Darwin Initiative Main Project Annual Report

Important note: *To be completed with reference to the Reporting Guidance Notes for Project Leaders:*

it is expected that this report will be no more than 10 pages in length, excluding annexes

Submission Deadline: 30th April 2017

Darwin Project Information

Project reference	23-029
Project title	Investing in agro-forestry options for forest restoration in Indonesia
Host country/ies	Indonesia/ Harapan Rainforest in Sumatra
Contract holder institution	Burung Indonesia
Partner institution(s)	Royal Society for the Protection of Birds (RSPB), Restorasi Ekosistem Indonesia (PT REKI), World Agroforestry Centre (ICRAF), University of Kent, Univesity of Edinburgh
Darwin grant value	**£298,896**
Start/end dates of project	1st August 2016/ 31st July 2019
Reporting period (e.g., Apr 2016 – Mar 2017) and number (e.g., Annual Report 1, 2, 3)	Aug 2016 – Mar 2017/ Annual Report 1
Project Leader name	Mangara Silalahi
Project website/blog/Twitter	
Report author(s) and date	Mangara Silalahi/ 31 Mar 2017

1. Project rationale

Indonesia has >80Mha of exhausted logging concessions. Restoration of these forests is a high priority for biodiversity conservation, but is undermined by smallholder encroachment. Working in Hutan Harapan/ Harapan Rainforest (HH), an Ecosystem Restoration Concession in central-south Sumatra, we will develop and implement agroforestry options to reconcile restoration goals and livelihood aspirations of local communities.

Indonesia has the largest population and highest rate of contemporary deforestation of any tropical country. Studies have shown exhausted logging concessions harbour high levels of biodiversity and supply valuable ecosystem services. Hence, their conservation is a priority. However, 49 million people, among the poorest in the country, live on forest margins. With limited livelihood options, many depend on illegally clearing forests for agriculture, including oil palm, with the uncertain hope of attaining land tenure in future. This accounts for ~1M ha of deforestation per year.

HH is a 98,000 ha formerly logged, highly diverse, natural forest, where these problems are epitomised. Over 2,000 households have settled illegally within the concession since 2005 and have cleared 18,256 ha for agriculture. However, following forest clearance, land preparation and planting are often delayed by limited capital and labour resources.

Agroforestry is one of few land management alternatives that has the potential to provide valuable livelihood opportunities consistent with restoration and biodiversity objectives. Moreover, the appropriate provision of capital or labour resources, value added processing, access to markets, and the possibility of obtaining land tenure security through management agreements provide a powerful incentive for the uptake of agroforestry and enable the brokering of agreements to halt forest loss. However, agroforestry options need to be designed to meet the aspirations of local farmers, maximise economic resilience and enhance biodiversity. The technologies developed and lessons learned could be applied across Indonesia with huge potential gains for some of the world's most threatened biodiversity and poorest people.

2.   Project partnerships

The project has been a collaborative effort between Burung Indonesia (BI), PT-REKI, the Royal Society for the Protection of Birds (RSPB), the University of Edinburgh, the University of Kent and the World Agroforestry Centre (ICRAF). Since the project inception in August 2016, BI has been responsible for coordination of project activities among the project partners, working closely with PT-REKI who have been working with the local communities in implementing the planting according to the agroforestry models. Monthly coordination meetings are being held between BI, PT REKI and RSPB to coordinate the implementation of the project activities. Dr Freya St John from the University of Kent and Dr Aidan Keane from Edinburgh University designed the socio-economic survey, with input from the team, and trained independent enumerators, with support from PT REKI and BI. ICRAF provided technical assistance on the design and modelling of agroforestry options. The partners are working according to their roles and responsibilities outlined in the project document.

3.   Project progress

3.1   Progress in carrying out project Activities

Activity 1.1 Develop gender disaggregated baseline household livelihoods survey instrument and train enumerators from PT-REKI.

Activity 1.4 Develop a farms systems analysis survey instrument and train enumerators from PT-REKI.

Activity 1.10 Develop gender disaggregated livelihoods impact survey instrument to be utilised throughout project to monitor impacts.

To avoid duplicated effort, it was decided during the initial field visit to HH by the project team that the data for three activities above will be collected using a single consolidated survey instrument. This survey was developed by Dr Aidan Keane and Dr Freya St John (FSJ) with input from the wider project team. It covers stated intentions to engage in agroforestry, socio-demographics (e.g. household composition, education), poverty and wellbeing indicators, and individual characteristics hypothesised to influence an individual's intention to engage in agroforestry (e.g. trust in key institutions, risk aversion, time preference) and aspirations for the future. There are also detailed sections on livelihoods and natural resource use (e.g. land, crops, farm resources, forest resources, employment) which will provide data on the households' farm systems. This will be used to explore existing livelihoods and farming practices, potential constraints on a household's ability to

participate in the proposed agroforestry initiatives (e.g. labour shortage, reliance on fertiliser) and familiarity with potential candidates for intercropping.

The survey instrument was initially designed in English and then translated to Bahasa Indonesia before being reviewed in a workshop attended by BI & PT-REKI staff, together with the survey team and FSJ. (*Given historic interactions between PT-REKI and the people living within HH, it was decided that an independent field team would be recruited to conduct the household livelihood surveys between March and April 2017.) Following this exercise the questionnaire was piloted in the field in early March. The workshop and piloting exercises allowed us to refine the language used in the survey and highlighted areas where the field team required additional instructions/ clarification to ensure that they were using the instrument consistently (see Annex 4 for final questionnaire).

Activity 1.2 Conduct household socio-economic survey of 500 households

Activity 1.5 Conduct farms system analysis survey for 250 farms

Activity 1.8 Conduct experimental economic games in at least 8 focal group sessions

In the early months of 2017, a team leader and five enumerators were recruited to carry out data collection using the questionnaire described above. FSJ travelled to HH in March to train the team, review and pilot the questionnaire. The survey team were trained in questionnaire administration, including GPS use and data entry.

Data collection started on 8 March 2017 and as of 4 April, data has been collected from 282 respondents from nine areas within Hutan Harapan. Data collection is due to be completed before the end of April 2017 after which data analysis and report production will proceed.

The field team are nearing the end of the data collection and data entry phase. Whilst there have been sensitivities to overcome whilst conducting fieldwork with residents, the team have, and continue to perform well and achieve their objectives. Regular contact is maintained with AK and FSJ and also PT-REKI and BI. We do not currently foresee any difficulties in completing this component of the project although adverse weather conditions place challenges on the team's movements.

Activity 1.7 Design experimental economic games to assess impediments to agroforestry uptake and train REKI staff to implement

Based on experience gained during the field trip to HH, it was decided that a scenario-based exploration of factors affecting choices around livelihoods, land use and uptake of agroforestry would be developed. The scenarios refer to potential future changes in two key variables - the price of rubber and the wages paid for labour on oil palm plantations – which were considered to be strong external influences on local people's decisions to engage or not with potential agroforestry opportunities.

Activity 2.1 Develop models for rubber, gaharu and native timber species agroforestry options

Activity 2.2. Conduct stakeholder workshops in communities ensuring gender balance is considered in design, to refine proposed options and agree an implementation plan

Four agroforestry systems have been developed and are being considered in discussions with the communities and PT REKI staff: rubber monoculture, simple agroforestry (rubber + 1 or 2 species), multi-species agroforestry (rubber + 6 or more species, including some timber species), and complex agroforestry (rubber + timber species / NTFPs + natural regeneration). The last three systems are likely to be most suitable at Hutan Harapan and complement the plans of PT REKI for the development of rubber agroforestry systems,

notably collaborative development with the Bathin Sembilan communties at the Mitrazone and Simpang Macan luar, and in the "Rubber band" buffer that REKI will be planting. Improved agroforestry practices with inclusion of rubber trees are being implemented with at least 2 community groups in the collaborative zone. A document entitled *Rubber Agroforestry Conceptual Models* (Annex 5) and a draft copy of the *Standard Operating Procedures for Agroforestry at HH* (in Bahasa Indonesia) (Annex 6) are available as means of verification that this action has been carried out.

An oral presentation of the proposed rubber agroforestry model was made at the Sustainable Rubber Conference (19-21 Oct 2016) in Xishuangbanna, China.The models and were incorporated into to the Sustainable Rubber Guidelines, which are being produce proposed in the document are now being incorpoaretd by a DFID (in Beijing) and Chinese Chamber of Commerce for Minerals and Chemicals (CCCMC) collaboration.

These are ideal opportunities to start learning how to successfully implement the operational management of the systems and exact choices are being made according to the preferences of the communities in the the collaboration zone, and of PT REKI in the "rubber band" buffer or the production zone. The Project is looking to ensure that the large-scale objectives do not spread the agroforestry effort so thinly that the planting areas fail to establish.

Participatory sessions have taken place with farmers to explain the four models for the agroforestry plan according to the *Rubber Agroforestry Conceptual Models* document and to seek the acceptance of the local communities to take part in the agroforestry plans of PT REKI. Options for agroforestry are still being developed in consultation with the local communities and an implementation plan for agroforestry with the communities would be finalised in the coming months.

