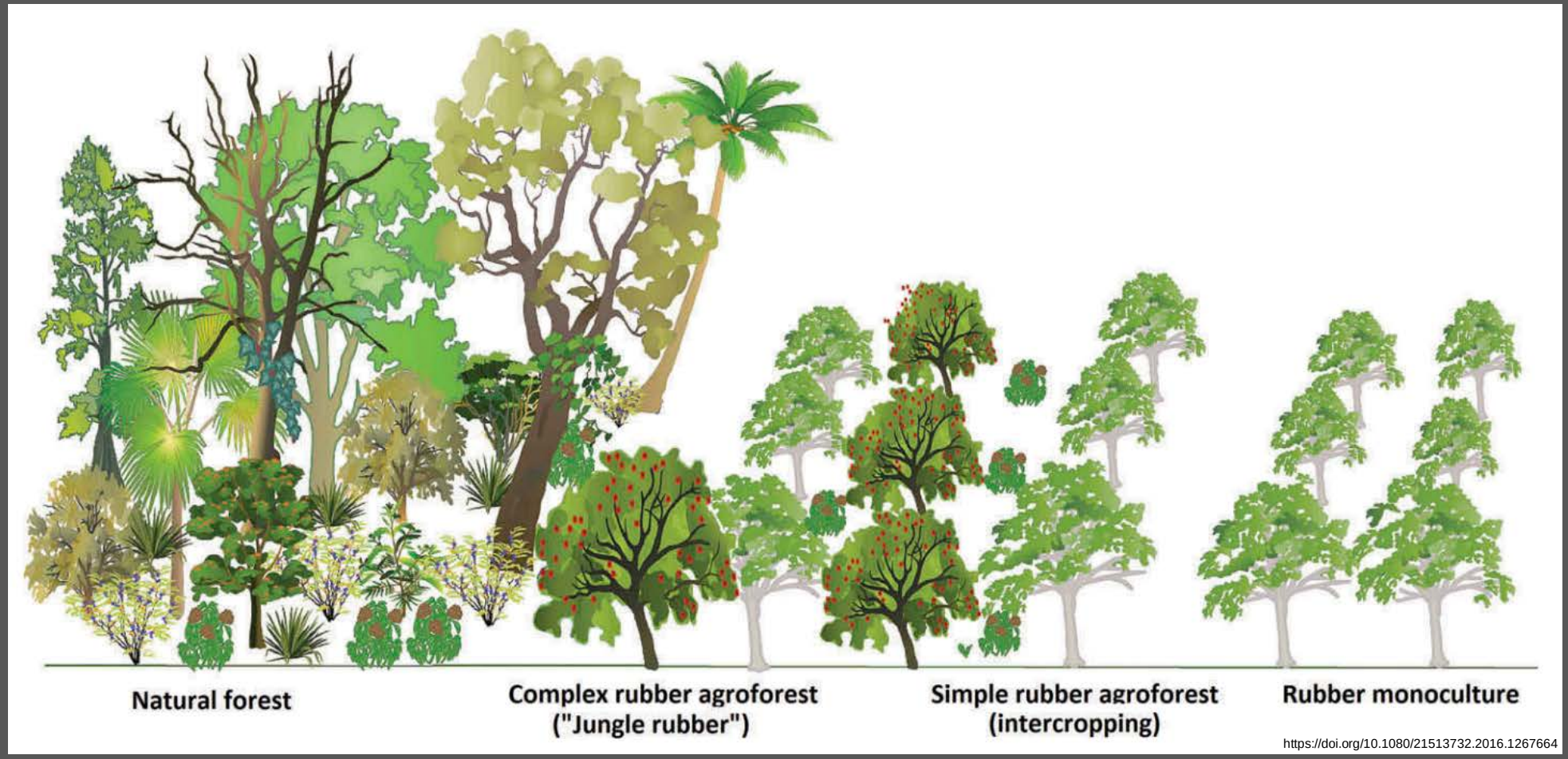
Indonesian Rubber Research Institute

Universitas Gadjah Mada

Introductory remarks: Adressing the resilience of the plantation landscapes

Alain Rival, CIRAD Resident Regional Director for Southeast Asian Island Countries

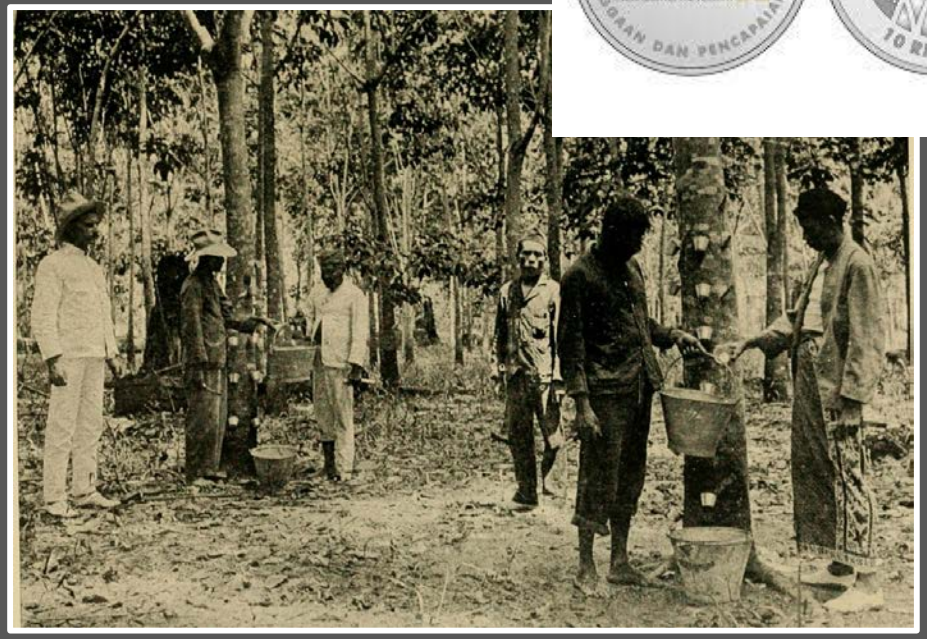
Addressing the resilience of the plantation landscapes



https://doi.org/10.1080/21513732.2016.1267664

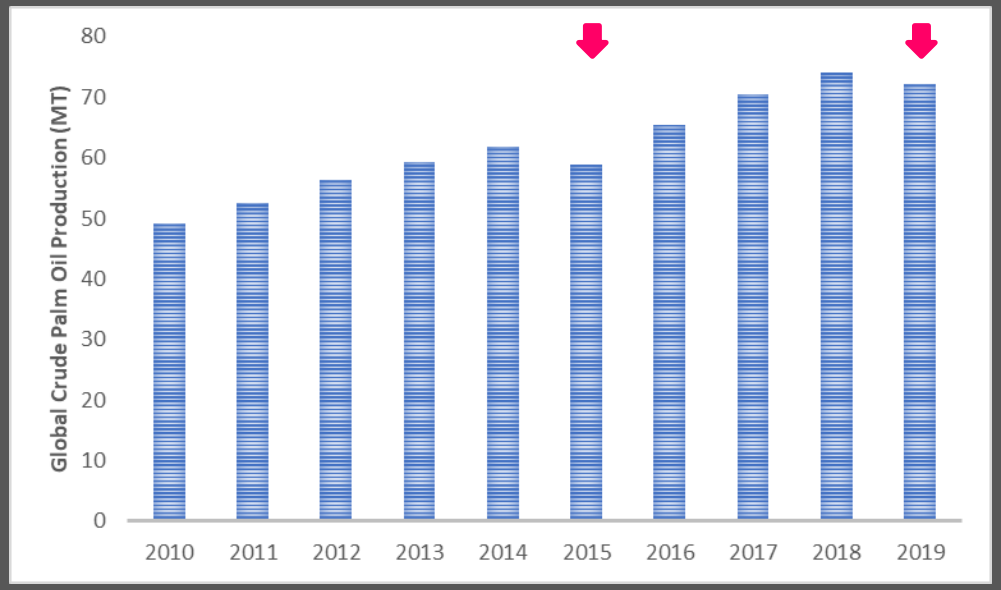
Alain Rival
Cirad
Resident Regional Director
Jakarta, Indonesia.

Happy birthday Plantations !



- The plantation system is one-century old
- It mainly relied on :
  - the abundance of fertile arable land
  - easy and available labour
  - a rigid colonial system
    - restricted rights – protected markets
- Is it resilient enough to successfully face new challenges?

Plantation agriculture and climatic resilience



A fragile centenary

- competitive production costs, but
- structurally based on faltering achievements

The limits of intensive monoculture

- Geographical concentration
  - Oil palm: 20 miHa – 2 countries
- Pathological risks
- Genetic erosion
- Social fragility
- Biodiversity

What climatic resilience?

Agroecological transition is not an option

CLIMATE CHANGE

Increased risk
- El Nino
- Operating systems
- Plant material
- Pests & diseases

GHG emissions
- Land Use Change
- Deforestation
- Agricultural inputs

Carbone capture

PLANTATION AGRICULTURE

This transition is multidisciplinary by nature

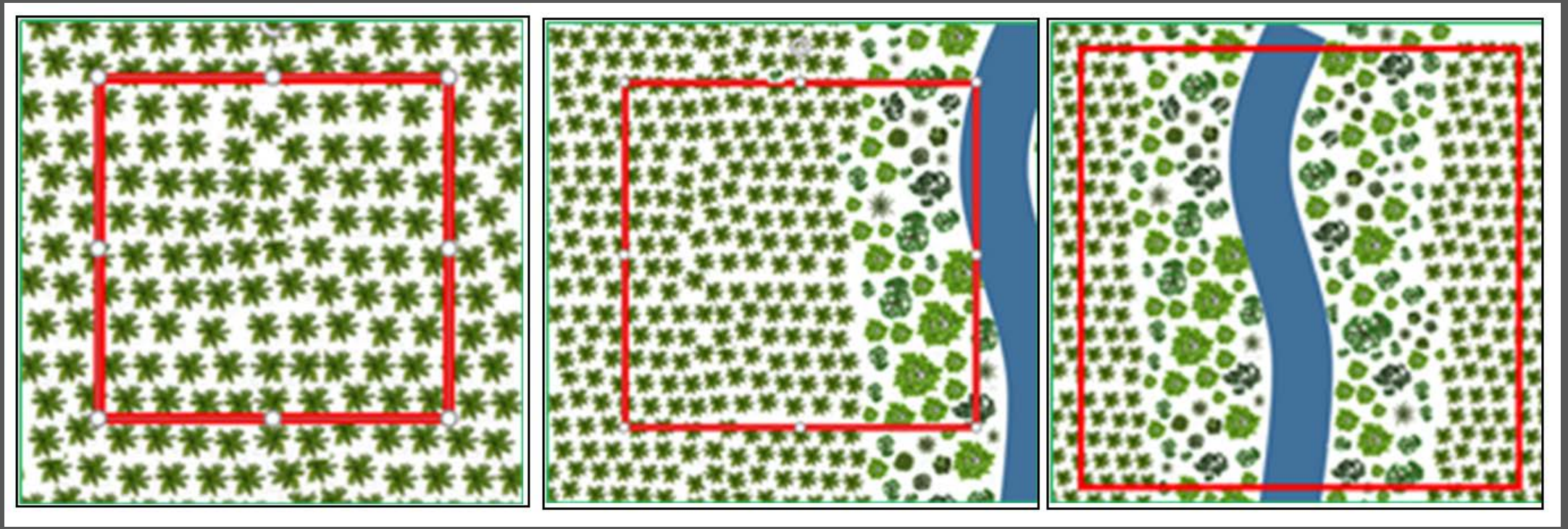
Questioning monospecific plantations

Production systems based on intensive monoculture certainly need to be explored with a new perspective embracing climate change.

Changes in agricultural practices will also involve new planting designs aiming at:

- mixing selected forest species with plantation crops
- and at mitigating abrupt ecological and socioeconomic changes at replanting time.

Innovative planting designs



Are you TALENTed?

TALENT is a training program for sustainable plantation landscapes in Southeast Asia

www.talent-programme.org

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TALENT
susTAinable LandscapE managemeNT

AFD
AGENCE FRANÇAISE DE DÉVELOPPEMENT

SALSA - Sustainable Agricultural Systems in Southeast Asia





A regional collaborative Research and Training Platform

The SALSA key ingredients

1. Deciphering territorial dynamics to understand and qualify vectors of deforestation
2. Operationalizing ecological intensification of tree crops
3. Ensuring the inclusivity of smallholders into innovation pathways
4. Academic and vocational training on the fundamentals of sustainability

Thank you for your kind attention.

alain.rival@cirad.fr

RUBIS
RUbber agroforestry Breeding Initiative for Smallholders

RUbber agroforestry Breeding Initiative for Smallholders (RUBIS)

A participatory breeding initiative for resilient rubber cultivation systems for smallholders in a context of global change

ZOOM Videoconference Meeting
11 January 2020

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Topic: Kick off Meeting of Rubbis Time: Jan 11, 2021 02:45 PM Jakarta

Join Zoom Meeting https://zoom.us/j/98744313973

Meeting ID: 987 4431 3973
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+19292056099,,98744313973#,,,,*460827# US (New York)
+12532158782,,98744313973#,,,,*460827# US (Tacoma)

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+1 301 715 8592 US (Washington D.C) +1 312 626 6799 US (Chicago) +1 346 248 7799
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Meeting ID: 987 4431 3973
Passcode: 460827

Find your local number: https://zoom.us/u/aY8BCn28x

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Recommendations for the videoconference to avoid background noise and to improve internet bandwidth

- **During the presentations**
  - Switch off your microphone and video when listening
  - Type your question in the chat

- **During Question-Answer Sessions**

1. Type your question in the chat
2. The moderator selects your question and gives you the floor
3. Switch on microphone and video only to take the floor
4. Switch off microphone and video when listening

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Meeting agenda

France	Indonesia		
8:30-8:45	14:30-14:45	**Welcome to ZOOM videoconference system organized by IRRI**	
8:45-9:35	14:45-15:35	**Opening session**	Moderator: Ms Arini Wahyu Utami
8:45	14:45	Welcome speech: RUBIS project challenges	Mr Pascal Montoro, UMR AGAP, CIRAD
8:55	14:55	Introductory remarks: Agriculture-based solutions and participatory science	Ms Marie-Christine Cormier-Salem, Director of Agropolis Foundation
9:05	15:05	Introductory remarks: Biodiversity and food security in Indonesia	Mr Panut Mulyono, Rector of UGM
9:15	15:15	Introductory remarks: Improving smallholder rubber farmer income through agroforestry system	Mr Edy Suprianto, Director of IRRI
9:25	15:25	Introductory remarks: Addressing the resilience of plantation landscapes	Mr Alain Rival, CIRAD Regional Director for Southeast Asian island countries
9:35-11:20	15:35-17:20	**Workpackage session**	Moderator: Mr Thomas Wijaya
9:40	15:40	WP0 - Coordination, activity monitoring & management of the interdisciplinarity	Ms Siti Subandiyah, Biotec RC, UGM
10:00	16:00	WP1 - Co-construction of varietal and cropping system ideotypes adapted to smallholders	Ms Dwi Shinta Agustina, IRRI
10:20	16:20	WP2 - Understanding and modelling the performances of rubber-based agroforestry systems in contrasting environments	Mr Frédéric Gay, UMR ABsys, CIRAD
10:40	16:40	WP3 - Determination of the predictive value of *Hevea* genetic resources in Indonesia	Ms Fetrina Oktavia, Sembawa RC, IRRI
11:00	17:00	WP4 - Data integration and designing solutions for resilient rubber cultivation systems for smallholders in a context of climate change	Mr Pascal Montoro, UMR AGAP, CIRAD
11:20-11:25	17:40-17:50	**Conclusion**	Moderator: Mr Thomas Wijaya
11:20	17:40	Conclusion remarks from the RUBIS Project Advisory Committee	Mr Gede Wibawa, Member of the Advisory Committee

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Work Package 0

Coordination, activity monitoring & management of the interdisciplinarity

Siti Subandiyah
Universitas Gadjah Mada

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The Aims of the RUbber agroforestry Breeding Initiative for Smallholders (RUBIS)

A participatory breeding initiative for resilient rubber cultivation systems for smallholders in a context of global change

- The RUBIS project supports a long-term programme
- Initiative in the participatory breeding scheme for resilient rubber cultivation systems for smallholders in a context of global change.
- This programme includes a process of reiteration of scientific questions and agriculture-based solutions to respond to fast-changing socio-economic and environmental constraints.
- The capitalisation of the multidisciplinary and participatory studies will be beneficial to the implementation of in- farm evaluation trials.
- Ultimately, the feedback from in-farm evaluation trials should lead to adjustment for a better resilience of the system

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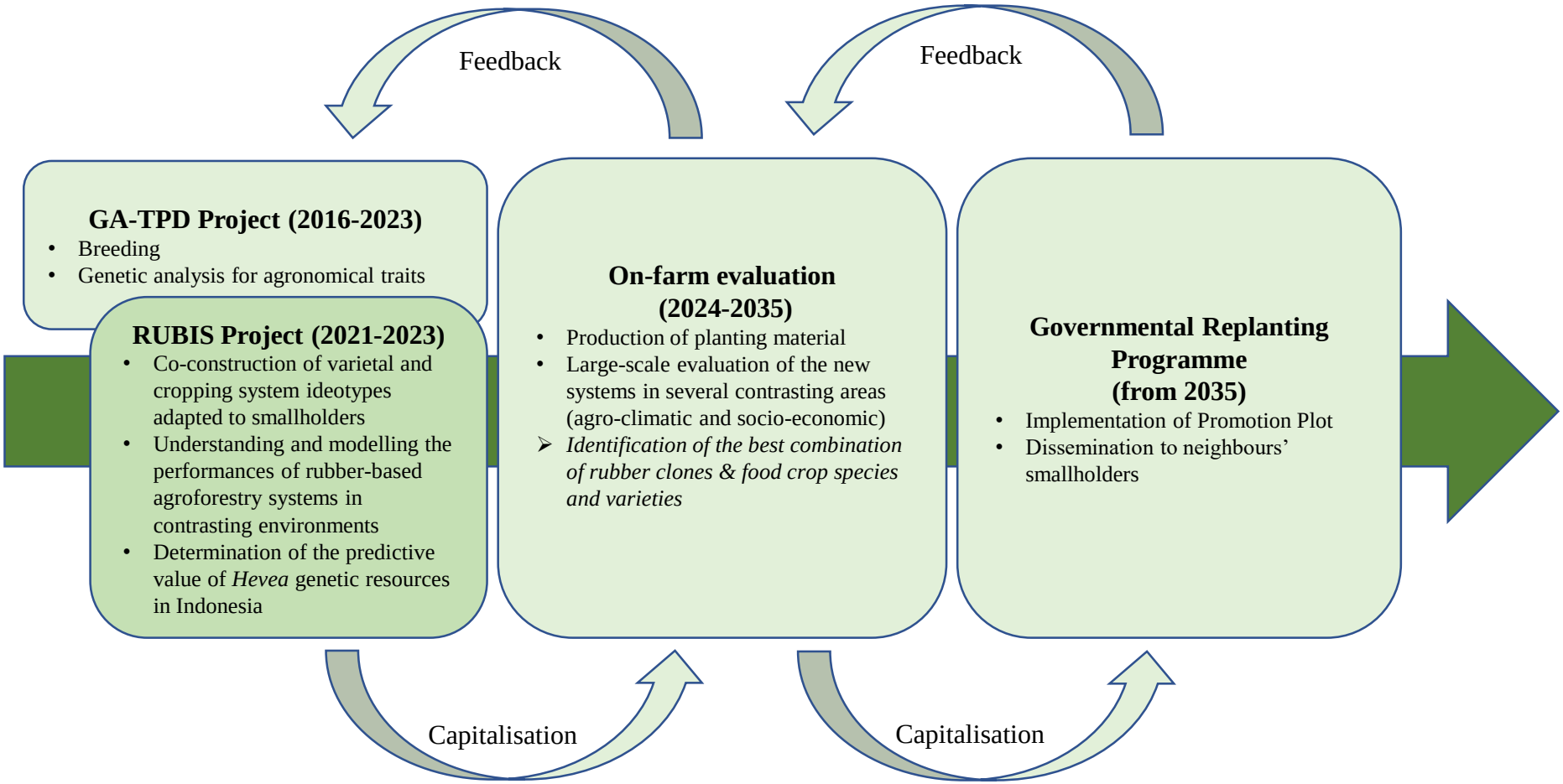
Insertion of the RUBIS Initiative in the participatory breeding scheme for resilient rubber cultivation systems for smallholders in a context of global change