Activity 2.3 Assess attitudes to and understanding of forest clearance and illegal activity drivers using randomised response techniques.

Enquiries during the initial field visit to HH suggested that the use of the randomised response technique (RRT) or the inclusion of other questions directly relating to illegal practices (e.g. forest clearance) might jeopardise the validity of the household survey and potentially create animosity which could threaten other components of the wider project. It was therefore agreed that we would focus primarily on questions in the survey about the respondents' willingness to engage in agroforestry and explore other approaches to investigating possible effects of agroforestry on land use (e.g. scenario-based activities; see 1.7 above). These scenarios have allowed us to explore factors which affect decisions about new land clearance and extraction of forest resources in a less sensitive manner, reducing the risk of biased responding.

Activity 2.4 Develop and sign agreements with 500 families for the development of agroforestry systems on 500 ha

Four Batin Sembilan community groups (104 families) have signed new collaborative agreements with HH covering an extra 1,453 ha in the livelihood zone. Negotiations with other communities for agroforestry development were also initiated, which is ongoing with verification of land claims by the community and facilitated by the local government (see Annex 7). In November 2016, a land use agreement was signed between Narwanto's group (consisting of 53 families and 153ha) in the Kandang area. This was followed by a socialization session on the Memorandum of Understanding to discuss the needs of the community and increase understanding on the role of agroforestry in improving their livelihoods. Another socialisation session with the Trimangno goup (also in Kandang, involving 171 families in 1,975 ha) was also held and about 1,000 rubber seedlings were given to the community here.

Initial steps have been taken to start implementation of agroforestry demplots with the indigenous Batin Sembilan families in Bungin (Simpang Mancan Luar and Mitrazone), where

agreements for collaboration with PT REKI had previously been obtained. An agroforestry demplot of 5 ha has been identified and about 5 groups are working to clear the area and establish the demplot with the help of PT REKI. The plan is to develop 50ha of agroforestry in the Bungin area using the four models of agroforestry porposed in the project. A major inhibition to the uptake of agroforestry has been short term cash flow. Almost all of the communities consulted were interested in developing their land but investment was said to be a challenge. Short-term cash crops provide a solution by generating incomes for these communities in less than a year. Effort was made in the last few months to assist the communities to plant corn, chillie and tapioca in land around their homes for shor-term cash.

Engagement with other communities continues, to gain their support for establishing a partnership agreement with PT REKI on the use of the land and to encourage the uptake of the agroforestry models recommended by the Project. These have been in the form of informal discussions and have occurred in Kandang and Bungin, as well as in Badak, Masai Rusa and Meranti.

2.6 Developing agroforestry manuals

The rubber agroforestry model developed under activity 2.1 was developed into a rubber agroforestry Standard Operating Procedure (draft) and translated into Indonesian by staff of PT REKI and the draft is under review by the team and will be finalised by the end of Year 1.

2.7 Develop biodiversity survey protocols

The experimental design of rubber agroforestry is still being discussed and will be finalised in the final SOP. The monitoring protocols have been designed and data sheets have been produced (see Annex 8) and will be reviewed prior to initiation of the biodiversity survey according to use at Hutan Harapan.

2.8 Conduct before agroforestry trial biodiversity surveys in project focal areas

A biodiversity monitoring plan has been drafted and discussions with the field teams were held in early April. Biodiversity monitoring will focus on eight demplots which have been designed to test the relative costs and benefits of the different systems directly, using a split plot design. The demplots will be established in eight locations close to communities collaborating with PT REKI on agroforestry. The baseline biodiversity surveys will be carried out between Oct 2017 and Jan 2018 by the Environmental Research department at PT REKI.

2.11 Baseline and endline remote sensing analysis of focal areas and HRF as a whole

Initial assessment of forested and deforested land has been completed across Harapan and changes in forest cover, relative to this baseline, is being monitored using Global Land Analysis and Discovery alerts.. Changes in forest cover will be assessed since the start of the project focussing on comparisons between areas where agroforestry has and has not been implemented. A report will be produced to track forest loss through time as well as the total area under agroforestry. It will take the initial forest extent layer and then produce biannual updates tracking deforestation and agroforestry extent (total and from the preceding 6 months). REKI team will start collecting GPSed polygons of agroforestry extent in the coming months. An area of 30 ha was mapped by drone in April 2017 which will be expanded to all agroforestry areas to track forest development of the agroforestry system.

3.2 Progress towards project Outputs

The project is on track to complete the survey of 500 households at HH to include economic data (Output 1.1), farm systems (Output 1.2) and impediments to agroforestry uptake (Output 1.3), in the form of a single consolidated survey instrument (Annex 4). The questionnaire was developed, translated, tested and revised during this period and used in the household surveys that were carried out in March and April 2017.

Data from the surveys will be analysed and completed by EOM12 as targeted and the analysis will be used to inform the collaborative design of agroforesty options at HH. The project will develop and conduct livelihoods impact survey of 150 participating and 150 non-participating families by EOM33 to measure impact of project interventions.

Four agroforestry systems using jungle rubber, fruit trees and wood species have been developed and will be finalised as planned by EOM12. Discussion sessions have been held with 78 households in Mitrazone and Simpang Macan Luar thus far and these sessions are still ongoing and will be expanded to include other villages. Agreements have been secured with 224 families in Kunangan Jaya II to collaborate on agroforestry, and negotiations with other families are underway. On farm trials will be established on 500 ha in focal areas in the second year of the Project (by EOM24) and once the agroforestry systems have been established in the demplots.

The biodiversity protocols and datasets have been designed and will be finalised before the survey starts, and after the demplots have been established. Initial assessments of forested land across Harapan using Global Land Analysis and Discovery alerts and monitoring of land use change are currently ongoing.

Training of independent enumerators for the household survey was held in early March and five PT REKI and two Burung staff assisted the team in organising the surveys, led by Freya St John from the University of Kent. This has helped to build the capacity of staff of PT REKI and Burung in carrying out surveys.

3.3 Progress towards the project Outcome

Families at Hutan Harapan are starting to get involved in the project to see how they can experience positive livelihood benefits, through improved economic resilience, security of tenure, increased over-all incomes and improved gender equity, as a result of project interventions.

Biodiversity monitoring protocols are being established and initial recordings will be made in the second year of the project as demplots of agroforestry are established across 500 ha of community managed land.

The area of forest clearance is being monitored by the HH management and the social fence of the rubber buffer and the collaboration zone is still being established.

The management of HH is not yet able to adopt agroforestry as a central tenant of its community development programme as the agroforestry programme is still in the initial stages of being tested.

Activities to influence ERC policy will be initiated in the second year of the Project after some experience has been gained from establishing the agroforestry systems within the community development programme at Hutan Harapan.

3.4 Monitoring of assumptions

The assumptions identified in the logical framework in the project document still apply at this stage of the project.

3.5   Impact: achievement of positive impact on biodiversity and poverty alleviation

BI has engaged with policy makers through the ERC Policy Review Forum and Partnerships for Forest (P4F) on identifying livelihoods options and NTFP business markets. P4F is in the process of formulating specific business plans for the identified forest products. Sharing of experiences of BI and PT-REKI, with other ERC managers through the ERC Association continued under the Project. The project has been raising awareness of agroforestry as an alternative to monoculture plantations to forest edge and encroacher communities through project activities thus far.

There has been limited achievement of positive impact on poverty alleviation thus far as the Project is still in its initial stages of implementation.

4.   Contribution to the Global Goals for Sustainable Development (SDGs)

The agreements signed by PT-REKI with the communities form the basis of collaborations that will ensure reduced deforestation and sustainable resource use. Ultimately, this will contribute to reduced deforestation and sustainable resource use across the entire ecosystem restoration concession under the management of PT-REKI and enhance the livelihoods of the people living within and alongside the concession. This will directly contribute to SDG15 (Sustainable use of terrestrial ecosystems), SDG13 (Climate change action) and SDG1 (No Poverty). Indirectly, the project also contributes to SDG2 (Zero hunger), SDG3 (Good health and well being), SGD5 (gender equality) through ensuring a sustainable and fair use of natural resources, and providing opportunities for work and cash income for women..

5.   Project support to the Conventions, Treaties or Agreements

Convention on Biological Diversity (In-situ Conservation, articles 8c/8f/8i/8j). The project will promote management of biological resources for sustainable use, through rehabilitating and restoring degraded ecosystems across 100,000ha of lowland forest.

Sustainable Use of Components of Biological Diversity (article 10a-e). Customary uses of the forest resources will be incorporated into the design of agroforestry options. The experiences gained at HH will be advocated to national decision makers through the national ERC forum.

Research and Training (article 12b/c). The project will contribute to research on livelihoods, agroforestry and conservation. Staff at BI and PT-REKI will be trained in the design and implementation of research components.

Technical and Scientific Cooperation (articles 5,18). Cooperation between the UK (RSPB, UK and UE) and Indonesian partners, and through the ERC policy review process and ERC Association, will result in improved capacity and policy.

Aichi Biodiversity Targets. The project will contribute to the following Aichi targets: 1(people aware of biodiversity values), 4(sustainable natural resource exploitation), 5(reduce habitat loss), 14(ecosystems contribute to livelihoods), 15(ecosystem resilience through restoration), 18(traditional knowledge for biodiversity conservation).

The project contributes to the illustrative goal #9 'Manage Natural Resource Assets Sustainably' of the High-level Panel on the Post-2015 Development Agenda, which the UK, Indonesia (and Liberia) co-chaired.

6. Project support to poverty alleviation

The four groups of Batin Sembilan live below the national poverty line. Under the Project, these local communities are given security of their land tenure through the identification of the boundaries of their land in the land use agreements signed with PT REKI. They are, therefore, able to utilise their land for long-term economic benefits while protecting the social and ecological aspects of HH.

7. Project support to gender equality issues

The household survey instrument was designed to allow the Project to investigate the contributions of men and women to agricultural labour and the differences between genders in their control of land, livestock and natural resources. In addition, agroforestry has repeatedly been shown to contribute to improved gender equity in projects, through facilitating women's access to cash income, and increase women's participation in the agroforestry process. During consultations and planning for agroforestry, women have made up about 25 % of participants in group meetings., The participation of women in agroforestry development is about 50%, and more (60%) in agroforestry development for planting rice, corn, chili and vegetables. The participation of women in rubber planting is slightly lower (40%).

8. Monitoring and evaluation

Progress in project implementation has been monitored through the documentation of outputs and indicators for each activity. Two qualitative indicators were produced, namely Rubber Agroforestry Conceptual Models and Agroforestry Standard Operating Procedures. **Quantitative indicators** using **independently verifiable measures** documented during the last project period included photocopies of agreement documents, and Unmanned Aerial Vehicle images of forest cover change.

The implementation plan was developed during the early stages of the project (see Annex 8). The management team comprising the project leader, staff of RSPB and PT REKI, meet on Skype every month to review progress on implementation of activities. Meeting notes are written and shared, which identify the actions needed following the meetings and these are reviewed at the following meeting. Partners have collaborated in submiting six monthly progress reports on activities, outputs and performance against indicators.

9. Lessons learnt

The project was able to identify the rubber agroforestry models based on experiences in Indonesia which could act as sources of income for the local communities. However, negotiations with the local communities have taken longer than expected to reach an agreement, especially because it involved local government agencies who were not always available. Raising awareness and gaining the acceptance of local communities to accept agroforestry and the system proposed by the project also requires more time than anticipated. Negotiations are also complicated by feelings that the expectations of communities have not always been met in the past. The Project is hoping that when the local communities see the successes in the demplots, acceptance of the agroforestry would increase at a rapid rate. The Project will use farmers who have adopted good agroforestry practices as an example to other farmers to encourage a greater uptake of agroforestry among local communities.

10.   Actions taken in response to previous reviews (if applicable)

Not applicable.

11.   Other comments on progress not covered elsewhere

12.   Sustainability and legacy

The development of agroforestry models and SOP for agroforestry has helped to increase capacity in PT-REKI and Burung Indonesia. The signing of land use agreements between PT REKI and the local communities is also being facilitated by the local and national governments; through this exercise the stakeholders are learning about conflict resolution and how to overcome some of them.

The rubber business plan for HH will be developed in the coming months and a management plan with clear guidelines for further development of cultivation, processing and marketing within HH will be prepared. Business plans are also being discussed for each of the intercrop products, including timber and NTFPs. During the course of discussions re agroforestry, PT REKI and Burung have also explored local solutions and are now interested to pursue the potential for local fast-growing timber species in agroforestry with the local community with potential private sector investment.

13.   Darwin identity

The Darwin Initiative funding formed part of a larger programme at HH which was funded by Danida, but had a clear identity in promoting agroforestry with the local communities. Staff at PT REKI and BI, and all the partners are familiar with the support provided by Darwin. T-shirts which were distributed to participants of the household surveys carried the logo of Darwin.

A page for the project on the University of Edinburgh research group's website uses the Darwin logo: https://edinburghconservationscience.com/2016/08/01/investing-in-agroforestry-options-for-forest-restoration-in-indonesia/

14.   Project expenditure

Table 1: Project expenditure <u>during the reporting period</u> (1 April 2016 – 31 March 2017)

Project spend (indicative) since last annual report	2016/17 Grant (£)	2016/17 Total Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)				
Overhead Costs				
Travel and subsistence				
Operating Costs				
Monitoring & Evaluation				
Capital items (see below)				
Others (see below)	£0	£0		
Total				

* All financial figures are currently still being compiled, as part of the financial report.

Annex 1:   Report of progress and achievements against Logical Framework for Financial Year 2016-2017

Project summary	Measurable Indicators	Progress and Achievements April 2016 - March 2017	Actions required/planned for next period
Impact Agroforestry options reconcile livelihood development with restoration and biodiversity goals across the 100,000-ha Harapan Rainforest, 2.7mha of ERCs and across a further >39mha Mha of logged over forests in Indonesia.		Initial steps have been taken towards changing the conditions of local communities associated with biodiversity e.g. steps towards sustainable use or equitable sharing of costs or benefits	
Outcome Agroforestry systems are developed and trialled at HH, resulting in improved livelihoods, enhanced biodiversity in cultivated areas and reduced rates of deforestation, and are incorporated into national ERC policy and best-practise.	0.1 The 500 families involved in the project experience positive livelihood benefits, through improved economic resilience, security of tenure, increased over-all incomes and improved gender equity, as a result of project interventions. 0.2 Biodiversity across 500 ha of community managed land is enhanced (increase diversity of plants, birds and soil organisms and shift in community composition towards forest dependent species) through agroforestry interventions by EOP. 0.3 Forest clearance reduced by 80% in project focal areas and by 30% across HRF by EOP against baseline rate at start of project as a result of the 'social fence'. 0.4 By EOP, HH management adopts agroforestry as a central tenant of its community development programme and rolls out an agroforestry programme across all encroached areas. 0.5 By EOP, ERC policy is adapted to facilitate agroforestry in community development	About 328 families at HH has starting to get involved in the project, but it is too early to assess their impacts. Biodiversity monitoring protocols have been drafted and initial recodings will be made in the second year of the project when demplots of agroforestry are established. The area of forest clearance is being monitored and the social fence of the rubber buffer and the collaboration zone is still being established. The management is yet able to adopt agroforestry as a central tenant of its community development programme as the agroforestry programme is still in the initial stages of being tested. Activities to influence ERC policy has yet to be initiated as the Project is in the initial stages of setting up the agroforestry systems within the community development programme at HH.	Data analysis of the household survey on socio-economy of HH, farms and gender disaggregated livelihoods, and attitudes to and understanding of forest clearance and illegal activity drivers, to inform the selection of activities and agroforestry models to be implemented and to monitor impact. Stakeholder workshops/ consultations will be conducted in communities to ensure gender balance is considered in design, to refine proposed options and agree on an implementation plan More participatory sessions with farmers to explain, plan and seek acceptance to take part in agroforestry Develop options for agroforestry (and establish demplots) in consultation with the local communities and finalise an implementation plan Sign of agreements with more families for the development of agroforestry systems To establish on-farm trials in focal areas and train farmers including women

	0.6. At least 3 other ERC license holders incorporate agroforestry into their community development programmes.	The manual for agroforestry management, rubber tapping will be finalised in consultation with local community and distributed to participating farmers
		Biodiversity surveys in agroforestry trials will be initiated
		A discussion on business plans and standard operating procedures for each focal species will be initiated
		ERC policy forum workshop on livelihood development in ERCs will be held
		Initial lessons will be shared with ERC Association and other key stakeholders via papers and workshops
Output 1. 1. Enhanced understanding of the household and farm systems level economics in communities at HRF and the potential contribution of locally developed agroforestry options to enhancing livelihoods	1.1. Household economic survey designed and carried out on 500 farms by EOM6 1.2. Farm systems analysis survey designed and implemented on 250 sample farms by EOM9 1.3. Experimental economic games designed and carried out in 8 focal groups by EOM9 to assess impediments to agroforestry uptake. 1.4. Household economic, farm system and economic games data analysed by EOM12 and analysis used to inform the collaborative design of agroforesty options in output 2. 1.5. Develop and conduct livelihoods impact survey of 150 participating and 150 non-participating families by EOM33 to measure impact of project interventions.	The project is on track to complete the survey of 500 households at HH to include economic data (1.1), farm systems (1.2) and impediments to agroforestry uptake (1.3), in the form of a single consolidated survey instrument. Evidence of this is provided in the questionnaire which was developed, translated, tested and revised accordingly in Annex 4. Indicators 1.4 and 1.5 are still appropriate later on in the project.
Activity 1.1 Develop gender disaggregated baseline household livelihoods survey instrument and train enumerators from PT-REKI.		The data for Activity 1.1, 1.4 and 1.10 will be collected using a single consolidated survey instrument to avoid duplication. The questionnaire was developed and translated into Bahasa Indonesia in February and March.