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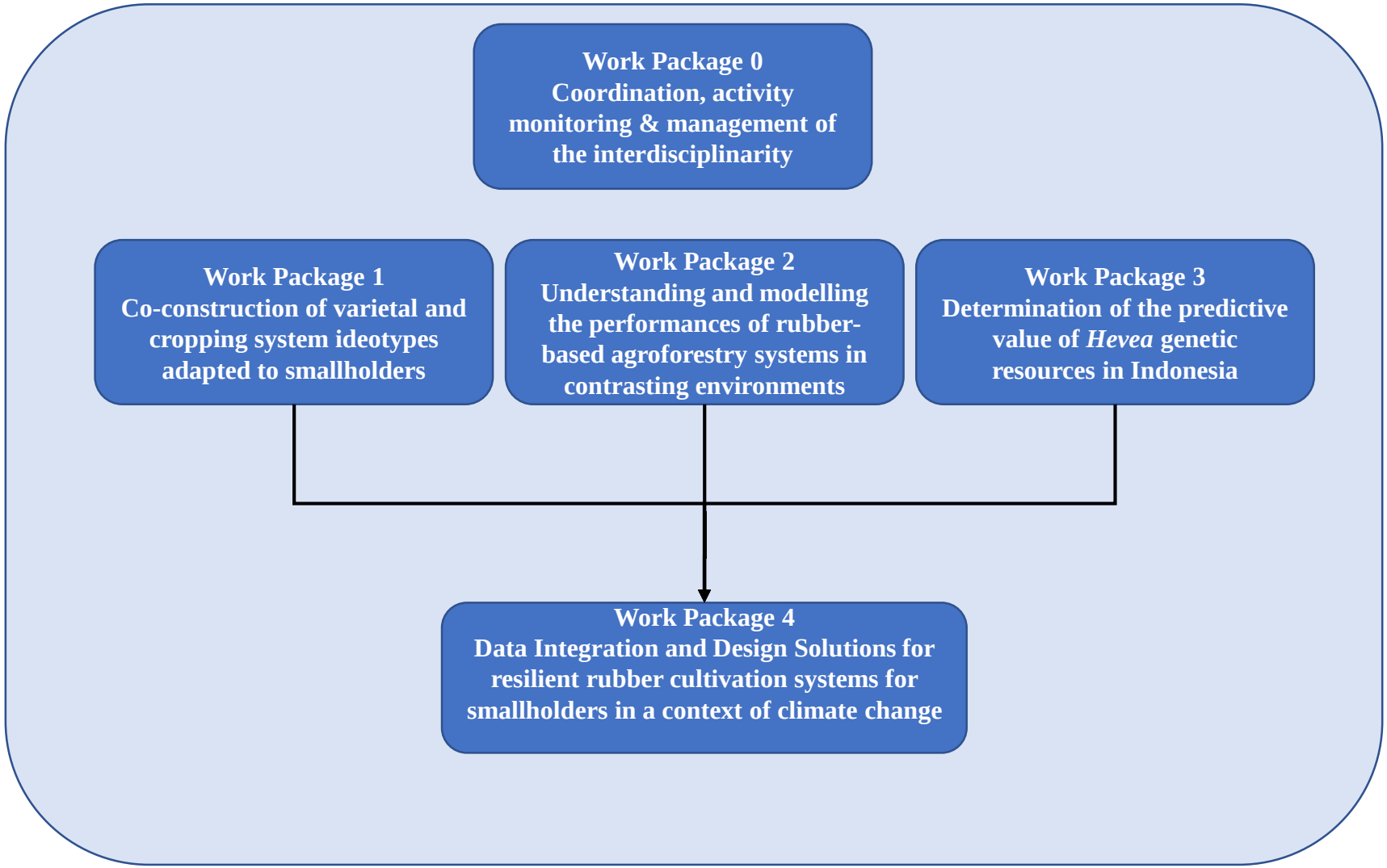
Project structure in 4 scientific workpackages



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RUBIS Project Organization Chart

Project Advisory Committee
- Dr Gede Wibawa, IRRI
- Dr Vincent Gitz, Dir FTA, CIFOR
- Ms Hafiza, Directorate of Estate Crops
- Mr Uhendi Haris, Gapkindo

Project Steering Committee
- Dr Claire Billot, Director UMR AGAP, CIRAD
- Dr Edy Suprianto, Director of IRRI,
- Prof. Dr. Paripurna, S.H., M.Hum., LL.M., Vice Rector of Collaboration and Alumni

Project Coordination Committee
- Dr Pascal Montoro, Project Leader
- Prof Siti Subandiyah, Project Co-Coordinator
- Dr Fetrina Oktavia, Project Co-Coordinator

Administrative Support
- Ms Claire Durot, Legal Service
- Mr Matthieu Fargeas, Project Accounting
- Ms Florence Chazot, Budget Monitoring
- Ms Rusmi Sri Wiyati, Assistant

Liaison Officers
- Dr Arini Ayuk Utami, Liaison Officer for Organization Interactions
- Dr Sophia Alami, Liaison for Innovation engineering and collective intelligence

WebMaster
- Mr Imade Yoga Prasada
- Mr Pascal Montoro

Work Package 1
Co-construction of varietal and cropping system ideotypes adapted to smallholders

- Ass Prof Arini Wahyu Utami, WP Co-Leader & Facilitator
- Prof Budiadi , WP Co-Leader
- Dr Eric Penot , WP Co-Leader
- Ms Shinta Agustina , WP Co-Leader

Participants

Ms M.Sc. Dwi Shinta Agustina, IRRI
Mr Dr Panjisakti Busunanda,
Ms Dr Bénédicte Chambon, CIRAD
Ms Lina Fatayati Syarifa, IRRI
Mr Dr Muhammad Ali Imron, UGM
Ms Dr Dyah Ismoyowati, UGM
Mr Dr Eric Penot, CIRAD
Mr Iman Satra Nugraha, IRRI
Ms Pr Siti Subandiyah, UGM
Mr Prof Budiadi Suparno, UGM
Ms Dr Arini Wahyu Utami, UGM
Mr Dr Gede Wibawa, RPN
Mr Dr Widiyatno, UGM
Mr Dr Thomas Wijaya, IRRI
Mr Dr Jamhari , UGM

Work Package 2
Understanding and modelling the performances of rubber-based agroforestry systems in contrasting environments

- Dr Frédéric Gay, WP Co-Leader & Facilitator
- Prof Siti Subandiyah, WP Co-Leader
- Dr Radite Tistama, WP Co-Leader

Participants

Ms Dr Yekti Asih Purwestri, UGM
Mr Dr Denis Fabre, CIRAD
Mr Dr Frédéric Gay, CIRAD
Mr Dr Raphaël Marichal, CIRAD
Mr Dr Raphaël Pérez, CIRAD
Ms Dr Valérie Pujade Renaud, CIRAD
Ms M. Sc. Alchemi Putri J. Kusdiana, IRRI
Mr Sahuri, IRRI
Mr Jamin Saputra, IRRI
Ms Pr Siti Subandiyah, UGM
Mr Prof Budiadi Suparno, UGM
Ms Kartika Restu Susilo, UGM
Mr Dr Alexis Thoumazeau, CIRAD
Mr Dr Radite Tistama, IRRI
Mr Dr Widiyatno, UGM

Work Package 3
Determination of the predictive value of *Hevea* genetic resources in Indonesia

- Dr Fetrina Oktavia, WP Co-Leader & Facilitator
- Dr Pascal Montoro, WP Co-Leader

Participants

Mr Dr Frédéric Bonfils, CIRAD
Mr Dr Panjisakti Busunanda,
Mr Dr Gilles Chaix, CIRAD
Ms M. Sc. Anne Clément-Vidal, CIRAD
Mr M.Sc. Gaëtan Droc, CIRAD
Mr Dr Jean-François Dufayard, CIRAD
Ms Dr Widhi Dyah Sawitri, UGM
Mr Dr Denis Fabre, CIRAD
Mr M. Sc. Irfan Faturrahman, IRRI
Mr Dr Jean Gérard, CIRAD
Mr Dr Eric Gohet, CIRAD
Ms M. Sc. Sherly Hanifarianty, IRRI
Mr Dr Rudi Hari Murti, UGM
Mr M. Sc. Sigit Ismawanto, IRRI
Mr M. Sc. Junaidi Junaidi, IRRI
Mr Dr Vincent Le Guen, CIRAD
Ms Dr, HDR Julie Leclercq, CIRAD
Mr Dr David Lopez, CIRAD
Mr Dr, HDR Pascal Montoro, CIRAD
Mr M. Sc. Pierre Mournet, CIRAD
Mr M. Sc. Andi Nur Cahyo, IRRI
Ms Dr Tri Rini Nuringtyas, UGM
Ms Dr Fetrina Oktavia, IRRI
Ms Dr Valérie Pujade Renaud, CIRAD
Ms M. Sc. Alchemi Putri J. Kusdiana, IRRI
Ms B.Sc. Maryannick Rio, CIRAD
Mr M. Sc. Budi Setyawan, IRRI
Ms Pr Siti Subandiyah, UGM
Ms M. Sc. Afdholiatus Syafaah, IRRI
Mr Firman, IRRI
Mr Erdianto, IRRI
Mr Imronsyah, IRRI
Ms Paina, IRRI
Ms Hetty Aprianti, IRRI
Ms Delly Mayangsari, IRRI

Work Package 4
Data Integration and Design Solutions for resilient rubber cultivation systems for smallholders in a context of climate change

- Dr Pascal Montoro, WP Co-Leader & Facilitator
- Ass Prof Arini Wahyu Utami, WP Co-Leader
- Dr Fetrina Oktavia, WP Co-Leader

Participants

Ms Dr Sophia Alami, CIRAD
Ms M.Sc. Dwi Shinta Agustina, IRRI
Ms Dr Bénédicte Chambon, CIRAD
Mr Dr Frédéric Gay, CIRAD
Mr Dr Pascal Montoro, CIRAD
Ms Dr Fetrina Oktavia, IRRI
Mr DR Abdul Aziz Saidou, CIRAD
Ms Pr Siti Subandiyah, UGM
Mr Prof Budiadi Suparno, UGM
Mr Dr Radite Tistama, IRRI
Mr Dr Thomas Wijaya, IRRI

- This project involves about 60 researchers and technicians from 3 organizations
- Capacity building through the involvement of 5 PhD and 5 Master students at UGM and SupAgro MU of dual degree and Joint Supervision

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The Steering Committee is composed of one representative of each party

The SC provides advice, ensure delivery of the project outputs and the achievement of project outcomes as well as support, guidance and oversight of progress.

- Providing input to the development of the project, including the evaluation strategy;
- Providing advice on the budget;
- Defining and helping to achieve the project outcomes;
- Identifying the priorities in the project – where the most energy should be directed;
- Identifying potential risks;
- Monitoring risks;
- Monitoring timelines;
- Monitoring the quality of the project as it develops;
- Providing advice (and sometimes making decisions) about changes to the project as it develops.

- Dr Claire Billot, Director UMR AGAP, CIRAD
- Dr Edy Suprianto, Director of IRRI,
- Prof. Dr. Paripurna, S.H., M.Hum., LL.M., Vice Rector of Collaboration and Alumni (still in consideration to be replaced by drg Ika Dewi Ana, M.Kes. PhD (Vice Rector for Research and Community Services)

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The Project Coordination Committee

The CC are in charge to:

- Monitor the progress of schedule activities, the achievement of deliverables, the budget
- Disseminate the information (**monthly newsletters**, scientific reports, plain language reports, etc.)
- Play a role as moderator for publications of scientific papers and website information
- Supervise the implementation of the Data Management Plan
- Organize the monthly meetings with WP leaders and bi-annual meetings
- Exchange with the Steering Committee and Advisory Committee

The two liaison officers will assist the CC to liaise between the three organizations and the various disciplines

Coordinators:
- Pascal Montoro (CIRAD),
- Siti Subandiyah (UGM),
- Fetrina Oktavia (IRRI)

Liaison Officers:
- Arini Wahyu Utami (UGM), LO for organizations interaction
- Sophia Alami (CIRAD) LO for Innovation engineering and collective intelligence

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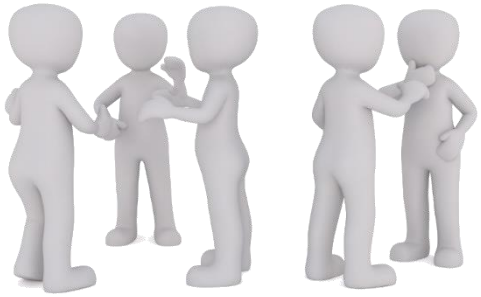
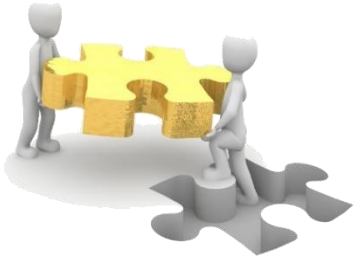
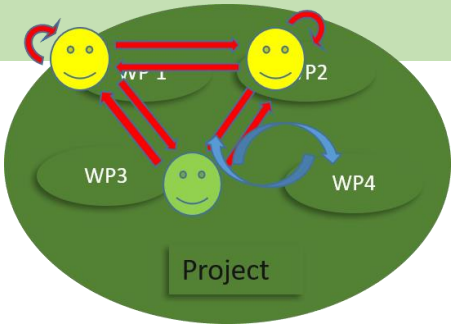
Management of the interdisciplinary dialogue & collective intelligence catalysis

- Liaison officers facilitate the relationship and promote discussions between the members of the different organizations and different disciplines
- Liaison officers can:
  - Organize side events to the project meetings
  - Propose plain language message to be disseminated on the website

- All scientists and stakeholders share the same global vision of the project.
- The inclusiveness of different knowledges from different stakeholders in order to promote the emergence of new ideas and solutions not previously scheduled by researchers.
- Several channels of communication will be created, meetings, workshops and current research activities, the project website
- The activities and the outputs will be the main channel of communication







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The Workpackage leaders

The WP leaders are in charge

- supervise the progress of research activities conducted in their respective WPs.
- organize:
  - The monthly meetings with WP members
  - Events scheduled in the project activities
  - The contribution of the WP to the monthly and bi-annual reports

Worpackage leaders

WP1: Ass Prof Arini Wahyu Utami, WP Co-Leader & Facilitator, Prof Budiadi , WP Co-Leader, Dr Eric Penot , WP Co-Leader, Ms Shinta Agustina , WP Co-Leader

WP2: Dr Frédéric Gay, WP Co-Leader & Facilitator, Prof Siti Subandiyah, WP Co-Leader, Dr Radite Tistama, WP Co-Leader

WP3: Dr Fetrina Oktavia, WP Co-Leader & Facilitator, Dr Pascal Montoro, WP Co-Leader

WP4: Dr Pascal Montoro, WP Co-Leader & Facilitator, Ass Prof Arini Wahyu Utami, WP Co-Leader, Dr Fetrina Oktavia, WP Co-Leader

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The RUBIS Project Advisory Committee

- **10 members: 5 scientists** from different organizations (CIFOR, ICRAF, EU-ASE universities, other teams from CIRAD, UGM and IRRI) and **5 representatives of stakeholders**, and possibly from Agropolis Foundation and French Embassy
- New members of the AC will be identified during the first semester 2021 based on the WP1 activities
- All members will be invited at the **bi-annual meetings to make recommendations**
- Aim to **promote the link with stakeholders** and especially Indonesian governmental agency for **funding the on-farm trials**, and with other existing projects and other commodities, as well as promoting the **regionalization of the project concept** at least in SEA countries with the help of SEARCA, EU, governmental funds.

Table. List of invited members

Gender	First Name	Name	Organization	Country	Position	Background
Mr	Gede	Wibawa	IRRI	Indonesia	Former Deputy Director for Research of RPN	Rubber-based agroforestry
Mr	Benoit	Bertrand	CIRAD	France	Breedcafs Project leader	Coffee breeding, coffee-based agroforestry
Mr	Vincent	Gitz	CIFOR	Indonesia	Director of Forests, Trees and Agroforestry (FTA)	Agroforestry
Mr	Uhendi	Haris	GAPKINDO	Indonesia		
Ms		Hafiza	Directorate of Estate Crops	Indonesia		

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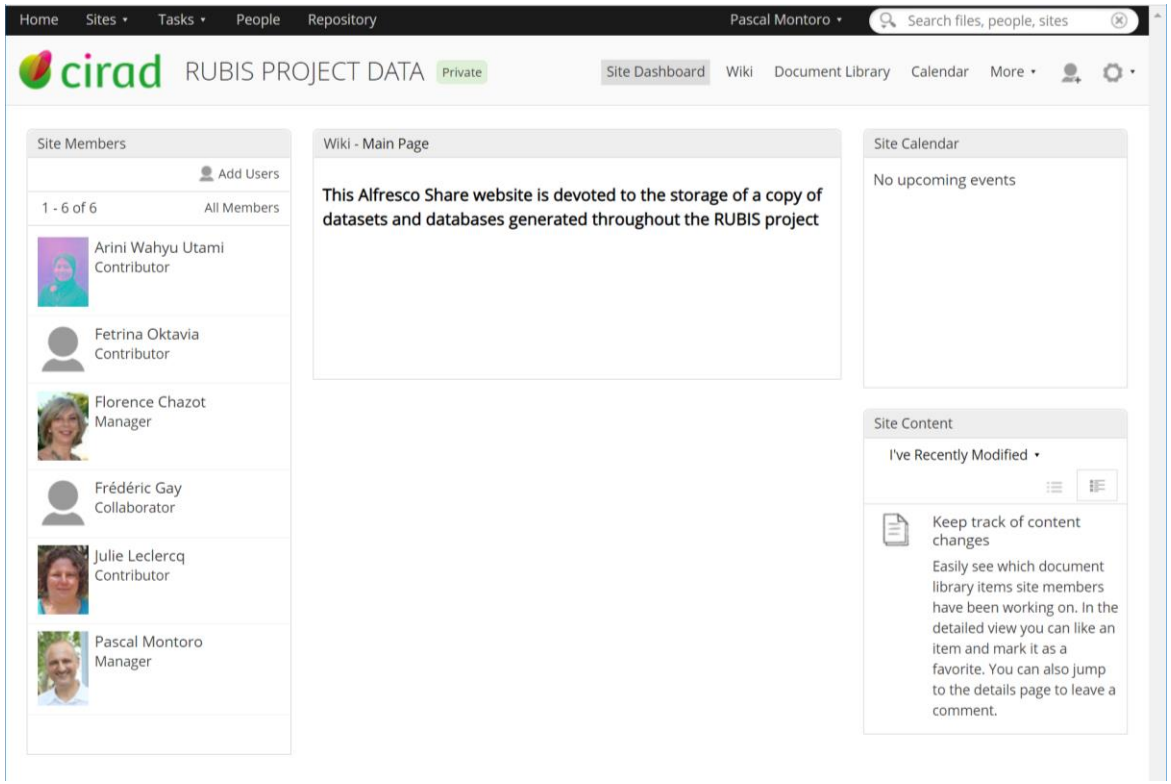
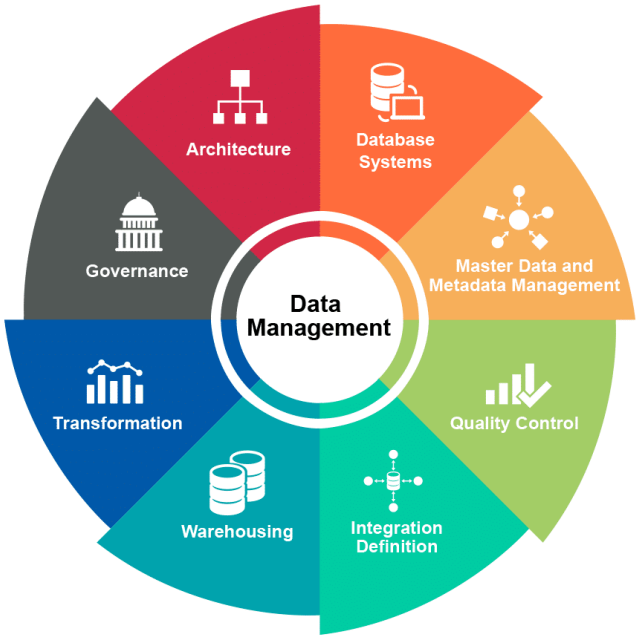
Data Management Plan

- The Data Management Plan is described in the Consortium Agreement
- Five persons are in charge to collect, check the quality of data and store the datasets
- One Alfresco-Share site devoted to the storage of a copy of the datasets and databases generated throughout the RUBIS Project





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Project communication tools

1. **Alfresco Share**

   - RUBIS PROJECT COORDINATION (WP leaders)
   - RUBIS PROJECT DATA (5 persons in charge of data)
   - RUBIS PROJECT MEMBERS ONLY (all members)

2. **Project internet website**

   https://www.rubis-project.org/

3. **Project Monthly NewsLetter**

4. **CIRAD server**

   - Genomic information related to the sequencing of the genome of rubber clones and genetic mapping
   - Restricted access of the Hevea Genome Hub to the Project members during the project, and then public open access after publication of data

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RUBIS
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Project website https://www.rubis-project.org/

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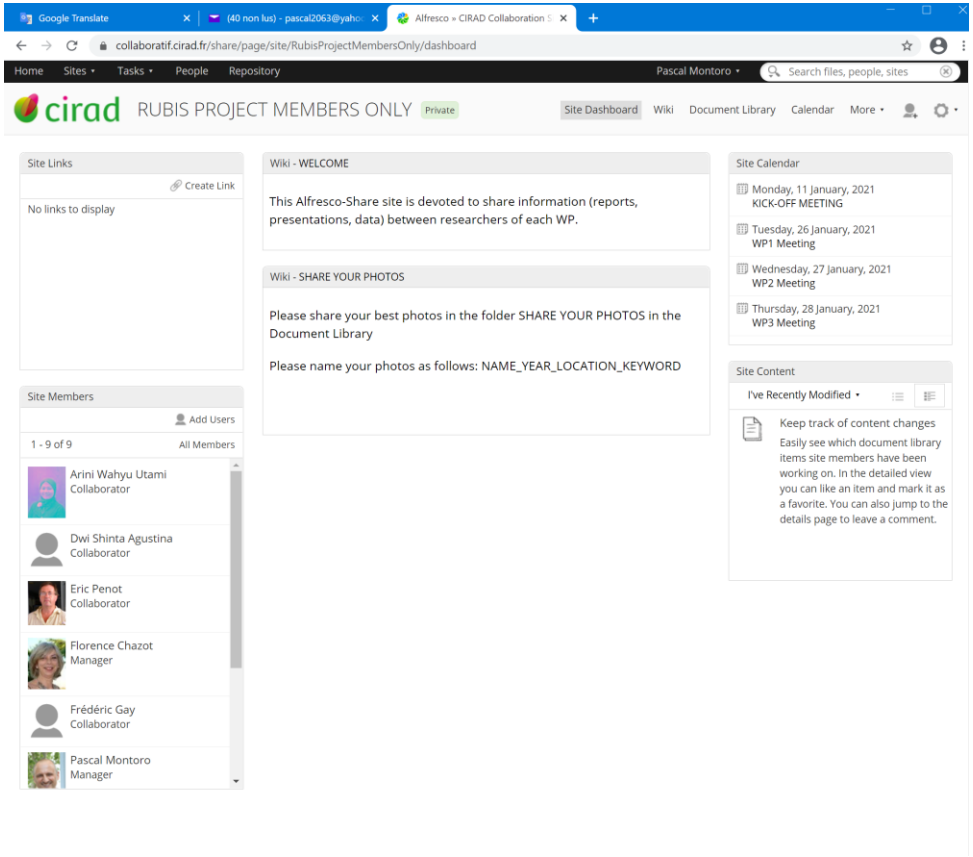
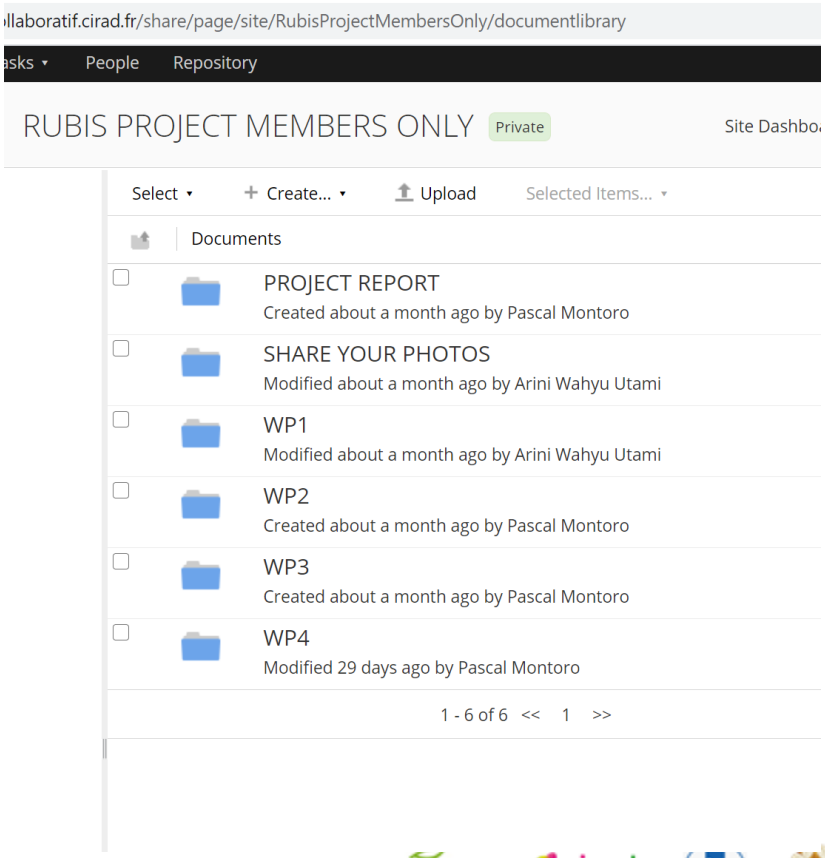
Alfresco-Share site PROJECT MEMBERS ONLY

- To register please contact florence.chazot@cirad.fr (send family name, first name, organization, email address)
- To find calendar of meetings, reports, presentations, sharing files, …





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Schedule and management of meetings and workshops

Date or frequency		January 2021	Monthly	Monthly	Bi-annual (June & December)	Annual	March 2021	July-Dec 2021	March 2022	November 2022 or March 2023	December 2023
Title of Workshop or meeting		Kick-off meeting	Project coordination meetings	Workpackage coordination meetings	Bi-annual Project Workshops + Side events (colllective intelligence, etc.)	Steering Committee	International Workshop on "Agronomic and socio-economic issues in rubber-based agroforestry systems"	Bilateral Workshops on "Needs and requirements from stakeholders for a sustainable natural rubber production"	First Multilateral Workshop on "Needs and requirements from stakeholders for a sustainable natural rubber production"	Second Multilateral Workshop on Data Integration & Design Solutions for resilient rubber cultivation systems for smallholders in a context of climate change	Final Rubis Project Workshop
Participant	Rubis Project	All project participants	WP coordinators	WP teams	All project participants	Representative of organizations & Coordination committee	All project participants	WP1 team	WP1 team & open to all project participants	All project participants	All project participants
	Stakeholders						Scientific and institutional stakeholders	Stakeholders	Representatives of stakeholders including non-organized SH	Representatives of stakeholders including non-organized SH	
	Advisory committtee	Advisory committee			Advisory committee		Advisory committee	Advisory committee	Advisory committee	Advisory committee	Advisory committee
Objective		Shared vision of the project structure, governance, objectives and outputs	Monitor progress, deliverables, budget communication. Foster exchanges and interdisciplinarity	Monitor activities	Scientific presentation & discussions	Provide advice, ensure delivery of the project outputs and the achievement of project outcomes	Gathering available data and information. Statement & typology of RAS	Identification of needs and requirements of stakeholders	Validation that needs and requirements are taken into account	Definition of packages. Design of in-farm trials. Data collection and sharing system	Project achievements & prospects
Output		Guidelines for WP leaders and researchers	Plain language report, website	Summary of the progress of activities	Progress report. New research questions. Paradigm shift	Recommendation report	Proceedings & concept note. Biblio & socio-economic db	List of needs and requirements. Validation of the SH typology	Go / No go for the Second Multilateral Workshop	Procedures and tools for the initiation of in-farm trials	Final Rubis Project Report

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Meetings calendar

- **See Alfresco site RUBIS PROJECT MEMBERS ONLY**
- **Next Bi-annual Project Meeting in June 21-22, 2021 (to be confirmed)**

Members	Meeting frequency	Day of meeting	Task
Project Coordination Committee	Week	Every Monday	• Administrative activity • External communication moderator including website, scientific publications and communications • Funding monitoring • Meeting organization (WP leaders, Bi-annual workshop, Steering Committee) • Monitoring deliverables, application of Data Management Plan • Internal communication by managing the dialogue between Parties and disciplines with the assistance of Liaisons Officers, dissemination of plain language summary, etc. • Drafting the monthly newletter • Coordination of the bi-annual reports
WP leaders	Month	First Monday of the month	• Monitoring activities • Drafting and presentation of monthly brief scientific progress reports and plain language summary • Drafting bi-annual scientific progress reports
WP members	Month	Last week of the Month: WP1 = Tuesday WP2 = Wednesday WP3 = Thursday	• Presentation of current and scheduled activities • Discussion on the scientific activities • Feedback on difficulties

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Thank you
Merci – Terima Kasih


Dr Fetrina Oktavia


Ms Shinta Agustina


Dr Radite Tistama


Prof Siti Subandiyah


Prof Budiadi


Ass Prof Arini Wahyu Utami

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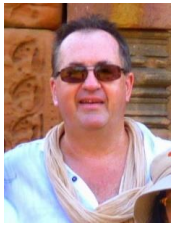
LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT


Dr Pascal Montoro


Dr Eric Penot


Dr Frédéric Gay


Dr Sophia Alami

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Work Package 1

Co-construction of varietal and cropping system ideotypes adapted to smallholders

Dwi Shinta Agustina
Indonesian Rubber Research Institute

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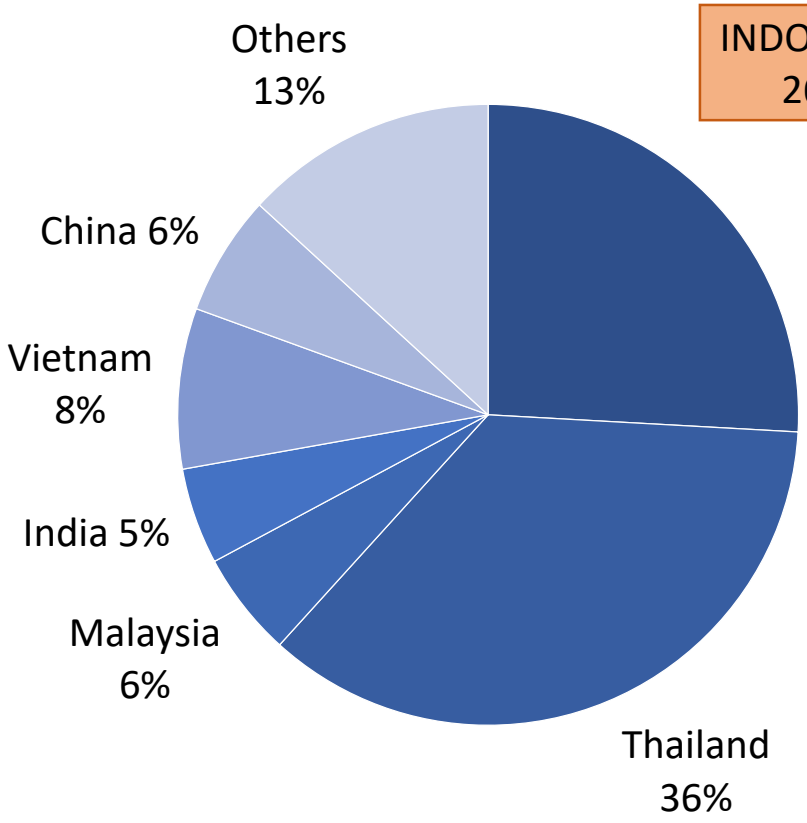
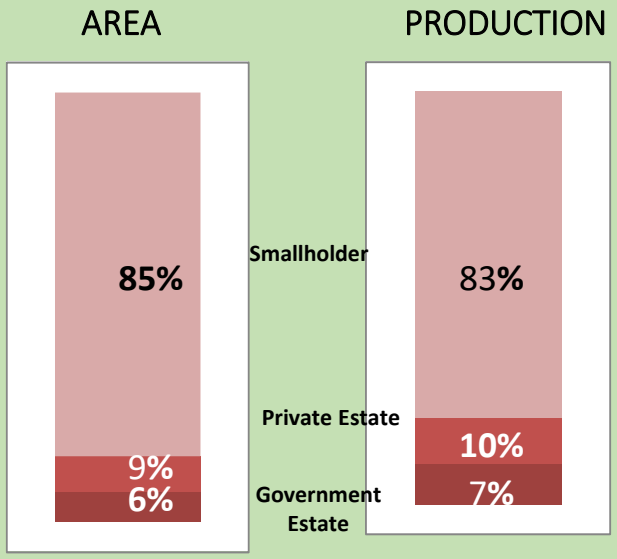
NATURAL RUBBER PRODUCTION IN MAIN PRODUCING COUNTRIES, 2018



INDONESIA
26%

INDONESIA 2018

TOTAL AREA : 3.67 M HA
Production : 3.63 M TON
Productivity : 1.161 KG/HA/TH



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Smallholder rubber in Indonesia: Trend of area, production, and productivity

Year	Total Area (ha)	Production (tons)	Yield (kg/ha/yr)
2014	3,067,388	2,583,439	1,053
2015	3.075.627	2.568.633	1,036
2016	3.092.365	2.754.747	1,104
2017	3.103.271	3.050.232	1,205
2018	3.113.418	3.005.027	1,161
Average Growth/ year (%)	0.5	4.65	