Activity 1.2 Conduct household economic survey of 500 households	The questionnaire was tested in March at HH and revised accordingly. The survey started in March and about 282 households have been surveyed by early April. The survey team are expected to complete the 500 households by the end of April.
Activity 1.3 Conduct analysis of household data	To be carried out upon completion of the survey.
Activity 1.4 Develop a farms systems analysis survey instrument and train enumerators from PT-REKI.	The data for Activity 1.1, 1.4 and 1.10 will be collected using a single consolidated survey instrument to avoid duplication. The questionnaire was developed and translated into Bahasa Indonesia in February and March.
Activity 1.5 Conduct farms system analysis for 250 farms	The questionnaire was tested in March at HH and revised accordingly. The survey started in March and about 282 households have been surveyed by early April. The survey team are expected to complete the 500 households by the end of April.
Activity 1.6 Analysis of farm systems data	To be carried out upon completion of the survey.
Activity 1.7 Design experimental economic games to assess impediments to agroforestry uptake and train REKI staff to implement	This would be a scenario-based exploration of factors affecting choices around livelihoods, land use and uptake of agroforestry and would be developed.
Activity 1.8 Conduct experimental economic games in at least 8 focal group sessions	The questionnaire was tested in March at HH and revised accordingly. The survey started in March and about 282 households have been surveyed by early April. The survey team are expected to complete the 500 households by the end of April.
Activity 1.9 Analyse and write up results of experimental economic games	To be carried out upon completion of the survey.
Activity 1.10 Develop gender disaggregated livelihoods impact survey instrument to be utilised throughout project to monitor impacts.	The data for Activity 1.1, 1.4 and 1.10 will be collected using a single consolidated survey instrument to avoid duplication. The questionnaire was developed and translated into Bahasa Indonesia in February and March.
Activity 1.11 Conduct economic survey of 150 participating and 150 non-participating families	To be implemented towards the end of Y3 of the project.
Activity 1.12 Analyse livelihoods impact of project interventions against baseline.	To be implemented towards the end of Y3 of the project.

Output 2. Agroforestry options, based on rubber, gaharu and native timber species, are designed, through a participatory process, to meet livelihood and restoration goals, and are trialled in focal communities in HH.	2.1 Models for jungle rubber, gaharu and native timber species developed by EOM12	Four agroforestry systems using jungle rubber, fruits trees and wood species have been developed and will be finalised as planned by EOM12.
	2.2 Stakeholder workshops involving all 500 Households to refine proposed agroforestry options across 500 ha and agree an implementation plan by EOM15	Discussion sessions held with 78 households in Mitrazone and Simpang Macan Luar by EOM8
	2.3 Agreements with 500 families for the development of agroforestry	Agreements with 224 families so far to collaborate on agroforestry, and

	systems covering 500 ha of their land (1+ha for each family) is signed by EOM18.	negotiations with other families underway.
	2.4 On farm trials established on 500 ha in focal areas (in 2.3) by EOM24 and monitored every 3 months.	
	2.5 Biodiversity surveys designed and carried out on a subset of agroforestry trials (stratified for distance to forest and other key environmental variables) at start and end of project.	Biodiversity protocols and datasets have been designed and will be finalised before the survey starts.
	2.6 Baseline and endline remote sensing analysis of on farm trial area (500ha+) and HH as a whole carried out by EOM3 and 36.	Initial assessment of forested land across Harapan completed using historical change alert updates to land change being made using Global Land Analysis and Discovery.Training of independent enumerators for the household survey was held in early March and five REKI and two Burung staff assisted the team in organising the surveys, led by Freya St John from the University of Kent.
	2.7. Ten REKI and 2 BI staff have been trained in livelihood surveys, farm system analysis and economic games by EOM6 and are involved in the implementation of surveys and analysis of data.	
Activity 2.1. Develop models for rubber, gaharu and native timber species agroforestry options		Four agroforestry systems have been developed and are being considered in discussions with the communities and PT REKI staff. Improved agroforestry practices with inclusion of rubber trees are being implemented with at least 2 community groups in the collaborative zones.
Activity 2.2. Conduct stakeholder workshops in communities ensuring gender balance is considered in design, to refine proposed options and agree an implementation plan		Collaborative development of agroforestry with the Bathin Sembilan communties at the Mitrazone and Simpang Macan Luar underway, and in the "Rubber band" buffer that REKI will be planting.
Activity 2.3 Assess attitudes to and understanding of forest clearance and illegal activity drivers using randomised response techniques.		Questions in the survey focused primarily on the respondents' willingness to engage in agroforestry and explore other approaches to investigating possible effects of agroforestry on land use to reduce the risk of biased responding.
Activity 2.4 Develop and sign agreements with 500 families for the development of agroforestry systems on 500 ha		Four Batin Sembilan community groups have signed new collaborative agreements with HutanHarapan covering an extra 1,453 ha in the livelihood zone.

Land use agreement was signed between Narwanto's group (consisting of 53 families and 153ha) in the Kandang area, followed by a socialization session. Socialisation session also with the Trimangno goup (also in Kandang, involving 171 families in 1,975 ha) was held.

Initial steps have been taken to start implementation of agroforestry demplots |

		with the indigenous Batin Sembilan families in Bungin (Simpang Mancan Luar and Mitrazone). Four Bathin Sembilan groups are working to clear the area of 5 ha to establish the demplot with help from PT REKI.
		Informal discussions and have occurred in Kandang and Bungin, as well as in Badak, Masai Rusa and Meranti.
Activity 2.5 Establish on-farm trials on 500 ha in focal area and train farmers including women and monitor throughout project		This activity will be initiated once the demplots have been established.
Activity 2.6 Develop manuals for agroforestry management, rubber tapping etc and distribute to participating farmers as appropriate and encourage farmer to farmer sharing through community meetings and workshops.		The rubber agroforestry model developed under activity 2.1 was collated into a rubber agroforestry Standard Operating Procedure (draft) and translated into Indonesian by staff of PT REKI. This draft is under review by the team and will be finalised by the end of Year 1.
Activity 2.7 Develop biodiversity survey protocols		The experimental design to assess the different rubber agroforestry is still being discussed. Monitoring protocols have been designed and data sheets produced. These will be reviewed prior to initiation of the biodiversity survey.
Activity 2.8 Conduct before agroforestry trial biodiversity surveys in project focal areas		Has been planned with the field team, due to be implemented once demplots have been established (i.e. from October / November 2017) Initial discussions with the field teams were held in early April and eight focal areas for the demplots have been identified close to communities that are collaborating with PT REKi on agroforestry. Biodiversity surveys will be carried out between Oct 2017 and Jan 2018 by PT REKI.
Activity 2.9 Conduct after agroforestry trial biodiversity surveys in project focal areas and analyse findings		This activity will be implemented in Year 2 of the Project.
Activity 2.10 Analysis of biodiversity data from trials		This activity will be implemented in Year 2 of the Project.
Activity 2.11 Baseline and endline remote sensing analysis of focal areas and HRF as a whole		Initial assessment of forested land completed across Harapan / land use change is being monitored using Global Land Analysis and Discovery alerts and a report will be produced in the coming months.
Activity 2.12 Develop business plans and standard operating procedures for each focal species.		This activity will be implemented in Year 2 of the Project.
Output 3. Agroforestry is recognised as an important tool in reconciling restoration goals with local livelihoods within the ERC policy forum and ERC Association.	3.1. ERC policy recommendations and lessons learnt submitted by BI and FORDA to MoEF by EOP	These indicators will be acheived later on in the Project.
	3.2. Lessons shared with the ERC Association and other key stakeholders (government ministries, NGOs, rights groups) via papers and 2 workshops during Year 3	
	3.3. Guidelines on community development in ERCs developed and circulated to ERC practitioners by EOP.	

Activity 3.1 ERC policy forum workshop on livelihood development in ERCs	This activity will be implemented in Year 2 of the Project.
Activity 3.2 ERC policy recommendations and lessons learnt developed and submitted by BI and FORDA to MoEF	This activity will be implemented in Year 3 of the Project.
Activity 3.3 Lessons shared with ERC Association and other key stakeholders via papers and workshops	This activity will be implemented in Year 2 of the Project.
Activity 3.4 Guidelines on community development in ERCs developed and circulated to key stakeholders.	This activity will be implemented in Year 4 of the Project.