Source : Directorate General of Estate Crops, 2017-2019

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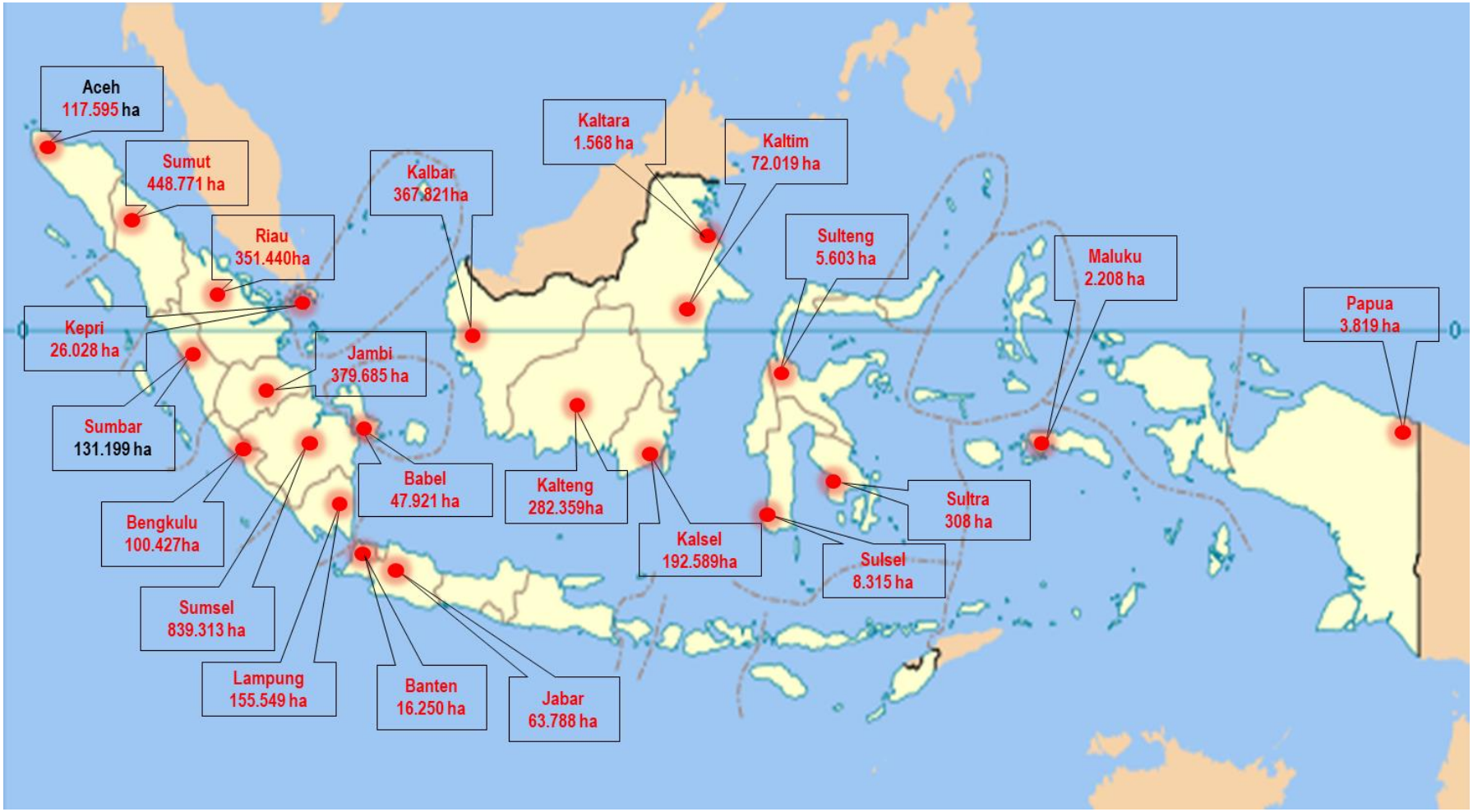
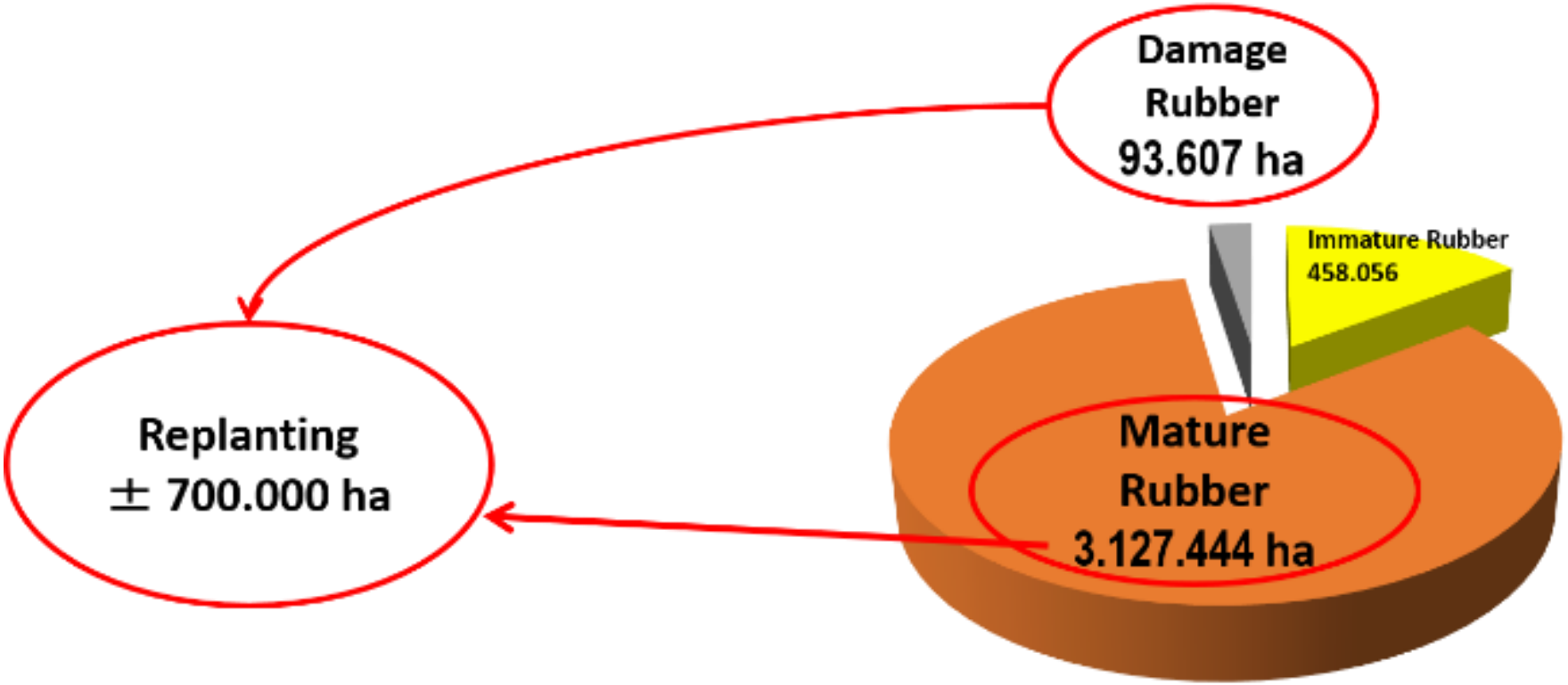
RUBBER AREA IN INDONESIA, 2018



Source : Directorate General of Estate Crops, 2016-2018

Target of Rubber Replanting 2018 - 2025



Source : Directorate General of Estate Crops 2015 - 2017

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Projects on jungle rubber & rubber intercropping systems


RAS 2 system in West Kalimantan, Indonesia in 1997 (Penot)


RAS in Thailand, 2016 (Penot)

- ICRAF 1994-2007. (Budiman (Gapkindo), E.Penot (CIRAD), G Wibawa (IRRI). Integrated rubber agroforestry for the future of smallholder rubber in Indonesia
- STD III Project (CIRAD, IRRI): 1993-1997: J-M Eschbach; Gede Wibawa. Study of Intercrops in between rubber: Station research and Farmer Plots.
- IRRI (2001-2004). Participatory rubber replanting model (Karyudi, IRRI)
- ICRAF Project 2004-2008. Coll. IRRI-CIRAD_PSU-KU (Gede Wibawa, Eric Penot, H. Sihombing). Promoting improved technologies (jungle rubber; rubber intercropping with food crops) which have the potential to improve the productivity of smallholder rubber agroforestry systems without conversion to monoculture and while maintaining productivity and biodiversity.
- ICRAF Project 2010. Eco-certified Natural Rubber from Sustainable Rubber Agroforestry in Sumatra, Indonesia (L. Joshi,....)

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Agroforestry systems in Indonesia

1. **Jungle rubber with non selected material**

2. **Long-term rubber-based agroforestry with perennial crops (Shorea, tek, coffea, cocoa, etc.)**

3. **Rubber-based agroforestry with food crops (banana, sugarcane, pineapple, rice, chilli, tubers, etc.) during immature period**

4. **Double rows of rubber trees separated by wide spacing for food intercrops (**Sahuri, IRRI, 2015-Present)

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Rubber Agroforestry Systems (RAS)= fruit/timber trees diversification in a single spacing cropping system based on clones

A CIRAD/ICRAF/IRRI reearch project from 1994 to 2007

Rubber planting density similar to that of monoculture

RAS 1 : an improved extensive jungle rubber

RAS 2 : an intensive system with intercrops

RAS 3 : réhabilitation of *Imperata grasslands*

1994 to 2007

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RAS1 : clonal rubber + forest regrowth : Jambi Rantau pandan

Objective :

- improving rubber production
- Extensive fruit/timber diversification,
- biodiversity conservation
- sustainable agriculture

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RAS 2 : clonal rubber + fruits + intercrops
Pasaman West Sumatra

Objective :

- improving rubber production
- intensive Fruit/timber diversification,
- Intercropping at immature period
- sustainable agriculture

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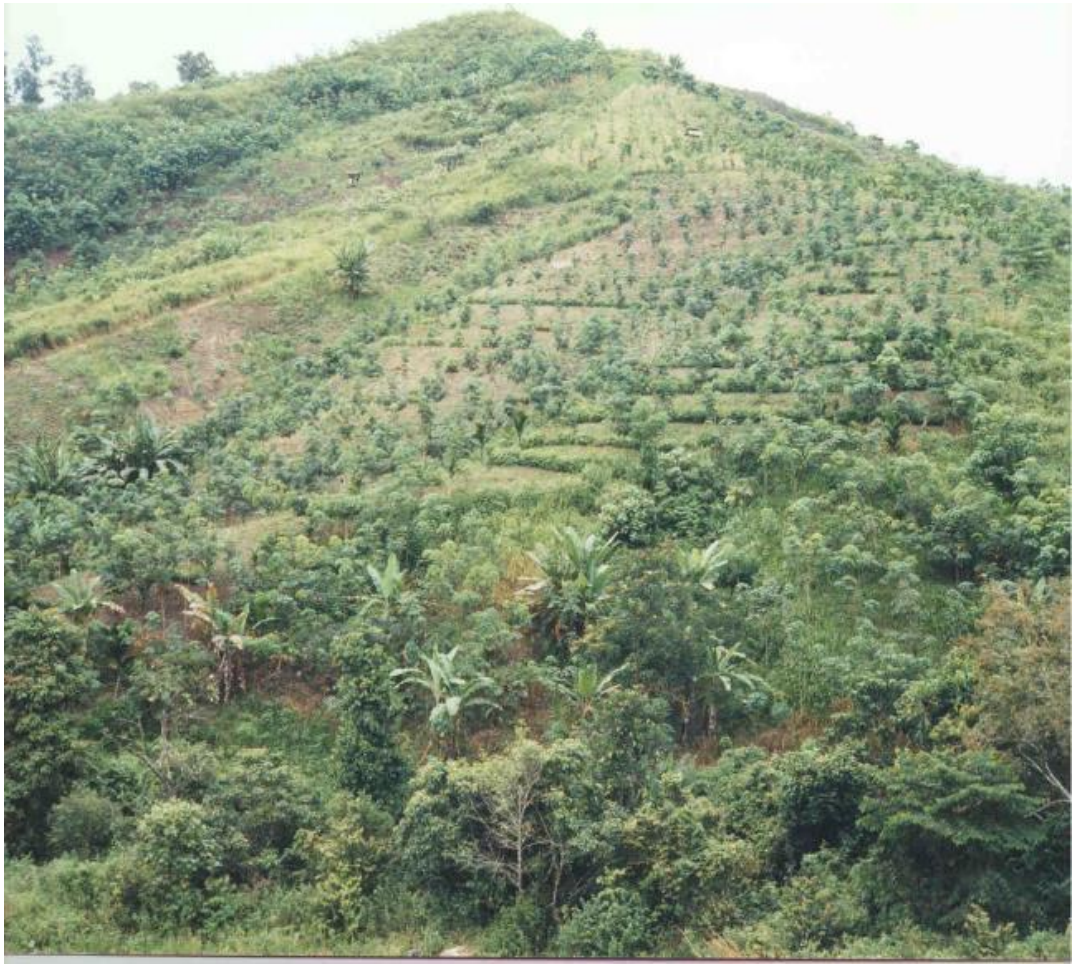
RAS2 West Sumatra : year 2 : complete land use rehabilitation of degraded land (Pasaman area)



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RAS 3 : clonal rubber + fruits + shading trees to kill *Imperata specific to West Kalimantan*

Objective :

- improving rubber production
- intensive Fruit/timber diversification,
- Specific intercrops for shading to kill at low cost *Imperata cylindrica = fast growing trees + covercrops*
- sustainable agriculture

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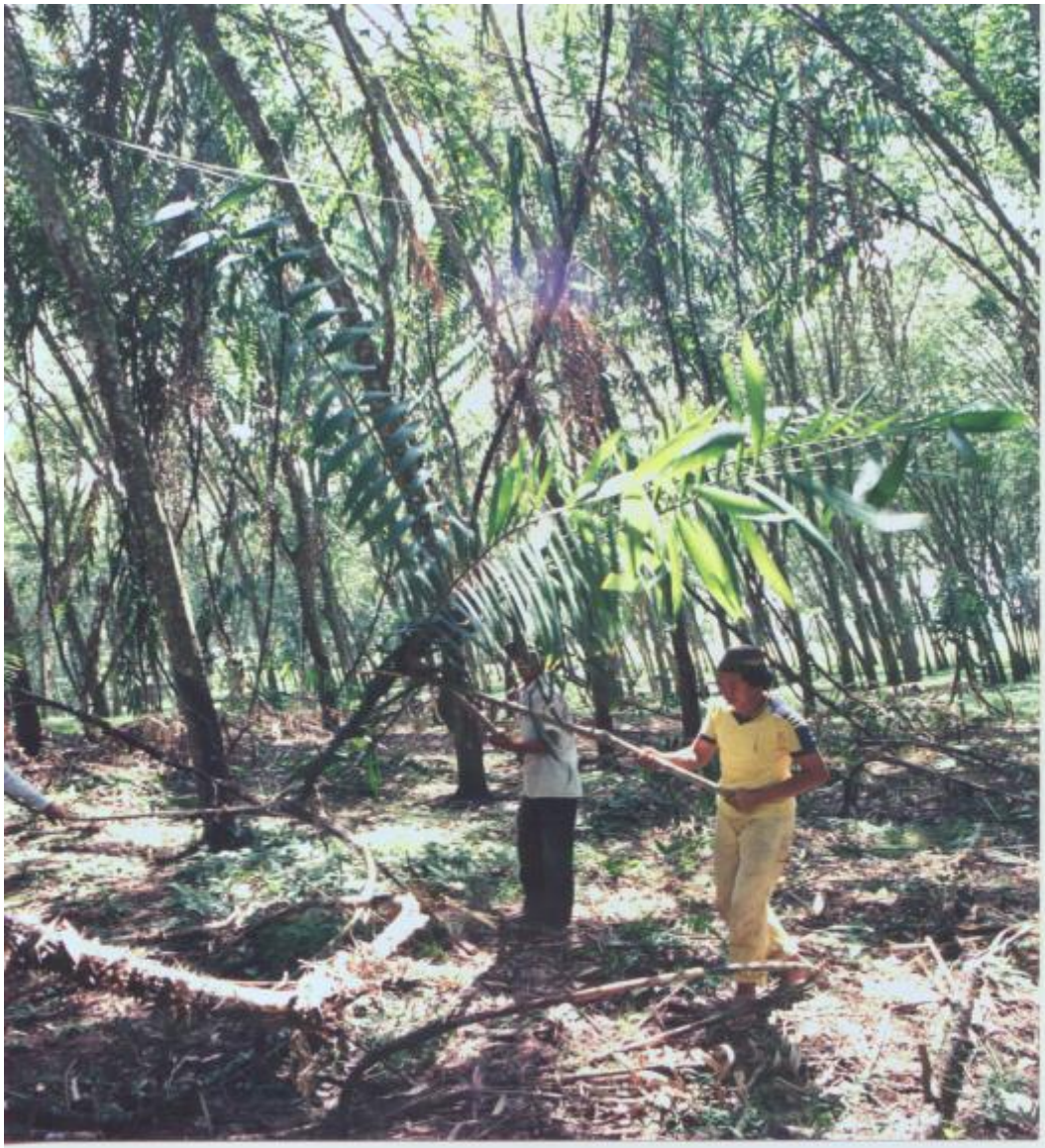
Association rubber and ratttan



- Developed in North Sumatra and Kalimantan
- Only at the end of rubber lifespan as rattan harvets destroy rubber canopy

- Good market for rattan

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Brief summary of previous research

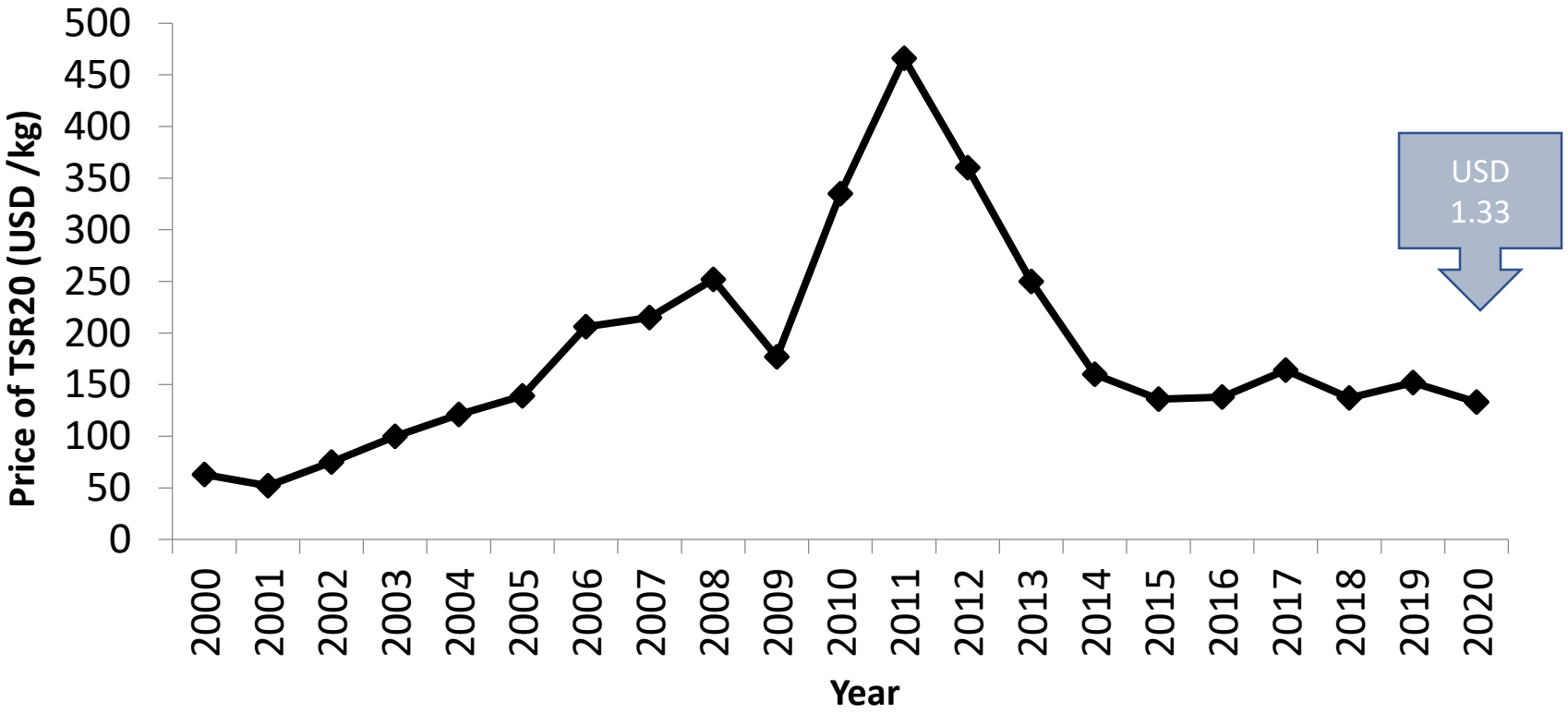
- Good findings in term of growth of planting materials; agronomic practices of RAS; interaction of growth factors (water, nutrients, pests and diseases; weeds)
- Suitability of intercrops with farm and farmers' characteristics
- Part of Agronomic modelling (ICRAF), local ecological knowledge
- Socio-economic aspects of RAS
- Bridging Research findings at Station level and farmers fields
- Transfer of technologies to farmers
- Support to Policy Recommendation process

- Why such good findings not adopted massively by Smallholders?
- How IT/Gadget could help in extension of research findings to smallholders
- What technologies needed by smallholders, in priority?