Annex 2: Project's full current logframe as presented in the application form (unless changes have been agreed)

Acronyms: EOP –End of Project, HH – Hutan Harapan, ERC – Ecosystem Restoration Concession, EOM – end of Month

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Impact (Max 30 words) Agroforestry options reconcile livelihood development with restoration and biodiversity goals across the 100,000-ha Harapan Rainforest, 2.7mha of ERCs and across a further >39mha Mha of logged over forests in Indonesia.			
Outcome: (Max 30 words) Agroforestry systems are developed and trialled at HH, resulting in improved livelihoods, enhanced biodiversity in cultivated areas and reduced rates of deforestation, and are incorporated into national ERC policy and best-practise.	0.1 The 500 families involved in the project experience positive livelihood benefits, through improved economic resilience, security of tenure, increased over-all incomes and improved gender equity, as a result of project interventions. 0.2 Biodiversity across 500 ha of community managed land is enhanced (increase diversity of plants, birds and soil organisms and shift in community composition towards forest dependent species) through agroforestry interventions by EOP. 0.3 Forest clearance reduced by 80% in project focal areas and by 30% across HRF by EOP against baseline rate at start of project as a result of the 'social fence'. 0.4 By EOP, HH management adopts agroforestry as a central tenant of its community development programme and rolls out an agroforestry programme across all encroached areas. 0.5 By EOP, ERC policy is adapted to facilitate agroforestry in community development 0.6. At least 3 other ERC license holders incorporate agroforestry into their community development programmes.	0.1.1 Analyses / report of impact of project on livelihoods 0.1.2. Livelihoods impact published in peer review journals. 0.2.1 Biodiversity survey data from before-and-after implementation of agroforestry trials. 0.3.1 Remote sensing report 0.4.1 HH management plan and Standard Operating Procedures 0.5.1 Policy forum reports, white papers and legal changes to ERC licenses. ERC Association meeting minutes and documented management commitments 0.6.1. Other ERC license holder reports, websites, press releases.	*Livelihood benefits can be detected by EOP.* We will focus primarily on analysis of benefits that can be measured in the short term such as security of tenure (via management agreements, perceived gender equity, skills transfer, etc.) and on modelling outcomes for long-term benefits. *Biodiversity benefits can be detected by end of project.* Most of the project area is crop land or early fallow that is regularly re-cut. Thus, even over a relatively short time positive biodiversity benefits can be realised. Additionally, we will focus analyses on identifying the trajectory of change (i.e. towards more forest dependent biotas). We will also use proxy indicators such as the impact of the project in further encroachment into the forest As benefits will continue to accrue beyond the life of the project PT REKI has committed to continuing support for the interventions and under-taking additional impact surveys of livelihoods and biodiversity 5 yrs and 10 yrs after completion of the project.
Outputs: 1. Enhanced understanding of the household and	1.1. Household economic survey designed and carried out on 500 farms by EOM6 1.2. Farm systems analysis survey designed and implemented on 250 sample farms by EOM9	1.1.1 Household systems survey report. 1.1.2 Household systems survey tools and data archived on open access	*Farmers from communities at HH are willing to collaborate with the project and participate in agroforestry trials* BI and PT-REKI's ongoing dialogue with encroacher groups and the activities of the community development department at HH (e.g. the project has provided primary

Project summary	Measurable Indicators	Means of verification	Important Assumptions
farm systems level economics in communities at HRF and the potential contribution of locally developed agroforestry options to enhancing livelihoods	1.3. Experimental economic games designed and carried out in 8 focal groups by EOM9 to assess impediments to agroforestry uptake. 1.4. Household economic, farm system and economic games data analysed by EOM12 and analysis used to inform the collaborative design of agroforesty options in output 2. 1.5. Develop and conduct livelihoods impact survey of 150 participating and 150 non-participating families by EOM33 to measure impact of project interventions.	platform. 1.2.1 Farm systems survey report 1.2.2 Farms systems survey tools and data archived on open access platform 1.3.1 Experimental economic games tool and data archived on open access platform 1.3.2 Report on experimental economic games 1.4.1 Publication of up to 3 peer reviewed papers. 1.4.2. Agroforestry option models 1.4.3 Stakeholder agreement on agroforesry options. 1.5.1. Analyses / report of impact of project on livelihoods	schooling, a health clinic, sanitation, and livelihood support for the Batin Sembilan) are continually building trust. Moreover, the potential of encroacher communities to secure tenure through management agreements with PT-REKI is likely to be a strong motive for collaboration. Through providing novel and appropriate technologies, skills training and planting material for agroforestry, as well as security of tenure and other incentives through management agreements, BI and PT-REKI will be enabling alternatives to current practices.
2. Agroforestry options, based on rubber, gaharu and native timber species, are designed, through a participatory process, to meet livelihood and restoration goals, and are trialled in focal communities in HH.	2.1 Models for jungle rubber, gaharu and native timber species developed by EOM12 2.2 Stakeholder workshops involving all 500 Households to refine proposed agroforestry options across 500 ha and agree an implementation plan by EOM15 2.3 Agreements with 500 families for the development of agroforestry systems covering 500 ha of their land (1+ha for each family) is signed by EOM18. 2.4 On farm trials established on 500 ha in focal areas (in 2.3) by EOM24 and monitored every 3 months. 2.5 Biodiversity surveys designed and carried out on a subset of agroforestry trials (stratified for distance to forest and other key environmental variables) at start	2.1.1 Models outputs for rubber, gaharu and native timber agroforestry systems made available through open access platform 2.1.2 Publication of agroforestry modelling results in peer-reviewed journal 2.2.1 Photographs, minutes and implementation plan from stakeholder workshops 2.3.1 Copies of signed management agreements 2.4.1 Monitoring reports of implementation of agroforestry trials on farms. 2.4.2 Training manuals archived	*Locally designed agroforestry options benefit biodiversity* Mature jungle rubber, an indigenous rubber agroforestry system in Indonesia, has similar biodiversity values to advanced secondary forest regrowth. The agroforestry options we will design will enhance structural diversity and species diversity, through diversification of inter-rows. At maturity, a rubber or high value timber agroforestry system with natural regeneration between rows is expected to form an analogue forest similar in diversity to jungle rubber. *Locally developed agroforestry options benefit livelihoods* Communities at HH have limited livelihood options, usually depending on subsistence crops and artisanal rubber or oil palm. Lack of capital to invest in inputs and vulnerability to global market fluctuations combine to reduce the profitability and suitability of even relatively lucrative crops, such as oil palm. Agroforestry, through diversification of income sources, will provide enhanced economic resilience and, when including gaharu and high

Project summary	Measurable Indicators	Means of verification	Important Assumptions
	and end of project. 2.6 Baseline and endline remote sensing analysis of on farm trial area (500ha+) and HH as a whole carried out by EOM3 and 36. 2.7. Ten REKI and 2 BI staff have been trained in livelihood surveys, farm system analysis and economic games by EOM6 and are involved in the implementation of surveys and analysis of data.	2.5.1 Analysis and report of before-and-after biodiversity surveys. 2.5.2 Publication of before-and-after biodiversity surveys in peer reviewed journal. 2.6.1 Report of forest cover change. 2.7.1 Training reports (by survey leaders) and trainers assessment of individual performances on each survey.	value timber species, potentially much higher income in the long-term. Diversification and focus on low labour demanding crops, also potentially benefits other aspects of livelihoods, such as off-farm income, health, school attendance and gender equality. *Licenses for harvesting of Gaharu are forthcoming* Gaharu is a CITES (Appendix II) listed species. Licenses are required for harvesting for the trees that are derived from sustainably managed populations. As the gaharu in our agroforestry systems will be grown from seed this will not be difficult to demonstrate. If stocks are derived from planted material the MoEF usually approves licenses without further requirements. Additionally, PT-REKI collaborates with FORDA in inoculation trials of wild gaharu, which is common in HRF.
3. Agroforestry is recognised as an important tool in reconciling restoration goals with local livelihoods within the ERC policy forum and ERC Association.	3.1. ERC policy recommendations and lessons learnt submitted by BI and FORDA to MoEF by EOP 3.2. Lessons shared with the ERC Association and other key stakeholders (government ministries, NGOs, rights groups) via papers and 2 workshops during Year 3 3.3. Guidelines on community development in ERCs developed and circulated to ERC practitioners by EOP.	3.1.1 ERC policy forum workshop report. 3.2.1 FORDA ERC white paper on community development in ERCs 3.2.1 Workshop reports and meeting minutes, and other papers and media outputs. 3.3.1 Guidelines for community development in ERC concessions published	*MoEF and other members of the ERC Association are receptive to the idea of adopting agroforestry for community developments.* BI together with FORDA host the ERC policy review process and regularly contribute to white papers, and PT-REKI chairs the ERC Association. BI and PT-REKI have established themselves as leaders in ERC policy and practical implementation. They have established good working relationships with FORDA and MoEF, and other stakeholders through hosting the ERC policy forum. Agroforestry has a long history in Indonesia and has been identified as a potentially important tool in Indonesia's REDD+ commitments.

Activities

1.1 Develop gender disaggregated baseline household livelihoods survey instrument and train enumerators from PT-REKI.

1.2 Conduct household economic survey of 500 households

1.3 Conduct analysis of household data

1.4 Develop a farms systems analysis survey instrument and train enumerators from PT-REKI.

1.5 Conduct farms system analysis for 250 farms

1.6 Analysis of farm systems data

1.7 Design experimental economic games to assess impediments to agroforestry uptake and train REKI staff to implement

1.8 Conduct experimental economic games in at least 8 focal group sessions

1.9 Analyse and write up results of experimental economic games

1.10 Develop gender disaggregated livelihoods impact survey instrument to be utilised throughout project to monitor impacts.