What do we expect from rubber agroforestry in terms of sustainability ?

- Income diversification (rubber , fruits , timber, etc) = better economic resilience
- No impact of agroforestry practices on rubber production as long as no trees above rubber canopy
- Reservoir of local biodiversity and « forest effect » on climate if largely used
- Less soil erosion and better use of water
- Soil fertility maintenance or improvement if soil is covered
- Possibility of timber production : rubber farmers might be the very next timber producers
- more globally environmental friendly
- Rubber do not require fertilizers and pesticides : rubber is already « bio compatible »

Fluctuation of Rubber Price (2000-2020)



Source : SICOM, 2020

Challenges for sustainable rubber cultivation

- The fluctuation and the current low rubber price reduce the attractiveness of the rubber cultivation in a context of higher and higher labour cost.
- The low capacity of transfer of technology to smallholders affects dramatically the productivity of plantations.
- Environmental degradation and climate change call for urgent actions for the adaptation of planting material and production systems.
- A participatory breeding programme with smallholders is expected to improve the resilience of rubber plantations.

Objective of the WP1 activities

WP 1 is aimed to identify 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.

WP1 activities

WP1. Co-construction of varietal and cropping system ideotypes adapted to smallholders.

Aim:

- to identify the typology of stakeholders including the non-organized smallholders in order to structure
- To implement a participatory science process to clarify their demand and need for future replanting programme

Activity 1.1. Analysis of the typology of stakeholders and agro-systems.

- Many agroforestry studies have been conducted by several organizations (CIFOR, ICRAF, UGM, RPN, IRRI, CIRAD, Univ Gottingen, etc.).
- A lack of integration of these data does not enable a clear image of the smallholdings.

⇒ **RUBIS International Workshop will be held virtually on 5-9 April 2021**

- ❖ Scientific committee: Dr. Thomas Wijaya (IRRI), with members consist of experts from 5 countries (France, Netherland, Indonesia, Malaysia, the Philippines)
- ❖ Organizing committee: Dr. Arini Wahyu Utami
- ❖ Deliverable: comprehensive proceedings and review paper to summarize the proceedings and describe the typology of RAS

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WP1 activities

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

⇒ Fieldwork: smallholder surveys, interviews, and Focus Group Discussions (FGD) in West Kalimantan, North Sumatra, Jambi, and South Sumatra

- The stakeholders: researchers, smallholders, traders, consumers, and both local and national authorities
- Questionnaire, interview guide, and template for data entry will be prepared together by CIRAD, IRRI, and UGM teams

- **Smallholder surveys and interviews**: by IRRI's researchers (Jambi and South Sumatera) and UGM's researchers & master students (West Kalimantan and North Sumatera)

- **Bilateral meetings of stakeholders** (2nd semester of 2021): to gather inputs and feedbacks from the stakeholders, and to formulate strategy for the implementation of participatory breeding programme

- **Multilateral workshop of stakeholders** (organized by IRRI in mid 2022): to determine the varietal and cropping system ideotypes suitable for stakeholders, the candidate farmers for large-scale in-farm trials, and potential compensation for smallholders involved in the large-scale evaluation of new planting material and cropping system

WP1 activities

Deliverables:

D1. Concept note on agronomic, socio-economic and environmental issues of rubber-based agroforestry systems (advantages, contraints, impact, limit of the systems, acceptation of these cultural practices)

D2. Master reports based on Focus Group Discussion sessions and Proceedings of the Bilateral Workshops on "Needs and requirements from stakeholders for a sustainable natural rubber production (WP1, Jan 2022)

D3. Creation of a stakeholders' network in Indonesia (WP1, Apr 2022)

D4. Scientific paper on rubber-based agroforestry systems and typology of smallholders in Indonesia (WP1, Dec 2022)

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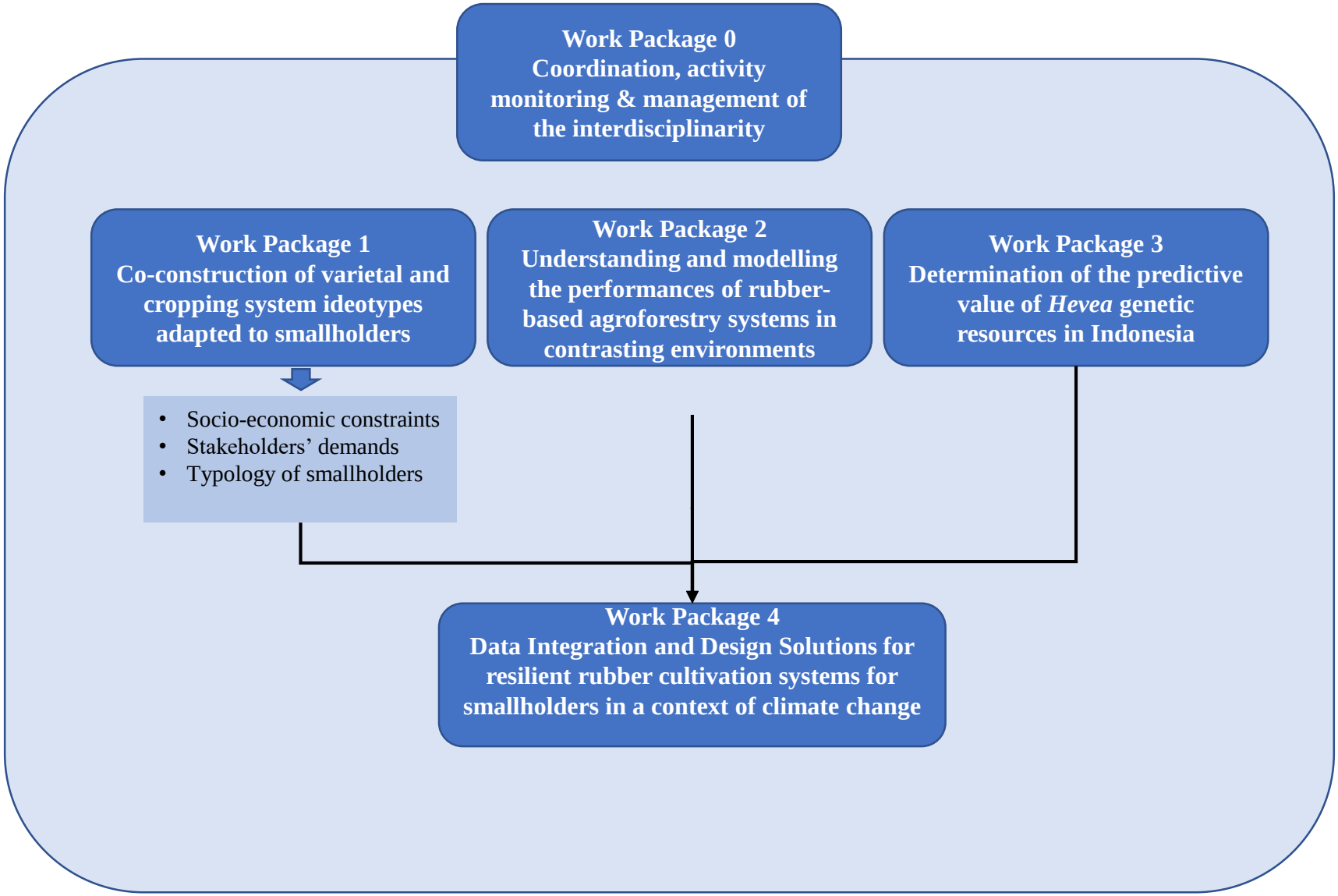
Workpackage outputs and interactions



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Work Package 2

Understanding and modelling the performances of rubber-based agroforestry systems in contrasting environments

Frédéric Gay
Cirad

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WP2 / OBJECTIVES AND DELIVERABLES

WP2. Understanding and modelling the performances of rubber-based agroforestry systems in contrasting environments

Coordination: Radite Tistama (IRRI) Frédéric Gay (UMR ABSys, CIRAD) Siti Subandiyah (Biotec RC, UGM)

Objectives of WP2

1/ characterizing the performances of RAS (typology from WP1) in terms of **productivity** and provision of regulating **ecosystem services**,

2/ identifying the **ecophysiological traits** to be targeted by **breeding** programs (WP3).

Main deliverables expected

- Contribution to the literature DB on RAS
- Scientific paper on ecophysiological factors and ecosystem services in various rubber-based agroforestry systems compared to monoculture (WP2)

WP2 / ACTIVITIES

2.1 Analysis biotic and abiotic constraints to performances of rubber agroforestry systems

Literature review (international paper, grey literature, local)

Field survey (water availability gradient, field indicators)

2.2 Monitoring and modelling the rubber double row agroforestry system separated by wide-spacing

Field trial at Sembawa IRRI's research station

Rubber-rice association with 2 planting pattern (single row vs double row) and several rice varieties with differences in shade tolerance and drought resistance.

2.3. Integration of ecophysiological and ecosystem services knowledge and data from monocropping and rubber-based agroforestry systems

Use of the Wanulcas or similar crop model

Simulation of climatic scenarios to assess the resilience of RAS

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WP2 / METHODS

MODELLING

Agronomic performances
Rubber
(growth and yield)
Associated species
(yield, growth…)

Ecophysiological traits
LAI, canopy structure,
root architecture,
LUE, WUE, NUE…

Soil functioning and soil ecosystem services assessments

Epidemiological monitoring
(rubber and
associated crop)

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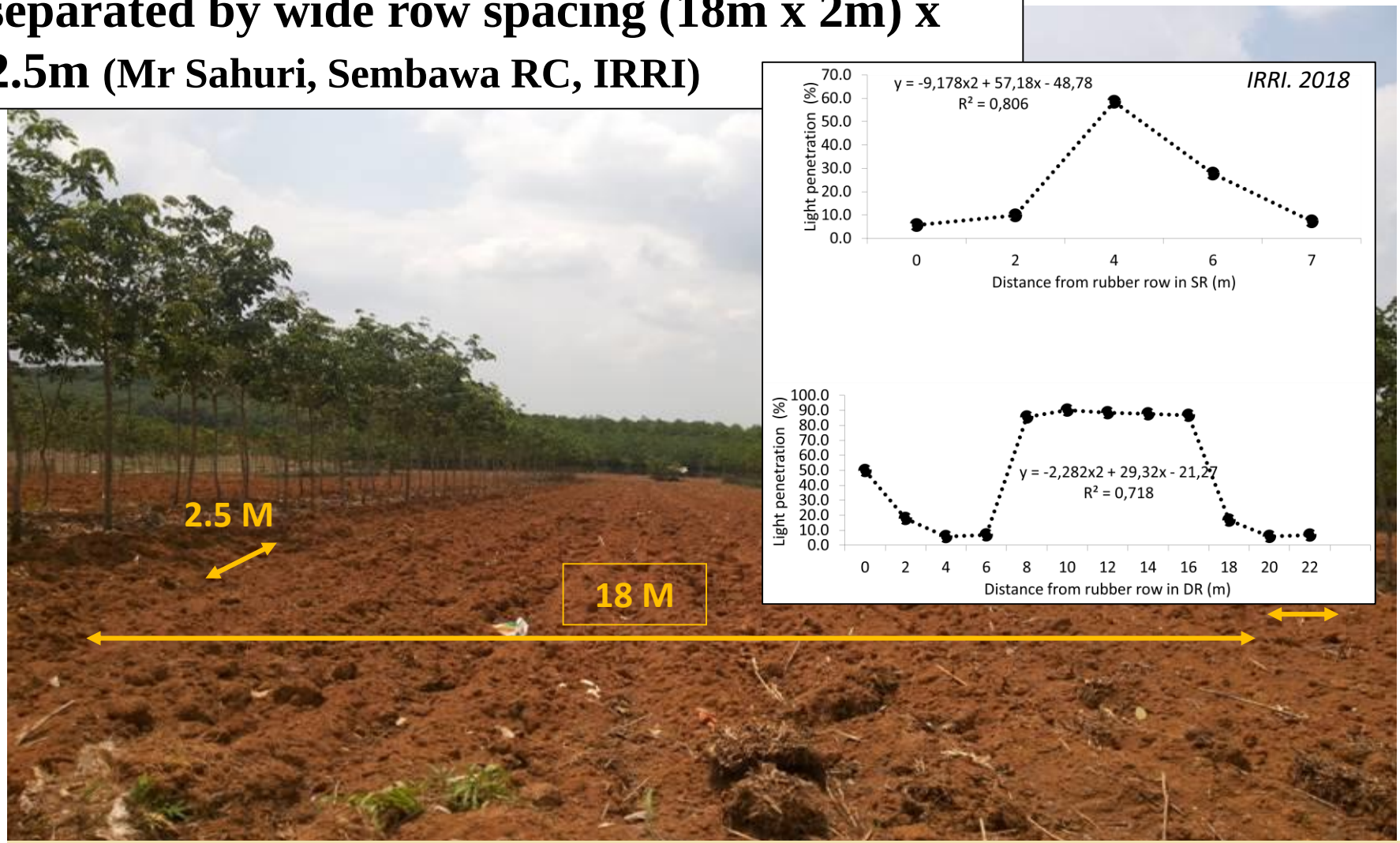
Double row rubber intercropping system separated by wide row spacing (18m x 2m) x 2.5m (Mr Sahuri, Sembawa RC, IRRI)



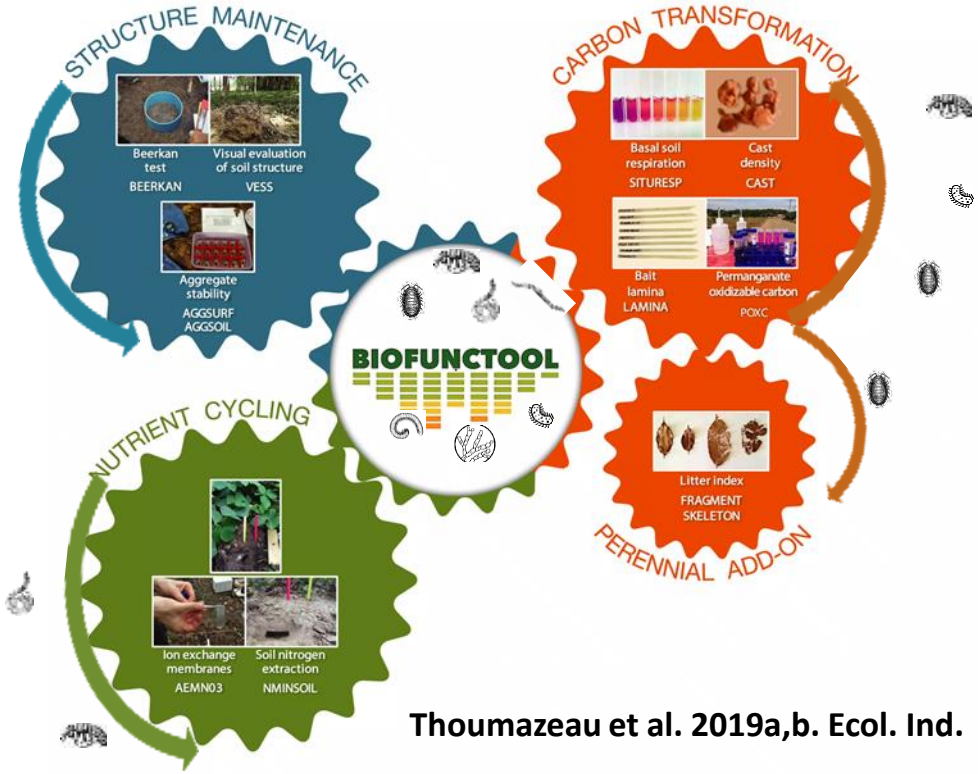
Using this wide row spacing, smallholders could cultivate intercrops between rubbers such as cash crops or other perennial crops

Biofunctool®, a new set of indicators to assess soil functions

Low-tech indicators

In-field indicators

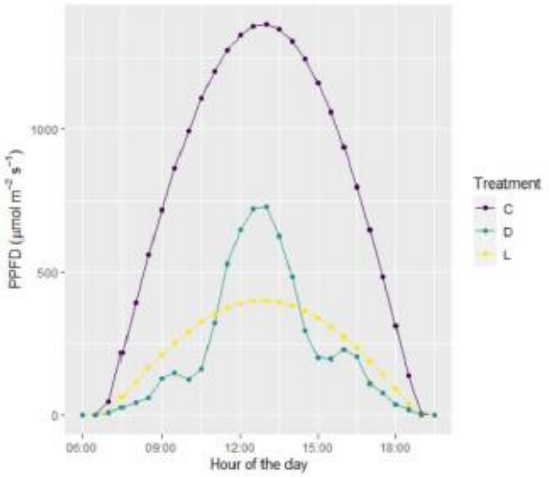
Cost-effective indicators



Thoumazeau et al. 2019a,b. Ecol. Ind.

Thoumazeau et al., 2019a. Biofunctool®: a new framework to assess the impact of land management on soil quality. Part A: Concept and validation of the set of indicators. Ecol. Ind., 97, 100-110.
Thoumazeau et al., 2019b. Biofunctool®: a new framework to assess the impact of land management on soil quality. Part B: investigating the impact of land management of rubber plantations on soil quality with the Biofunctool® index. Ecol. Ind., 97, 429-437.

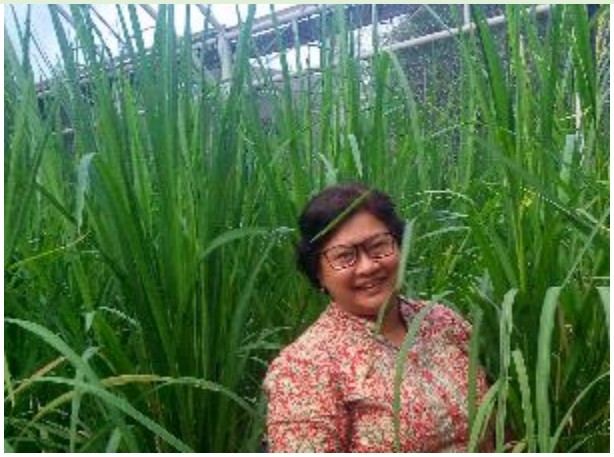
Screening rice genotypes for shade tolerance (Agroforice project / R.Perez / CIRAD)



WP2 / METHODS

Rice Cultivars	Pigment	Mortality (%)	
Hitam Toraja	Black	20	
Ciherang	**White**	**40**	
Cempo Ireng WT	Black	80	
Cempo Ireng Gunung kidul	Black	20	
Merah Sumbawa	Red	20	Upland
Blambangan A3	Red	20	
Putih Payo	White	100	
Putih Berlian	White	20	
Merah Pari Eja	Red	0	Upland
Hitam Lampung Selatan	Black	20	
Sembada Hitam	Black	20	
Siam Anjir	White	60	
Segreng	**Red**	**20**	
Pokali	White	80	
Aek Sibundong	Red	0	Upland
Cempo Ireng Pendek	Black	60	
Delima Merah	Red	0	Upland
Hitam Kalsel	Black	20	
Inpari	White	60	
Lokal Merah Kalsel	Red	40	
Patan GK	Red	40	

Screening of rice cultivars in severe drought condition (FTSW 0.2) by Dr Yekti Asih Purwestri



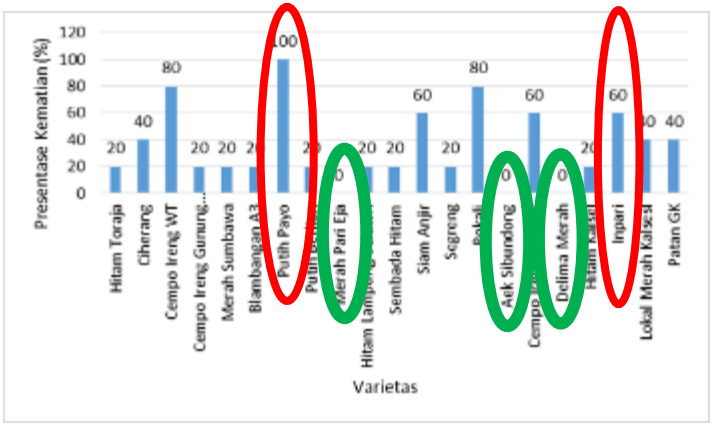


Figure 1. Screening of 21 rice cultivars in severe drought condition (FTSW 0.2)

Expl Agric. (2012), volume 48 (1), pp. 49–63 © *Cambridge University Press 2011*
doi:10.1017/S0014479711000086X

TRANSPIRATION, GROWTH AND LATEX PRODUCTION OF A *HEVEA BRASILIENSIS* STAND FACING DROUGHT IN NORTHEAST THAILAND: THE USE OF THE WaNuLCAS MODEL AS AN EXPLORATORY TOOL

By L. BOITHIAS†,‡, F. C. DO§, S. ISARANGKOOL NA AYUTTHAYA¶, J. JUNJITTAKARN¶, S. SILTECHO†† *and* C. HAMMECKER‡‡

Meine van Noordwijk, Betha Lusiana, Ni'matul Khasanah, Rachmat Mulia

WaNuLCAS 4.0

Background on a model of

Water, Nutrient and Light Capture in Agroforestry System

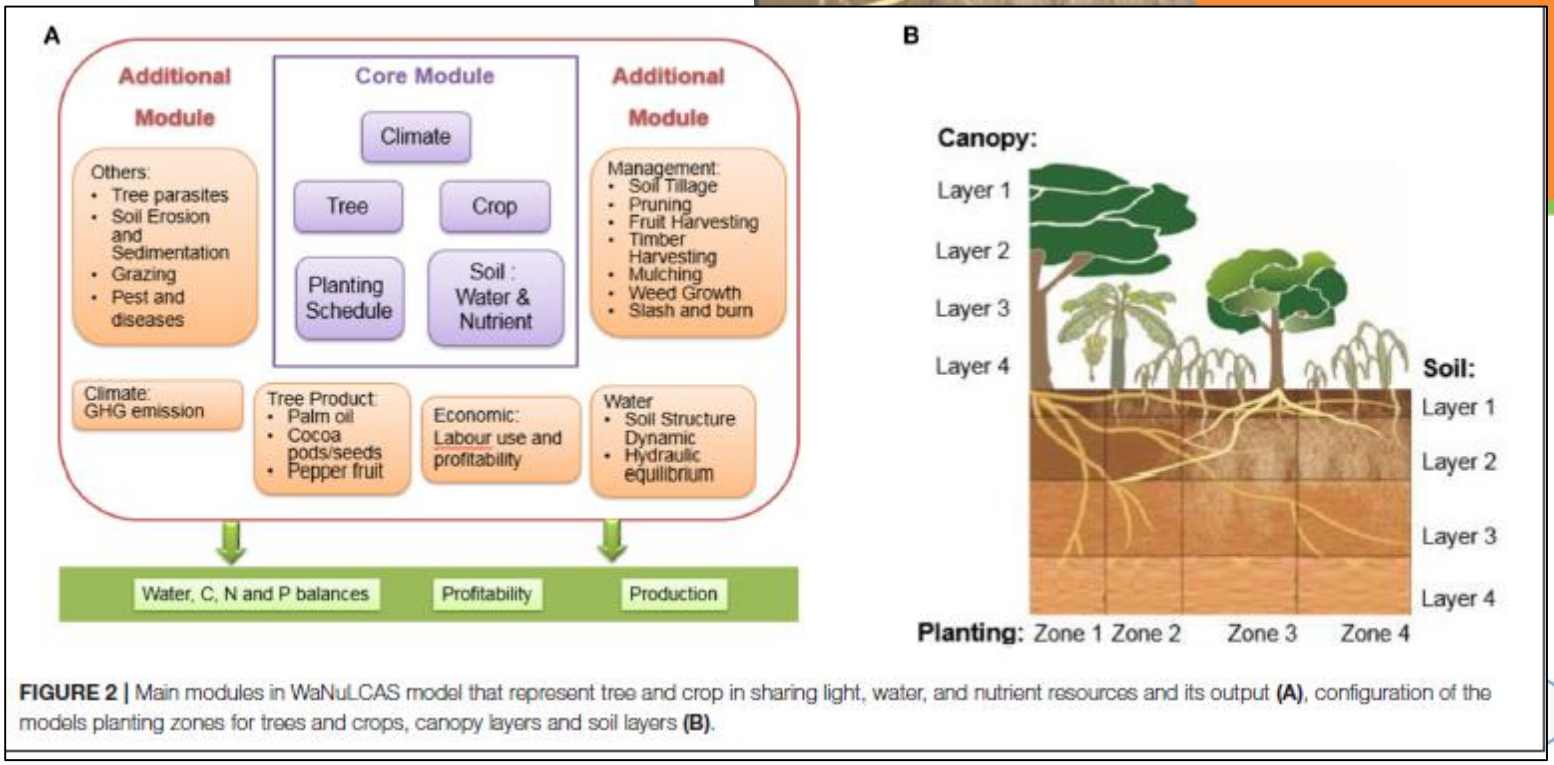


FIGURE 2 | Main modules in WaNuLCAS model that represent tree and crop in sharing light, water, and nutrient resources and its output **(A)**, configuration of the models planting zones for trees and crops, canopy layers and soil layers **(B)**.

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THE WP2 TEAM

IRRI	CIRAD	UGM
Dr. Radite Tistama (Agronomy)	Dr. Frederic Gay (Agronomy and Ecophysiology)	Pr. Siti Subandandiyah (Plant Pathology)
Dr. Fetrina Oktavia (Plant Breeding)	Dr. Denis Fabre (Ecophysiology)	Dr. Yekti Asih Purwestri (Molecular biology)
Ms. Alchemi Putri J. Kusdiana (Plant pathology)	Dr. Raphaël Marichal (Soil biology)	Pr. Siti Subandiyah (Plant pathology)
Mr. Sahuri (Agronomy)	Dr. Eric Penot (Socio-economy)	Pr. Budiadi Suparno (Forestry)
Mr. Jamin Saputra (Soil science)	Dr. Raphaël Pérez (Ecophysiology)	Dr. Widiyatno (Agroforestry)
	Dr. Valérie Pujade Renaud (Plant pathology, molecular biology)	Dr. Budiastuti Kurniasih (Agroecology)
	Dr. Alexis Thoumazeau (Agroecology)	Ms. Kartika Restu Susilo (Student)

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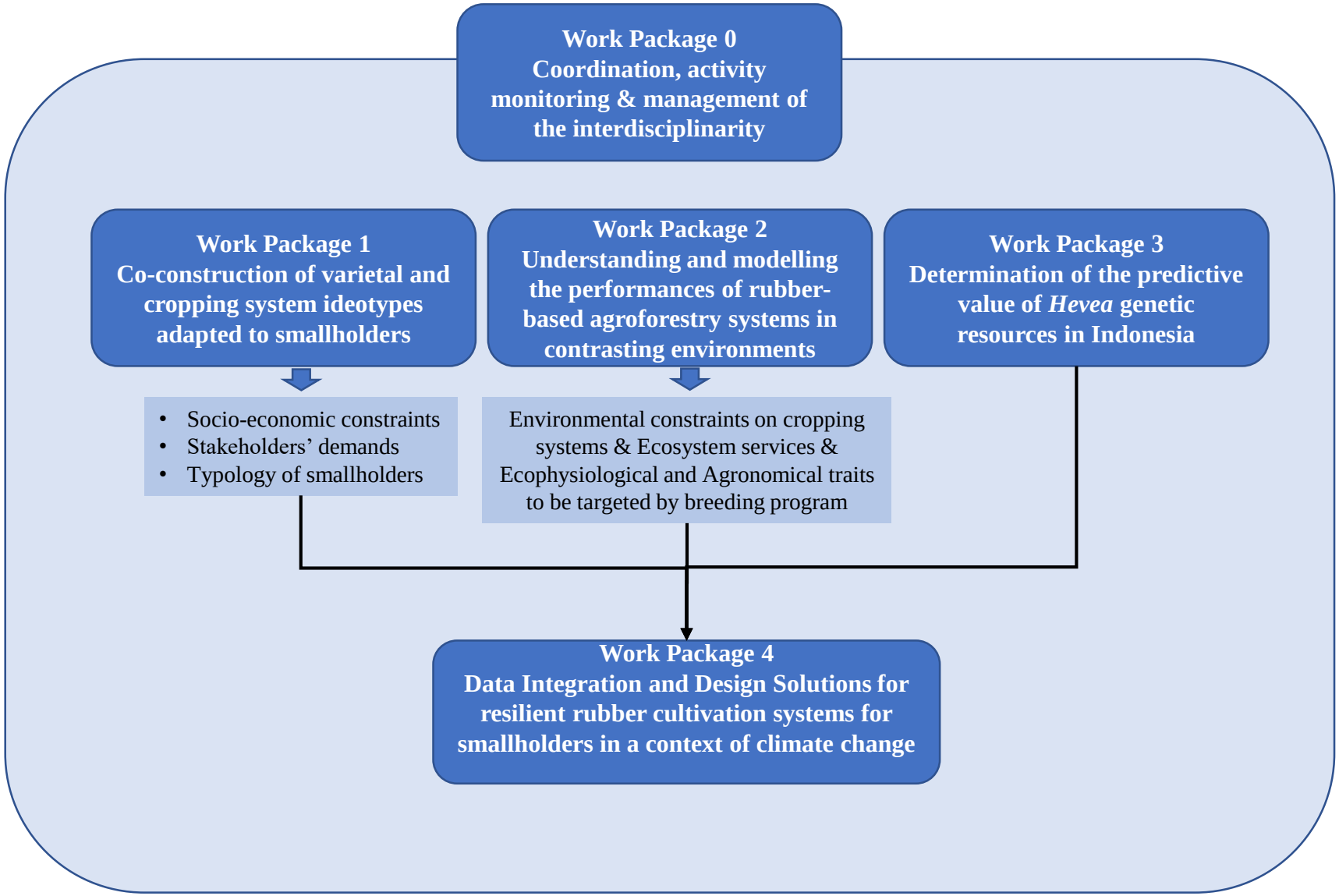
Workpackage outputs and interactions



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Work Package 3

Determination of the predictive value of *Hevea* genetic resources in Indonesia

Fetrina Oktavia
Indonesian Rubber Research Institute

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Background and context

Aim of conventional rubber breeding program

To obtain the new superior clones which have high latex yielding and good agronomic characters (robust and fast growth, tolerant to biotic and abiotic stress, good quality of wood, good architecture) for monospecific plantations

Technical constraints for breeding program

- **Low fruit set by hand-pollination (< 2%)**
- **Long-term breeding** due to Hevea biology and cultivation
- Complex agronomical traits involving numerous alleles
- Incompatibility between scion and rootstock in grafting process
- Ageing over the propagation of clones

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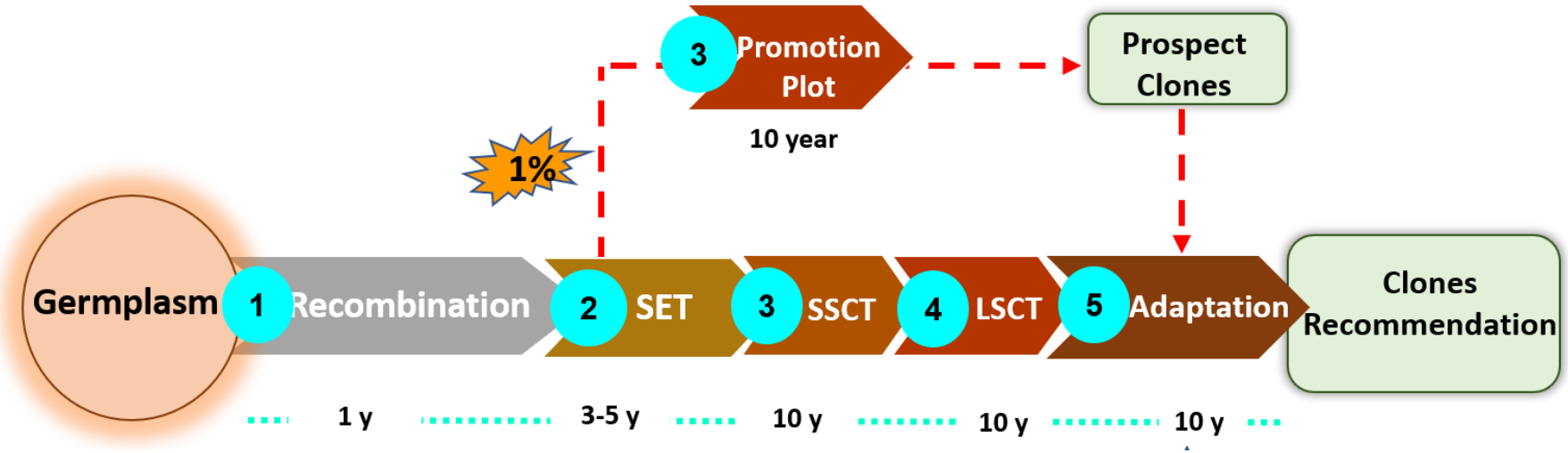
Standard Operating Procedure for *Hevea* conventional breeding



Research centres (Sembawa, Getas, Sungei Putih) **IRRI/Government/Private**

Strategy:

Approach of modern breeding program by WP 3 Activity of Rubis

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IRRI Rubber Germplasm

- 8,000 genotype of rubber germplasm in Budwood garden
- 4,000 progenies F1 SET
- 201 progenies in SSCT
- 30 clones in LSCT/Adaptation

IRRI Recommendations

Latex Clones

IRR 104, IRR 112, IRR 118, IRR 220, BPM 24, PB 260, PB 330, PB 340

Latex Timber Clones

IRR 5, IRR 39, IRR 42, IRR 219, IRR 230, RRIC 100

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Genetic Analysis of Tapping Panel Dryness (IRRI-CIRAD GA-TPD Project)

Schedule of activities:

- 2012-2013 : Crossing of PB 260 ♀ x SP 217 clone ♂ to obtain segregation population
- 2013 : Establishment of a Seedling garden
- November 2016 : Planting of population in controlled conditions of SSCT1 in 5 ha area
- 2016 – 2020 : maintenance and phenotyping during the immature period (growth, leaf diseases, Drought Factor Index)
- June-September 2018:

- Analysis of the legitimacy of the population (PB 260 x SP 217)
- Analysis of the conformity of plant material in the trials
- Genetic map with 229 SSR markers

- 4 January 2021 : Start to open tapping

Total analysed genotypes	257
Legitimated	**153**
Failure	49
Not confirmed	4
Selfing	6
Not tested	14
Dead / retarded	31

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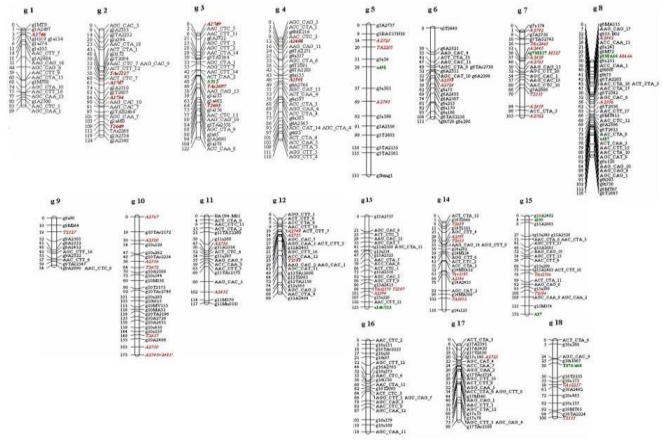
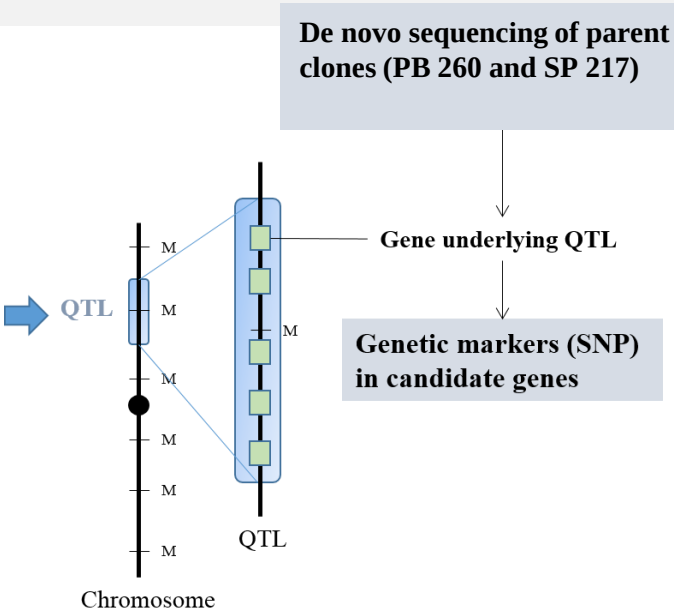
New challenges for the genetic and genomic analysis of major physiological and agronomical traits