1.11 Conduct economic survey of 150 participating and 150 non-participating families

1.12 Analyse livelihoods impact of project interventions against baseline.

Project summary	Measurable Indicators	Means of verification	Important Assumptions
2.1 Develop models for rubber, gaharu and native timber species agroforestry options 2.2 Conduct stakeholder workshops in communities ensuring gender balance is considered in design, to refine proposed options and agree an implementation plan 2.3 Assess attitudes to and understanding of forest clearance and illegal activity drivers using randomised response techniques. 2.4 Develop and sign agreements with 500 families for the development of agroforestry systems on 500 ha 2.5 Establish on-farm trials on 500 ha in focal area and train farmers including women and monitor throughout project 2.6 Develop manuals for agroforestry management, rubber tapping etc and distribute to participating farmers as appropriate and encourage farmer to farmer sharing through community meetings and workshops. 2.7 Develop biodiversity survey protocols 2.8 Conduct before agroforestry trial biodiversity surveys in project focal areas 2.9 Conduct after agroforestry trial biodiversity surveys in project focal areas and analyse findings. 2.10 Analysis of biodiversity data from trials 2.11 Baseline and endline remote sensing analysis of focal areas and HRF as a whole 2.12 Develop business plans and Standard operating procedures for each focal species. 3.1 ERC policy forum workshop on livelihood development in ERCs 3.2 ERC policy recommendations and lessons learnt developed and submitted by BI and FORDA to MoEF 3.3 Lessons shared with ERC Association and other key stakeholders via papers and workshops 3.4 Guidelines on community development in ERCs developed and circulated to key stakeholders.			

Annex 3: Standard Measures

Table 1 Project Standard Output Measures

Code No.	Description	Gender of people (if relevant)	Nationality of people (if relevant)	Year 1 Total	Year 2 Total	Year 3 Total	Total to date	Total planned during the project
6A 6B	Number of people to receive training for HH surveys and organising surveys Number of days of training to be provided	4 females & 6 males	Indonesian	10			10	10 10 days
6A 6B	Number of farmers to receive training in rubber agroforestry Number of days of training to be provided	4 females and 8 males: 12	Indonesian	20	80	100	20	200 Throughout project
6A 6B	Number of people to receive training on developing business plans and standard operating procedures for agroforestry Number of days of training to be provided	9 females and 21 males (total 30 people)	Indonesian Indonesian	30	50	60	30	140 Throughout project
7	Number of (e.g., different types - not volume - of material produced) training materials to be produced for use by host country		Indonesian	3	2	2		HH survey SOP Imple notes Video handbook
10	Number of individual field guides/manuals to be produced to assist work related to species identification, classification and recording		Indonesian	1	2	1	1	4
11A	Number of papers to be published in peer reviewed journals		Indonesian	1	1	1		3
11B	Number of papers to be submitted to peer reviewed journals		Indonesian	1	2	3		6
12A	Number of computer based databases to be **established** and handed over to the host country		Indonesian/Bri tish	1	1	1		3
14A	Number of conferences/seminars/ workshops to be **organised** to		Indonesian	2	1	1		4

	present/disseminate findings							
14B	Number of conferences/seminars/ workshops **attended** at which findings from Darwin project work will be presented/ disseminated		Indonesian/British	1	2	3		6
22	Number of permanent field plots and sites to be established during the project and continued after Darwin funding has ceased		Indonesian	2	6			8
23	Value of resources raised from other sources (e.g., in addition to Darwin funding) for project work				4009	147,024	5,166	156,199

In Table 2, provide full details of all publications and material produced over the last year that can be publicly accessed, e.g. title, name of publisher, contact details, cost. Mark (*) all publications and other material that you have included with this report.

Table 2   Publications

Title	Type (e.g. journals, manual, CDs)	Detail (authors, year)	Gender of Lead Author	Nationality of Lead Author	Publishers (name, city)	Available from (e.g. weblink or publisher if not available online)
Questionnaire for household survey (*)	Survey questionnaire	Freya St John and Aidan Keane, 2017	Female	British		Author
Rubber Agroforestry Conceptual Model	Manual	Tom Swinfield and Rhett Harrison, 2017	Male	British		Author
Standard Operating Procedure for Agroforestry at HH	Manual	BI and PT REKI, 2017	Male	Indonesian		PT REKI
Rubber agroforestry biodiversity and ecosystem service monitoring plan	Manual	Tom Swinfield and Rhett Harrison, 2017	Male	British		Author
Sharing experience in agroforestry	Journal article	Mangara, Tom Swinfield, Rhett Harrison, 2019	Male	Indonesian		Author

Annex 4: Questionnaire for the Household Survey

Hutan Harapan household questionnaire

I confirm that I have had the Personal Information Sheet read out to me and I understand the information provided for this study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason. If I withdraw, my data will be removed from the study and will be destroyed.

I understand that the answers I provide will be used for the purposes detailed in the Personal Information Sheet and that my responses will be anonymised before analysis.

Based upon the above, I agree to take part in this study.

Research Assistant Signature:
Date:
Translate

1	Enumerator name: Nama Enumerator
2	Date: Tanggal
3	Village/Community ID: No KTP (foto kopi KTP) :
4	Name of village/community: Nama Desa/Dusun/ loaksi:
5	Household ID: Nomor KK (jika ada)
6	Name of household: Nama Kepala Keluarga:
7	GPS Longitude: Titik GPS Bujur timur
8	GPS Latitude: Titik GPS Lintang Selatan

14.1

14.2   Socio-demographics: Interviewee

9	Name of respondent: Nama Responden
10	Sex of respondent: Jenis Kelamin:
11	Age of respondent in years: Umur:
12	Position within household: 1 = Husband/Father 2 = Wife/Mother 3 = Widow/Widower Posisi dalam Keluarga 1 = suami 2 = isteri 3 =Janda/duda

13	Name of head of household: Nama Kepala Keluarga:	

NVar 18	What is the highest level of education you have achieved? Apa tingkat pendidikan yang paling tinggi dari orang dewasa dalam rumah tangga ini?	*1 = No education/Tidak sekolah* *2 = SD Primary school (SR/SD) or Packet A or lower* *3 = SMP/ SLTP Secondary school (SLTP) or passed Packet B* *4 = SMA/SLTA/SMK (SMR/ SLTR High school) or higher or passed Packet C* 5 = PT (Tertiary)

Household composition

All of these questions refer to conditions over the last 12 months and apply only to your household.
Semua pertanyaan ini mengacu pada kondisi 12 bulan terakhir dan hanya berlaku untuk rumah tangga anda

Household baseline data: Household members are persons living with this household or still financially supported by this household

Data Dasar Rumah tangga: Anggota rumah tangga adalah orang yang masih tinggal bersama atau masih dalam tanggungan

NVar3	How many people are there in your household? Berapa orang anggota keluarga dalam rumah tangga ini?	*Orang*
NVar4	How many families are there in the household? Berapa Kepala Keluarga yang ada di dalam rumah tangga ini?	*KK*
NVar5	How many living adult males are there in the household? (aged 17 years or older) Berapa orang anggota rumah tangga yang laki-laki dewasa? (usia 17 tahun ke atas)	*Orang*
NVar6	How many living adult females are there in the household? (aged 17 years or older) Berapa orang anggota rumahtangga yang perempuan dewasa? (usia 17 tahun ke atas)	*Orang*
NVar7	How many living male children (younger than 17 years) are there in the household? Berapa orang jumlah anak laki-laki (usia di bawah 17 tahun)?	*Orang*
NVar8	How many living female children (younger than 17 years) are there in the household?	

	Berapa jumlah anak perempuan (usia di bawah 17 tahun)?	*Orang*
NVar9	What is the ethnicity of your household? Apa suku di rumah tangga anda ?	1 = Bathin Sembilan *2 = Malayu* *3 = Javanese* *4 = Sudanese* *5 = Batak* *6 = Minangkabau* *7 = Kerincenese* *8 = Palembang* 9 = Others/Dan lain-lain: _____ _____
14	Does anyone within the household occupy a position of leadership within the community? Apakah ada dalam keluarga ini yang memiliki posisi kepemimpianan dalam masyarakat?	*0 = No* *1 = Yes:* *Sbg: _____*

14.3
14.4 Wellbeing: Subjective wellbeing

	Is yours a prosperous household? Apakah bapak / ibu merasa keluarga di rumah ini sudah sejahtera ?	*1 = No, it is not prosperous* *2 = Fairly* *3 = Yes, it is prosperous* *1 = Tidak / belum* *2 = Sedang* *3 = Ya*
NVar 11		
NVar 21	Do you consider your household to be poor? Apakah anda merasa keluarga ini menjadi miskin?	*1 = Yes, it is poor* *2 = Fairly poor* *3 = No, it is not poor* *1 = Ya* *2 = Cukup miskin*

		3 = Tidak
NVar 36	Do you consider your household to be happy? Apakah rumah tangga anda merasa senang tinggal di sini?	1 = No, it is unhappy 2 = Reasonably happy 3 = Yes, it is happy 1 = Tidak, ia tidak senang 2 = Sedang 3 = Ya, senang