Identification of genes underlying QTLs requires a high density map and a reference sequence of rubber genome

- Completion of the SSR genetic maps with SNP markers from GBS (genotyping by sequencing) (Genotyping Platform, UMR AGAP)
- De novo sequencing of a high quality genome sequence using new sequencing strategy
- Incrementation of the Hevea Genome Hub developed by CIRAD with genetic information



Hevea genetic map (2000 cM, 1 cM = 1 Mbp, 18 linkage groups (18 chromosomes)



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Latex diagnosis, a powerful tool for phenotyping populations in breeding and genetic programs

Latex diagnosis is used to monitor the physiological status of rubber plantations

- Sucrose
- Inorganic phosphorus
- Thiols
- DRC (Dry rubber content)

→

- **Optimize harvesting system for latex production**
- **Avoid TPD occurrence**

→ **Clonal typology**

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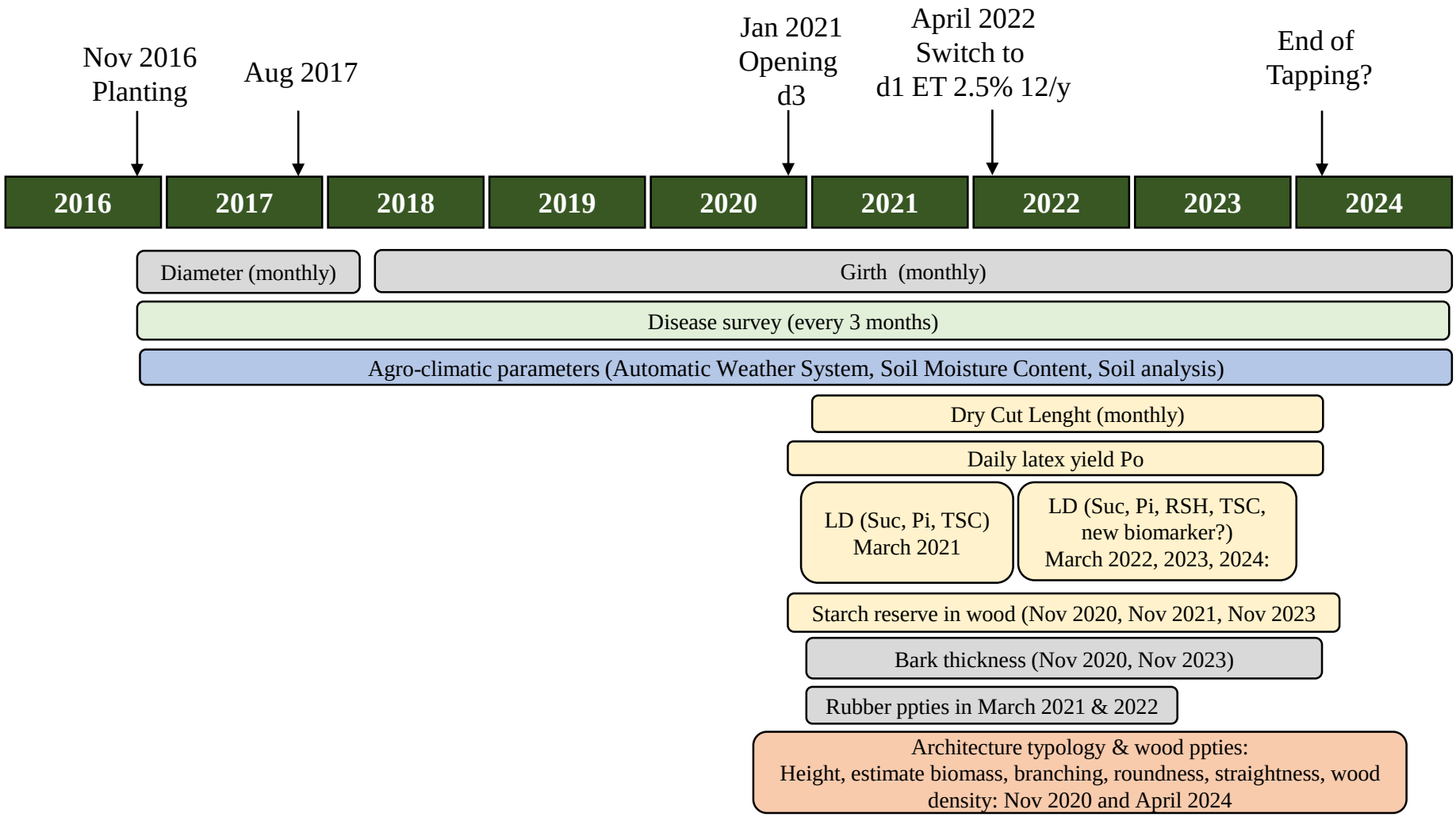
General scheme of multidisciplinary phenotyping on SSCT-1



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The objective of WP 3 activities

Classes the rubber clones according to the agronomic and physiologic capacities in order to facilitate the selection of material for further on-farm large-scale trials

The traits will be selected for matching with the cropping systems identified by stakeholders (WP1) and with a potential tolerance to predicted environmental constraints (WP2).

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WP 3 Research Activity

Typology of rubber clones

- IRRI recommended rubber clones
- F1 progenies of PB 260 x SP 217

Genotyping and genomic analyses

1. Genetic conformity of the plant material phenotyped in trials
2. Construction of a high-density map
3. De novo sequencing of reference parent PB 260 & resequencing of the male parent clone SP 217 genome

Genetic analysis of complex traits

1. Genetic analysis of physiological traits related to latex production
2. Genetic analysis of traits related to the resistance to major pathogens of rubber plantations in Indonesia
3. Analysis of rubber film mesostructure with SECMALS to forecast some properties of raw rubber
4. Phenotyping of traits related to the architecture typology of trees and wood properties

Development of high throughput phenotyping methods

1. Attempts for rapid methodology for latex diagnosis in multiplate spectrophotometer, sucrose content using test strip
2. Application of the NIRS to estimate parameters of latex diagnosis.

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Deliverables from WP3

1. Scientific paper on genome sequencing and high-density map (June 2022)
2. Hevea Genome Hub with QTL and gene annotation (Dec 2023)
3. Training on NIRS (near infrared spectroscopy) (March 2022)
4. Training on QTL detection and detection of genes underlying QTLs using Hevea Genome Hub (June 2022)
5. Draft scientific paper on the identification of QTLs and underlying candidate genes for physiological traits related to latex production, for plant disease traits and for rubber properties (Dec 2023)

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Project structure
WP0
WP1
WP2
WP3
WP4

WP3. Determination of the predictive value of Hevea genetic resources in Indonesia

WP3 (162 Ko)

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.

The objective of this WP is to class the rubber clones according to their agronomic and physiologic capacities in order to facilitate the selection of material for further on-farm large-scale trials, which will be established after the present project. The traits will be selected for matching with the cropping systems identified by stakeholders (WP1) and with a potential tolerance to predicted environmental constraints (WP2). The *Hevea* germplasm consists of wild Amazonian core-collection of 100 accessions, 14 recommended clones and progenies under selection. The predictive value of rubber clones will be determined from data of long-term large-scale clone trials in various contrasting areas. Besides, the current GA-TPD project deals with the phenotyping of a segregating population of 200 genotypes (clone PB 260 ♀ x clone SP 217 ♂), which is being analyzed in controlled conditions and in a small-scale clone trial (5 replicates of 2 copies = 2,000 trees = 5 ha) planted in November 2016. A fine genomic and phenotypic characterization of a progeny under selection will provide new candidate clones based on traits not characterized above such as physiological parameters related to latex production, tolerance to abiotic and biotic stress as well as rubber and wood properties. Genetic and genomic analysis of these traits will enable further marker-assisted selection applications.

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WP3 Scientists

No	Degree	First Name	Name	Organization	Speciality
1	Dr	Fetrina	Oktavia	IRRI	Plant Breeding
2	Dr, HDR	Pascal	Montoro	CIRAD	Plant Cell & Molecular
3	Dr	Sophia	Alami	CIRAD	Socio-economy
4	Dr	Frédéric	Bonfils	CIRAD	Chemistry
5	Dr	Panjisakti	Busunanda	UGM	Plant Breeding
6	Dr	Gilles	Chaix	CIRAD	NIRS
7	M. Sc.	Anne	Clément-Vidal	CIRAD	Biochemistry
8	Dr	Frédéric	Do	IRD	Ecophysiology
9	M.Sc.	Gaëtan	Droc	CIRAD	Bioinformatics
10	Dr	Widhi	Dyah Sawitri	UGM	Biochemistry, Molecular
11	Dr	Denis	Fabre	CIRAD	Ecophysiology
12	M. Sc.	Irfan	Faturrahman	IRRI	Rubber technology
13	Dr	Frédéric	Gay	CIRAD	Agronomy, Ecophysiology
14	Dr	Jean	Gérard	CIRAD	Wood technology
15	Dr	Eric	Gohet	CIRAD	Agronomy
16	M. Sc.	Sherly	Hanifarianty	IRRI	Rubber technology
17	Dr	Rudi	Hari Murti	UGM	Plant Breeding
18	M. Sc.	Sigit	Ismawanto	IRRI	Plant Breeding
19	M. Sc.	Junaidi	Junaidi	IRRI	Agronomy, Physiology
20	Dr	Vincent	Le Guen	CIRAD	Rubber geneticist
21	Dr, HDR	Julie	Leclercq	CIRAD	Genomics, Physiology
22	Dr	David	Lopez	CIRAD	Bioinformatics
23	M. Sc.	Pierre	Mournet	CIRAD	Genotyping Platform
24	M. Sc.	Andi	Nur Cahyo	IRRI	Plant Breeding
25	Dr	Tri Rini	Nuringtyas	UGM	Biochemistry, molecular
26	Dr, HDR	Valérie	Pujade Renaud	CIRAD	Plant pathology, molecular
27	M. Sc.	Alchemi	Putri J. Kusdiana	IRRI	Plant pathology
28	B.Sc.	Maryannick	Rio	CIRAD	Molecular biology
29	M. Sc.	Budi	Setyawan	IRRI	Plant Breeding
30	Pr	Siti	Subandiyah	UGM	Plant pathology
31	M. Sc.	Afdholiatus	Syafaah	IRRI	Plant Breeding
32	Dr	Tri Rapani	Febbiyanti	IRRI	Plant Pathology
33	MSc	Martini	Aji	IRRI	Agronomy
34	B.Sc.	M. Riski	Darojat	IRRI	Plant Breeding

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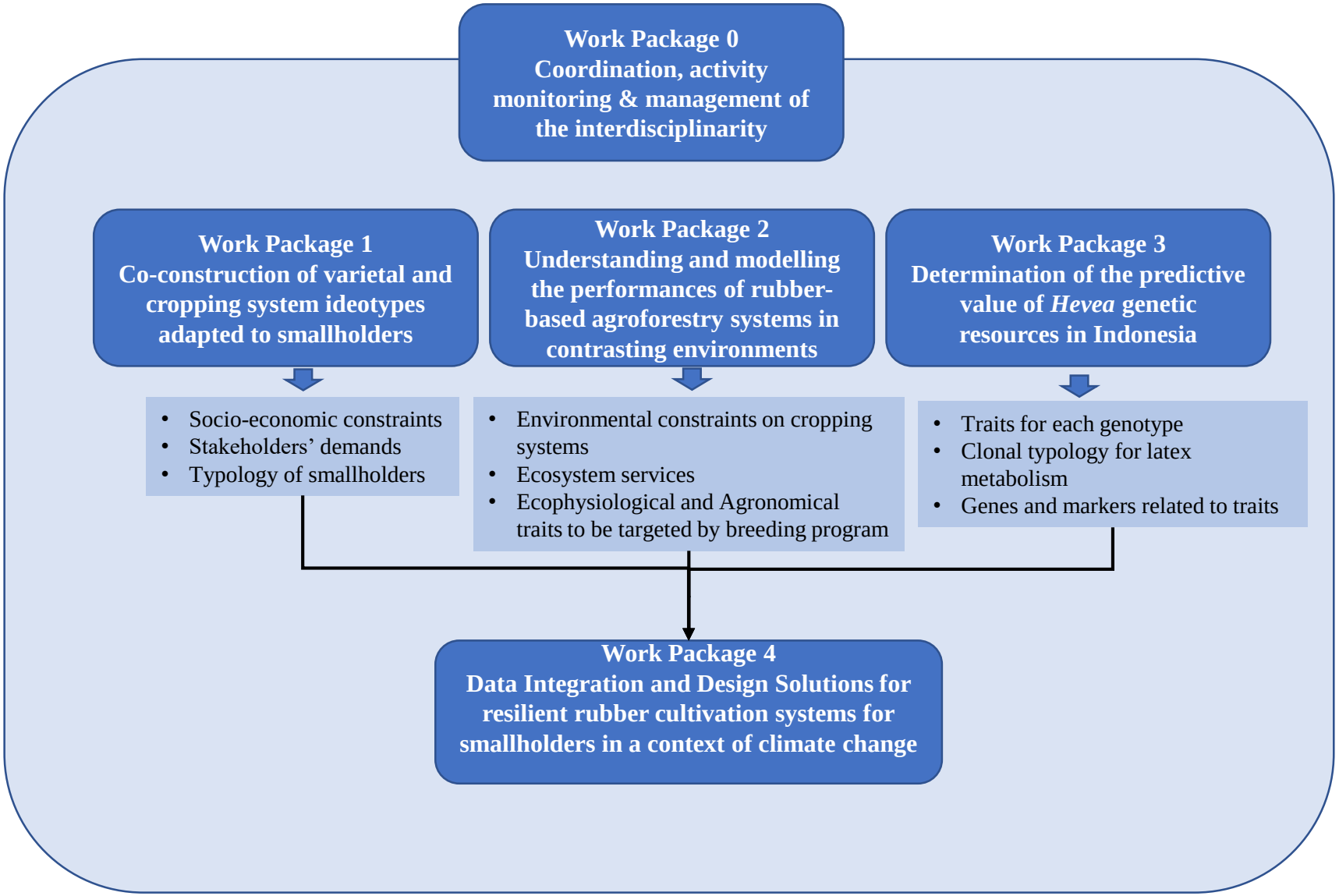
Workpackage outputs and interactions



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Work Package 4

Data integration and designing solutions for resilient rubber cultivation systems for smallholders in a context of climate change

Pascal Montoro
Cirad

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Work package 4. Data integration and designing solutions for resilient rubber cultivation systems for smallholders in a context of climate change

Objectives

- Integrate project data and information from WP1, WP2 and WP3
- Design both planting packages, experimental network and tools for further establishment and monitoring of on-farm trials
- Develop a digital tool to get information from on-farm trials

- Draft a proposal for funding on-farm trials
- *Identify new scientific questions for a new research proposal*

Process of integration

- Data integration and solutions designing will follow a step-by-step process throughout the life of the project with all stakeholders
- Identification of tentative scenarios

Structure of WP4 activities

- Task 4.1 Progressive data and knowledge integration throughout the project
- Task 4.2 Second Multilateral Workshop on Data integration and designing solutions for resilient rubber cultivation systems for smallholders in a context of global change
- Task 4.3 Development of KoboCollect system for the formalization of on-farm data collection
- Task 4.4 Sharing and dissemination of co-constructed solutions

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Task 4.1 Progressive data and knowledge integration throughout the project

Bi-annual Project Workshops
(work package members and representatives of stakeholders**)**
- Progress report of WPs

Side meeting sessions
- Integrate progressively the outputs
- Identify new questions to be studied during the project or to be implemented in another step

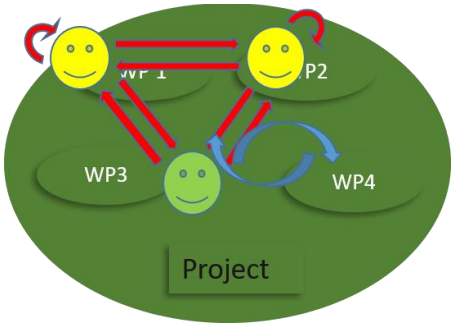
➢ The preliminary conclusions may lead to iteration of research activities

WP4 Master student
- Full literature database on RAS and other part of the project
- Multivariate analyses of socioeconomics, agronomic, genetic data

→ Development of scenarios (packages, trials network, smallholders' candidates, etc.)

Tentative scenarios to be discussed at the **second multilateral workshop**

Collective intelligence facilitation to ease the integrative approach and inclusiveness (Liaison Officers)



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Task 4.2 Second Multilateral Workshop on Data integration and designing solutions for resilient rubber cultivation systems for smallholders in a context of global change

- This Workshop will be organized by **IRRI at the Sembawa RC** in November 2022 or March 2023 when sufficient information will be obtained from WP1, WP2 and WP3.
- Participation of RUBIS Project members, Advisory Committee and **representatives of stakeholders** identified by WP1
- Live language translation will be provided for **English and Indonesian**.

Objectives

- Presentation of the tentative scenarios
- Check if the scenarios can answer the demand of stakeholders
- Analyse their local socio-economy and environment impacts on the pattern of rubber plantations

➢ Selection of the best scenarios to be tested in on-farm-trials
➢ Theoretical design of replanting packages (**rubber genotypes, intercrop species and varieties, agronomic practices, etc.**)
➢ Theoretical statistical design for on-farm large-scale trials, and specifications for on-farm data collection.

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How to prepare the data collection from on-farm trials?

"More **than 500 million smallholder farms worldwide** play a significant role in food production and the genetic diversity of the food supply. Until now, it has been **difficult to get information to or from smallholder farmers**, compounding basic infrastructural problems such as access to inputs, markets, financing, and training. The **spread of mobile technology**, remote-sensing data, and distributed computing and storage capabilities are opening new opportunities to integrate smallholder farmers into the broader agri-food system. The scale of these changes holds out the potential for another agricultural revolution."

In integrating a suite of coordinated digital tools and technologies into Feed the Future activities to accelerate agriculture-led economic growth and improved nutrition

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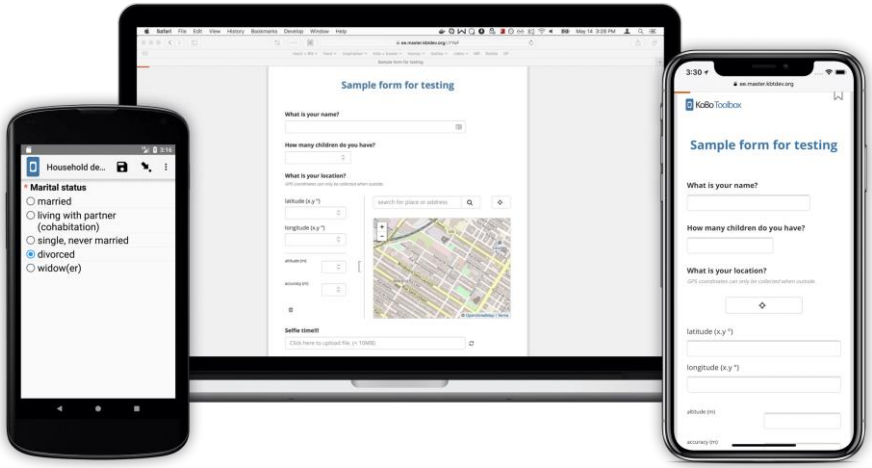
KoboToolbox, a simple, robust and powerful tool for data collection

Using the KoBoCollect tool to analyze the socio-economic and socio-cultural aspects of commercial hunting and consumption of migratory waterbirds in the Lakes Chad and Fitri (Chad).
Deniau et al. (2017).
http://www.efita2017.org/proceedings/



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Task 4.3 Development of KoboCollect system for the formalization of on-farm data collection

4.3.1 Setting-up Kobocollect system using forms for RAS survey

- Implementation of the forms into KoboCollect system
- Create a Kobocollect account into the Cirad KoboCollect platform (data extraction in csv and/or Excell format, cleaning and check of data quality using R scripts, storage in a FAIR database, automatic reporting)
- Make a pilot test of the developed tool

4.3.2 Full-scale test of the Kobocollect system in Indonesian smallholding

- Training and on-farm test in Indonesia (3 days of seminar and 3 days of field test)

Master student, University of Montpellier (major in communication technology)

Supervision Aziz Saïdou, UMR AGAP

Task 4.4 Sharing and dissemination of co-constructed solutions

Sharing co-constructed solutions at the Indonesian and regional levels

- Dissemination on the **project website**
- **Participation to International Conferences** (IRRDB Conference, the International Rubber Conference or World Forestry Congress, etc.)
- A summary **concept-note** to the different organizations (Ministry of Agriculture, Ministry of Forestry, NGOs, producers' associations, etc.)
- A scientific **position paper** on the project conclusions
- Drafting a **proposal for funding** further on-farm trials and on-going research studies

WP4 deliverables

D13. **Literature database** in Mendeley format gathering references related to socioeconomic and agronomic studies on rubber-based agroforestry systems (WP4, end of the project 2023)

D14. **Training on statistics** using R for multivariate analyses (WP4, November 2022)

D15. **Theorical designs of replanting packages** (WP4, March 2023)

D16. **Methodology** for on-farm **data collection** and **statistical design** for on-farm and large-scale trials

D17. A **summary concept-note** on the co-constructed solutions on rubber-based agroforestry systems for Indonesian smallholders

D18. **Position paper** on the resilience of the rubber-based agroforestry system (WP4, Dec 2023)

D19. **Project Website**

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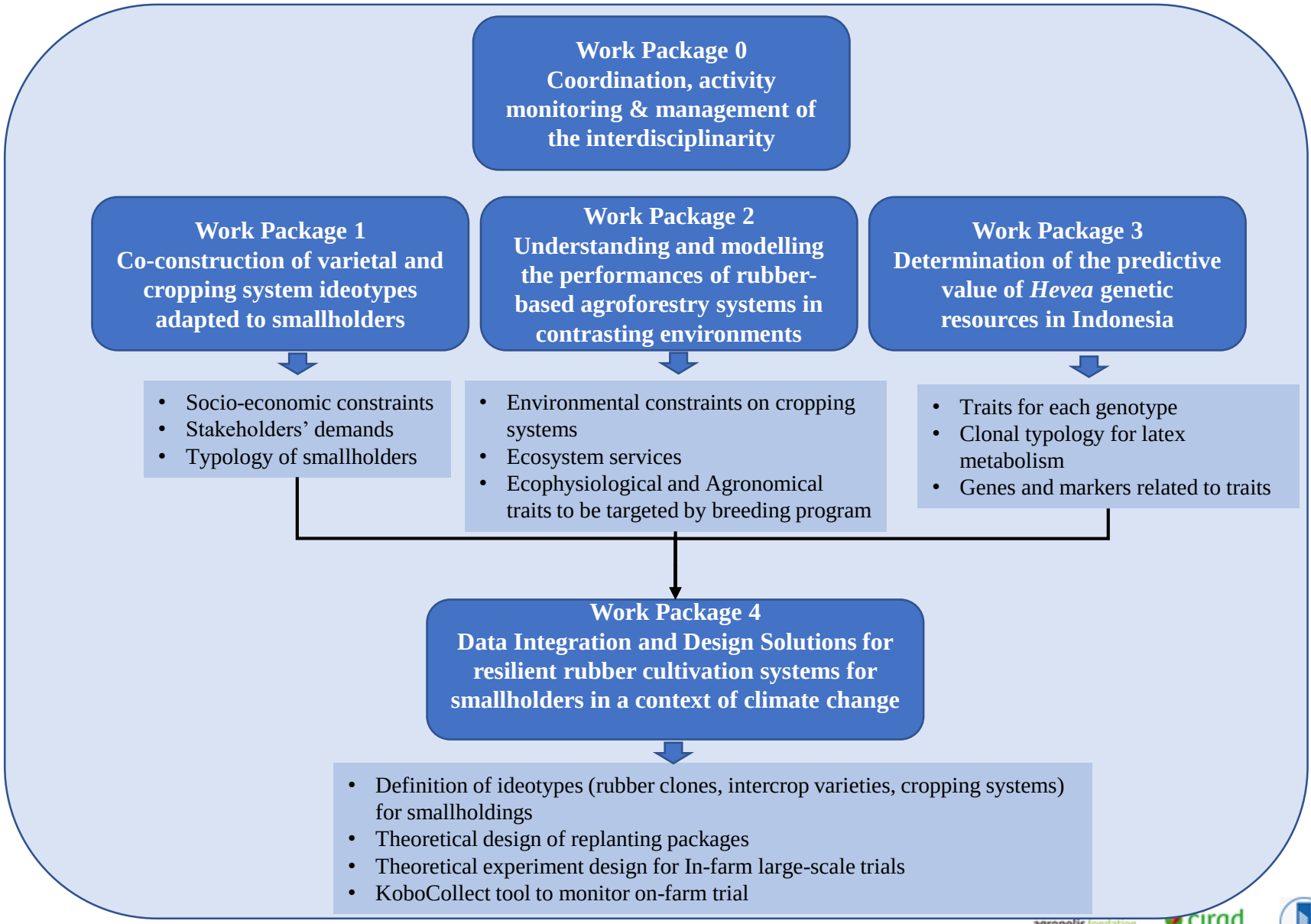
Workpackage outputs and interactions



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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
- Ms Hafiza, Directorate of Estate Crops
- Mr Uhendi Haris, Gapkindo

Ms Marie-Christine Cormier-Salem, Director of Agropolis Foundation
Mr Panut Mulyono, Rector of UGM
Mr Edy Suprianto, Director of IRRI
Mr Alain Rival, CIRAD Regional Director for Southeast Asian island countries

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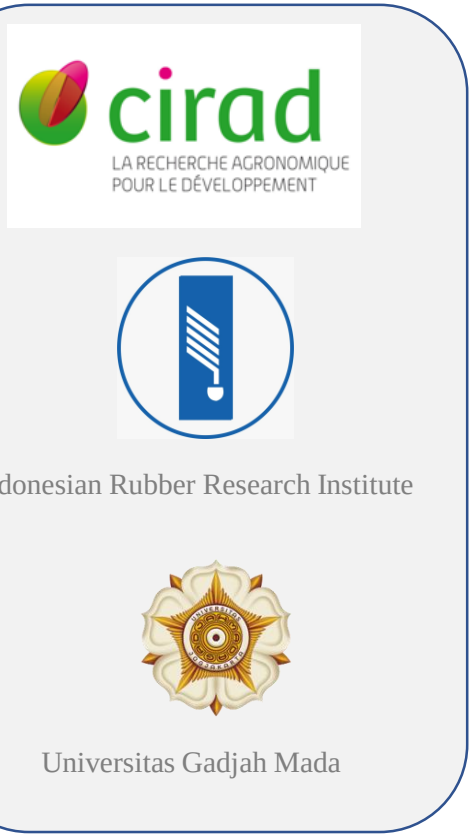
ACKNOWLEDGEMENTS



Gender	First Name	Family Name	Organization	Discipline
Ms	Dwi Shinta	Agustina	IRRI	Socioeconomy
Ms	Sophia	Alami	CIRAD	Socioeconomy
Ms	Yekti	Asih Purwestri	UGM	Biotechnology
Mr	Frédéric	Bonfils	CIRAD	Rubber technology
Mr	Panjisakti	Busunanda	UGM	Breeding, Biostatistics, Quantitative genetics
Mr	Gilles	Chaix	CIRAD	Physliogy, NIRS
Ms	Bénédicte	Chambon	CIRAD	Socioeconomy
Ms	Florence	Chazot	CIRAD	
Ms	Anne	Clément-Vidal	CIRAD	Biochemistry
Mr	Muhammad Rizki	Darojat	IRRI	
Mr	Gaëtan	Droc	CIRAD	Bioinformatics
Mr	Jean-François	Dufayard	CIRAD	Bioinformatics
Ms	Claire	Durot	CIRAD	Legal
Ms	Widhi	Dyah Sawitri	UGM	Biotechnology
Mr	Denis	Fabre	CIRAD	Ecophysiology
Mr	Matthieu	Fargeas	CIRAD	Accounting
Ms	Lina	Fatayati Syarifa	IRRI	Socioeconomy
Mr	Irfan	Faturrahman	IRRI	
Mr	Frédéric	Gay	CIRAD	Agronomy, Ecophysiology
Mr	Albert	Flori	CIRAD	Statistics
Mr	Jean	Gérard	CIRAD	Wood technology
Mr	Eric	Gohet	CIRAD	Agronomy, Latex physiology
Ms	Sherly	Hanifarianty	IRRI	Rubber technology
Mr	Rudi	Hari Murti	UGM	Breeding
Mr	Muhammad Ali	Imron	UGM	
Mr	Sigit	Ismawanto	IRRI	Breeding, Genetics
Mr	Junaidi	Junaidi	IRRI	Agronomy, Latex physiology
Mr	Vincent	Le Guen	CIRAD	Genetics
Ms	Julie	Leclercq	CIRAD	Biotechnology, Genomics
Mr	David	Lopez	CIRAD	Bioinformatics
Mr	Raphaël	Marichal	CIRAD	Agronomy
Mr	Pascal	Montoro	CIRAD	Genomics, Latex physioloy
Mr	Pierre	Mournet	CIRAD	Genomics
Mr	Andi	Nur Cahyo	IRRI	Agronomy, Ecophysiology
Ms	Tri Rini	Nuringtyas	UGM	Biochemistry
Ms	Fetrina	Oktavia	IRRI	Breeding, Genetics
Mr	Eric	Penot	CIRAD	Socioeconomy
Mr	Raphaël	Pérez	CIRAD	Ecophysiology
Mr	Imade Yoga	Prasada	UGM	Socioeconomy
Ms	Valérie	Pujade Renaud	CIRAD	Plant pathology
Ms	Alchemi	Putri J. Kusdiana	IRRI	Plant pathology
Ms	Maryannick	Rio	CIRAD	Molecular biology
Mr		Sahuri	IRRI	Agronomy
Mr	Abdoul-Aziz	Saidou	CIRAD	Agronomy, socioeconomy
Mr	Jamin	Saputra	IRRI	Agronomy
Mr	Iman	Satra Nugraha	IRRI	
Mr	Budi	Setyawan	IRRI	Plant pathology
Ms	Siti	Subandiyah	UGM	Plant pathology
Mr	Budiadi	Suparno	UGM	Agroforestry
Ms	Kartika Restu	Susilo	UGM	Agronomy
Ms	Afdholiatus	Syafaah	IRRI	Latex physiology
Mr	Alexis	Thoumazeau	CIRAD	Agronomy
Mr	Radite	Tistama	IRRI	Agronomy
Ms	Arini	Wahyu Utami	UGM	Socioeconomy
Mr		Widiyatno	UGM	Agroforestry
Mr	Thomas	Wijaya	IRRI	Agronomy, Ecophysiology
Ms	Rusmi Sri	Wiyati	Faculty of Agriculture	Agronomy
Mr	Jamhari		UGM	
Mr		Firman	IRRI	Agronomy
Mr		Erdianto	IRRI	Agronomy
Mr		Imronsyah	IRRI	Breeding, Genetics
Ms		Paina	IRRI	Molecular biology
Ms	Hetty	Aprianti	IRRI	
Ms	Delly	Mayangsari	IRRI	

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Conclusion remarks

Gede Wibawal, Member of the RUBIS Project Advisory Committee

Rubber agroforestry Breeding Initiative for Smallholders (RUBIS)

Conclusion

of the Kickoff Meeting

Zoom Meeting 11 January 2021

Gede Wibawa
IRRI

Management of RUBIS' Project

- RUBIS project has finalized the organization structural of the project:
  - Steering Committee
  - Project Coordination Committee, with LO
  - Work Package Leaders
  - Advisory Committee
- Intitution involes: CIRAD, IRRI, UGM supported by different stakeholders
- Long term data management and communication tools
  - Project website and data communication
- Project time line (monthly, bi-annual, annual, final report)
  - Meetings
  - Workshops

Warranty of the excellent management of the project

WP1: *Co-Construction of varietal and cropping system ideotypes adapted to smallholders*

- Exploring the previous research findings on RAS:
  - from jungle rubber, modified jungle rubber, intensive rubber-based Agroforest, imperata grassland management with RAS
  - Annual crops, perennial crops
  - Rubber row spacing modification for different objective of smallholders
  - Modelling: growth factors; socio-economic
  - Transfer of technology/capacity building: participatory approach
- Research collaboration and funding agencies
  - National, international Research institutes, universities, farmers
  - WB, ADB, Associations
- **Objectives:** to better use and integrating the previous data, information, experiences on RAS, to strengthen the practice of RAS innovations to be transfered, later, to different typologies of smallholders
- Socio-economic survey, multi-stakeholder meeting, international workshops, publications
- Two activities and four group of deliverables.

WP2: *Understanding and modelling the performances of rubber-based agroforestry systems in contrasting environments*

- Add explore more data to study the interaction of soil-climate-plants and management practices, through modelling.
- Model used: Biofunctool and WaNulCAS 4.0
- Method development of the model
- Exploring the double rows spacing for RAS: respons of rubber and intercrops (shade tolerant upland rice varieties to be tested): food security
- Agronomic aspects; Eco-physiology; pest and diseases epidemiology and monitoring; soil functioning and ecosystem services assessment (plot level), socio-economic aspects
- 3 Activities with two group of main deliverables

Team: IRRI, CIRAD, UGM

WP 3. *Determination of the predictive value of Hevea genetic resources in Indonesia*

- **Objectives**: Classes the rubber clones according to the agronomic and physiologic capacities in order to facilitate the selection of material for further on
  - Adapted to stakeholders' needs (cropping systems and tolerance to environmental constraints, latex and timber perforcamce)
  - Will be usefull for a solid IRRI' clone recommendation
  - Will be usefull for detail scientific understanding on genotype and phenotype interactions with genomic analysis
  - Rapid methodology for Latex Diagnostic

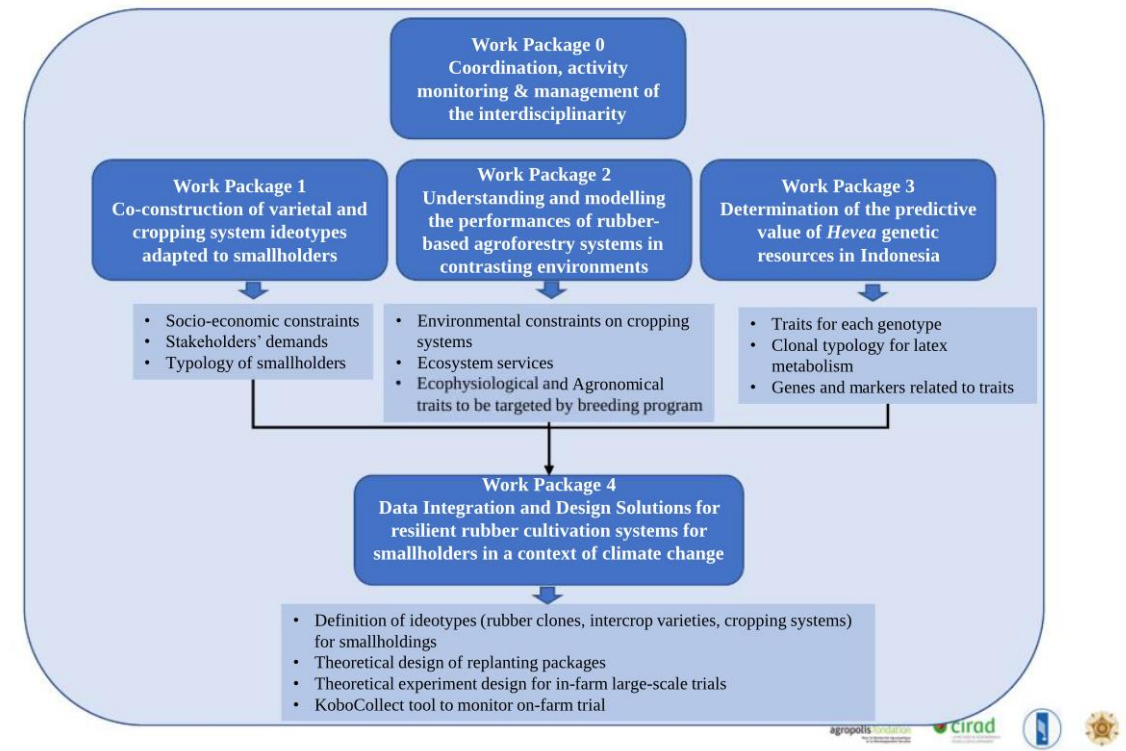
- Detail work activities have been presented very clearly in order to fulfill the objectives

- 4 activities and 5 deliverables

Transfering the messages from global issues to local context

- to use and valuing the integrated results of data, information and knowledge aquisition of agro systems for the benefit of stakeholders, especially smallholders
- Testing and developing mobile technology tools for on-farm data collection to integrate smallholders to a broader agro systems
- Research dissemination in more efficient manner
- Development of new proposals and further scientific questions (another scientific benefit)

RUBIS Project:
should be a successfull research project implementation



Integrated approach of the project, that involves:

- Global issues to local contexts
- International reputed research Institutes/Univ: CIRAD, IRRI, UGM, CIFOR
- Rubber Stakeholders: DG Plantation, Gapkindo,
- Across scientific background: Breeding, Genetics, Agronomy, Ecophysiology, Modelling, Mobile Tech, Data management, ...(> 60 researchers)
- Across research sites: research station, farmers field (participatory based science)
- From Research to Capacity Building: 5 PhD, 5 Masters

STRONG COORDINATION & COMMUNICATION ARE NEEDED

Terima Kasih
Merci
Thank You