Multidimensional poverty: Health and nutrition

NVar 12	Did the family experience a shortage of staple food during the last year Adakah keluarga anda merasa kekurangan makanan pokok pada tahun lalu?	1 = Yes 3 = No 1= ya 3 = tidak
NVar 13	Is clean water available at this location? Apakah air bersih tersedia di lokasi ini?	1 = No 2 = Yes, but only sometimes 3 = Yes, always 1= ya 2= ya, tapi kadang-kadang 3 = ya selalu
NVar 14	In the event of sickness, do members of your household always receive modern medical treatment from a doctor, nurse, midwife, or traditional care from a shaman or healer? Pada saat sakit, apakah anggota keluarga ini mendapat perawatan dari dokter, perawat, bidan atau pengobatan traditional dari dukun?	1 = Never 2 = Sometimes 3 = Yes, always 4 = Nobody has been sick during the last 12 months 1 = tidak pernah 2 = kadang-kadang 3 =ya. Selalu 4 = tidak ada yang sakit dalam 12 bulan terakhir

Multidimensional poverty: Material wealth

NVar 15	[PLEASE ASSESS FOR YOURSELF, DO NOT ASK] What is the quality of the respondent's house like?	1 = Below standard: Temporary house 2 = Standard: Semi-permanent house 3 = Above standard: Permanent house

	Kondisi rumah (**Petugas melihat saja, tidak perlu ditanyakan**)	*1 = Rumah tidak permanen* *2 = Standard desa/Rumah semi-permanen* *3 = Di atas standard desa/Rumah permanen*
Nvar 16	Does the household own a motorbike or an outboard engine? Apakah rumah tangga ini mempunyai tempek/speed atau sepeda motor/mobil?	*1 = No* *3 = Yes* *1 = Tidak* *3 = Ya*
NVar 17	[PLEASE ASSESS FOR YOURSELF, DO NOT ASK] Does the household own a satellite dish or a refrigerator? Apakah rumah tangga ini mempunyai parabola atau kulkas?	*1 = No* *3 = Yes* *1 = Tidak* *3 = Ya*
NVar 17 NESP	Does the family have a toilet inside the house? Apakah keluarga ini memiliki toilet di dalam rumah (bias juga observasi)	1 = No 3 = Yes *1 = Tidak* *3 = Ya*

Multidimensional poverty: Knowledge

NVar 18	What is the highest level of education among the adult members of your household (including the household head)? Apa tingkat pendidikan yang paling tinggi dari orang dewasa dalam rumah tangga ini?	*1 = No education* *2 = SD/SR (Primary school) or Packet A or lower* *3 = SMP/ SLTP Secondary school or passed Packet B* *4 = SLTA/SMA/SMK (High school) or higher or passed Packet C* 5 = PT (Tertiary)
NVar 19	Are there any children aged between 7 and 16 years	*1 = None attend school*

	old in your household attending school (children funded by your household)?	*2 = Not all attend school* *3 = All attend school* *4 = No children aged between 7 and 16* 1 = ada yg tidak bersekolah 2 = semuanya tidak sekolah 3 = semuanya sekolah 4 = tidak ada yang berusia antara 7-16 tahun
	Apakah ada anak-anak yang berusia diantara 7-16 tahun di keluarga ini yang sedang sekolah?	
NVar 20	Are there any household members with additional off-farm qualifications (e.g. healing, shaman, making handicrafts, carpentry, driving)? Apakah ada anggota rumah tangga dengan tambahan kualifikasi diluar sector pertanian (contoh, penyembuhan, dukun, membuat kerajinan, pertukangan, sopir)	*1 = None* *2 = One person* *3 = More than one person* 1 = tidak ada 2 = satu orang 3 = lebih dari satu orang

14.5 Livelihoods questions: Crops

15	Do you grow any crops? [If **Yes**, continue. Otherwise go to next section.] Apakah adan menanam tanaman pangan? (jika ya, lanjutkan. Kalau tidak beralih ke bagian berikutnya)	*0 = No* *1 = Yes* *0 = Tidak* *1 = Ya*
16	How much land do you grow crops on? Seberapa luas areal lahan yang ditanami dengan tanaman pangan?	*HECTARES:* ------------Hektar :
17	What proportion of your household's food comes from crops? Seberapa besar makanan keluargamu berasal dari tanaman pangan?	*1 = All or nearly all (81-100%)* *2 = More than half of it (61-80%)* *3 = About half of it (41-60%)* *4 = Less than half of it (21-40%)* *5 = A small amount (1-20%)* *6 = None (0%)* 1 = semua atau mendekati semua (81-100%) 2 = Lebih dari setengah (61-80%) 3 = Sekitar setengah (41-60%) 4.= kurang dari setengah (21-40%)

		5 = Jumlahnya sedikit (1-20 %) 6 = tidak ada
18	What proportion of your household's income comes from crops? Seberapa besar pendapatan keluargamu berasal dari tanamanan pangan?	*1 = All or nearly all (81-100%)* *2 = More than half of it (61-80%)* *3 = About half of it (41-60%)* *4 = Less than half of it (21-40%)* *5 = A small amount (1-20%)* *6 = None (0%)* 1 = semua atau mendekati semua (81-100%) 2 = Lebih dari setengah (61-80%) 3 = Sekitar setengah (41-60%) 4.= kurang dari setengah (21-40%) 5 = Jumlahnya sedikit (1-20 %) 6 = tidak ada
19	Who works on your land to grow crops? Siapa yang bekerja di lahan mu untuk menanam tanaman pangan	*1 = Adult male* *2 = Adult female* *3 = Male youth* *4 = Female youth* *5 = Reciprocal arrangements with family, friends or neighbours* *6 = Hired labour* 1 = Laki-laki dewasa 2 = perempuan dewasa 3 = laki-laki muda 4 = perempuan muda 5 = gotong royong bergiliran dengan teman, keluarga atau tetangga ***6 = pakai tenaga kerja***

RHO MIS Q4	What are the most important crops you grow? [List up to three] Tanaman pangan apa yang paling penting anda tanah? (buat listnya samapai 3 jenis)					
	Crop name *[TEXT]* Nama tananaman pangan	**Was the harvest good or bad last year?** *[CODE 1]* Apakah pemanenannya baik atau buruk dalam tahun terakhir?	**How important is this crop for the household's own consumption?** *[CODE 2]* Seberapa penting jenis tanaman pangan untuk comsumsi rumah tangga sendiri?	**How important is this crop for the household to sell?** [CODE 2] Seberapa pendint tanaman pangan ini untuk dijual bagi keluargamu?	**Who usually sells or trades the harvest?** [CODE 3] Siapa yang bisasinya menjual hasil panen tersebut?	**Who usually decides when to eat the crop?** [CODE 3] Siapa yang umumnya menentukan ketika tanaman pangan tersebut untuk dikonsumsi?
20						
21						
22						

CODE 1: 0 = Bad; 1 = Good
CODE 1 0 = jelek   2 = baik

CODE 2: 0 = Not important at all; 1 = Very little importance; 2 = Little importance; 3 = Moderate importance; 4 = Great importance; 5 = Very great importance
CODE 2. 0 = tidak penting sama sekali, 1 = sangat tidak penting 2 = sedikit penting 3 = sedang pentingnya 4 = sangat penting 5 = penting sekali

CODE 3: 1 = Husband or other male; 2 = Wife or other female; 3 = Male Youth or Child; 4 = Female Youth or Child
CODE 3 1 = suami atau laki-laki lain 2 = isteri atau perempuan lain 3 = anak lelaki atau pemuda 4 = perempuan muda atau anak-anak wanita

		TICK				TICK
23a	Mango			24n	Ubi	
23b	Duku			24o	Rambutan	
23c	Kabau			24p	Jeruk	
23d	Petai			24q	Cempedak	
23e	Jernang			24r	Nangka	
24f	Durian			24s	Jambu	
24g	Jengkol			24t	Sawo	
24h	Gaharu			24u	Cocoa/coklat	
24i	Cucumber/timun			24v	Pinang	
24j	Mangosteen/manggis			24w	Coconuts/ kelapa	
24k	Ridan			24x	Dan lain lain (others):	
24L	Chillies/cabe					
24m	Pisang					

Which of the following fruits and vegetables do you grow: TICK ALL THAT APPLY:
Dari list dibawah ini, jenis buah-buahan dan sayuran apa yang anda tanam?

Agricultural inputs

24	Did you use fertilisers during the last year? [If **Yes**, continue. Otherwise go to next section.] Apakah anda menggunakan pupuk selama setahun terakhir? Jikaya, lanjutkan. Jika tidak beralih ke bagian berikutnya	*0 = No* *1 = Yes* [Select multiple] 1 = Farm compost 2 = Manure 3 = Inorganic/chemical 0 = tidak 1 = ya
25	What types of fertiliser did you use? Jenis pupuk apa yang telah diunakan?	[Select multiple] 1 = Farm compost/ Kompos pertanian 2 = Manure/ Pupuk kotoran hewan 3 = Inorganic/chemical/ Pupuk kimia

Please indicate how much you agree or disagree with the following statements:
Mohon diindikasikan seberapa besar anda setuju atau tidak setuju dengan statemen di bawah ini.

		Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
26	In a normal year, we have enough man-power to farm the way we want to Dalam tahun normal, kami memiliki tenaga					

	kerja yang cukup untuk melakukan kegiatan pertanian berdasarkan yang saya inginkan					
27	In a normal year, we can afford to buy the inputs we want to farm the way we want to Dalam tahun normal, kami memiliki kemampuan untuk membeli input yang kita inginkan dalam kegiatan pertanian.		2			
28	In a normal year, you have sufficient man-power to plant and tend your crops Dalam tahun normal, kami memiliki tenaga kerja yang cukup untuk menanam dan menjaga tanaman kami					
29	In a normal year, you have sufficient man-power to harvest your crops Dalam tahun normal, kami memiliki tenaga kerja yang cukup untuk memanen tanaman kami					

Rubber

	Do you grow any rubber? [If **Yes**, continue. Otherwise go to next section.] Apakah andar menanam karet? (Jikaya, lanjutkan. Jika tidak beralih ke bagian berikutnya)	*0 = No* *1 = Yes* *0 = Tidak* *1 = Ya*
RHOMIS Q4	Who decides what crops to plant? Siapa yang memutuskan tanaman apa yang akan ditanam?	*1 = Adult male* *2 = Adult female* *3 = Male youth* *4 = Female youth* 1 = laki-laki dewasa 2 = perempuan dewasa

		3 = pemuda laki-laki 4 = permuda perempuan
30	Who works on your land? Siapa yang bekerja pada lahan anda?	*1 = Adult male* *2 = Adult female* *3 = Male youth* *4 = Female youth* *5 = Reciprocal arrangements with family, friends or neighbours* *6 = Hired labour* 1 = laki-laki dewasa 2 = perempuan dewasa 3 = pemuda laki-laki 4 = pemudi perempuan 5 = gotong royong bergatian dengan keluarga, teman dan tetangga 6 = menggunakan tenaga kerja
NVar38	What was the age of the forest cleared for your swidden field? Pada umur berapa hutan yang ditebang untuk pertanian gilir balik?	*1 = Less than 2 years* *2 = Less than 5 years* *3 = Between 5 and 10 years* *4 = Between 10 and 20 year* *5 = More than 20 years* *6 = Primary forest that has never been cleared* 1 = kurang dari 2 tahun 2 = kurang dari 5 tahun 3 = antara 5-10 tahun 4 = antara 10-20 tahun 5 = lebih dari 20 tahun 6 = hutan primer yang belum pernah ditebang.

NVar29	How is rice sufficiency in your household? Bagaimana kecukupan beras dalam rumah tangga anda?	*1 = No provisions, sometimes we are unable to buy rice* *2 = No provisions, but we can always buy rice despite difficulties* *3 = We never have trouble buying rice* *4 = We have sufficient provisions to last until the next harvest* 1 = tidak ada tentu, kadang-kadang kita tidak dapat membli beras 2 = tidak menentu, tetapi kita selalu dapat membeli beras

		walaupun sulit 3 = Kita tidak pernah bermasalah membeli beras 4 = Kami memiliki cukup dana untuk bertahan sampai panen berikut.

Livestock

31	Do you keep any livestock? (e.g. chickens, ducks, fish, beehives, sheep, goats or cattle) [If **Yes**, continue. Otherwise go to next section.] Apakah anda memelihara ternak? (contoh ayam, bebek, ikan, madu lebah, kambing, sapi)	*0 = No* *1 = Yes* *0 = Tidak* *1 = Ya*
32	What proportion of your household's food comes from your livestock? Seberapa besar makanan keluargamu berasal dari ternak	*1 = All or nearly all (81-100%)* *2 = More than half of it (61-80%)* *3 = About half of it (41-60%)* *4 = Less than half of it (21-40%)* *5 = A small amount (1-20%)* *6 = None (0%)* 1 = semua atau mendekati semua (81-100%) 2 = Lebih dari setengah (61-80%) 3 = Sekitar setengah (41-60%) 4.= kurang dari setengah (21-40%) 5 = Jumlahnya sedikit (1-20 %) 6 = tidak ada
33	What proportion of your household's income comes from selling your livestock or livestock products? Seberapa besar pendapatan keluargamu berasal dari penjualan ternak atau produk turunan ternak	*1 = All or nearly all (81-100%)* *2 = More than half of it (61-80%)* *3 = About half of it (41-60%)* *4 = Less than half of it (21-40%)* *5 = A small amount (1-20%)* *6 = None (0%)* 1 = semua atau mendekati semua (81-100%)

		2 = Lebih dari setengah (61-80%) 3 = Sekitar setengah (41-60%) 4.= kurang dari setengah (21-40%) 5 = Jumlahnya sedikit (1-20 %) 6 = tidak ada

	RHOMIS Q8	Please tell us about any livestock your household owns Mohon sebutkan tentang kepemilikan ternak anda					
	Animal	*a) Do you keep this?* *[CODE 0]* Apakah anda memiliki ternak	*b) How important is meat / produce for the household's own use?* *[CODE 1]* Seberapa penting daging/produk untuk konsumsi rumah tangga sendiri?	*c) How important is meat / produce for the household to sell?* *[CODE 1]* Seberapa penting daging/produk untuk dijual?	d) Who owns the animals? *[CODE 2]* Siapa pemilik ternak?	*e) Who usually sells the meat / produce?* *[CODE 2]* Siapa biasanya menjual daging yang diproduksi?	f) Who usually decides when to eat the meat / produce? *[CODE 2]* Siapa umumnya memutuskan ketika daging untuk dikonsusmsi?
34	Chickens/ayam						
35	Ducks/bebek						
36	Fishponds/ikan peliharaan						
37	Beehives/lebah madu						
38	Sheep or						

	Goats/domba – kambing						
39	Cattle/Sapi						
40	Buffalo/Kerbau						

CODE 0: 0 = No; 1 = Yes
CODE 0 0 = tidak   1= ya

CODE 1: 0 = Not important at all; 1 = Very little importance; 2 = Little importance; 3 = Moderate importance; 4 = Great importance; 5 = Very great importance
CODE 1 0 = tidak penting sama sekali   1 = s sangat sedikit penting 2= kecil kepentingannya 3 = moderate penting 4 = penting   5 : sangat penting sekali

CODE 2: 1 = Adult male; 2 = Adult female; 3 = Male youth; 4 = Female youth
CODE 2   1 = laki-laki dewasa 2 = perempuan dewasa 3 = pemuda   4 = pemudi

Forest resource use: penggunaan sumber daya hutan

41	Does your household use resources collected from the forest? [If **Yes**, continue. Otherwise go to next section.] Apakah keluarga anda memanfaatkan sumberdaya hutan? Jika Ya , lanjutkan. Jika tidak beralih ke bagian berikutnya	*0 = No* *1 = Yes* *0 = Tidak* *1 = Ya*
RHO MIS Q12	What proportion of your household's food comes from wild products? Seberapa besar proporsi makanan keluargamu yang berasal dari hutan?	*1 = All or nearly all (81-100%)* *2 = More than half of it (61-80%)* *3 = About half of it (41-60%)* *4 = Less than half of it (21-40%)* *5 = A small amount (1-20%)* *6 = None (0%)* 1 = semua atau mendekati semua (81-100%) 2 = Lebih dari setengah (61-80%) 3 = Sekitar setengah (41-60%) 4.= kurang dari setengah (21-40%) 5 = Jumlahnya sedikit (1-20 %) 6 = tidak ada
42	What proportion of your household's income comes from selling wild products? Seberapa besar pendapatn keluargamu yang berasal dari produk hutan?	*1 = All or nearly all (81-100%)* *2 = More than half of it (61-80%)* *3 = About half of it (41-60%)* *4 = Less than half of it (21-40%)* *5 = A small amount (1-20%)* *6 = None (0%)* 1 = semua atau mendekati semua (81-100%) 2 = Lebih dari setengah (61-80%) 3 = Sekitar setengah (41-60%) 4.= kurang dari setengah (21-40%)

		5 = Jumlahnya sedikit (1-20 %) 6 = tidak ada

Please tell us about the resources your household collects from the forest.
Jelaskan tentang sumberdaya hutan yang dimanfaatkan oleh keluargamu

	Resource Sumberdaya	a) Do you collect this? [CODE 0] Apakah anda memanfaatkan	b) How important is this wild product for the household's own use? [CODE 1] Seberapa penting pruduk hutan untuk konsumsi rumah tanggamu?	c) How important is this wild product for the household to sell? [CODE 1] Seberapa penting sumberdaya hutan bagi keluargamu untuk dijual?	d) Who usually collects this wild product? [CODE 2] Siapa yang umumnya mencari sumberdaya hutan?	e) Who usually sells this wild product? [CODE 2] Siapa umumnya menjual submerdaya hutan tsb?	f) Who usually decides when to eat this wild product? [CODE 2] Siapa umumnya memutuskan untuk mengkonsumsi sumberdaya hutan tsb?
43	Firewood / Wood for charcoal						
44	Construction materials. Konstuksi material (bamboo/rattan)						
45	Medicinal plants Tumbuhan obat						
46	Fruit / nuts / mushrooms Buah-buahan/ kacang/ jamur						
47	Wild honey Madu liar						
48	Insects Serangga						
49	Wild meat						

	Daging liar						
50	Wild fish ikan liar						

RHO MIS Q13	Is there a time of year when you rely more on food collected from the forest compared to other times? Apakah ada waktu tertentu untuk memanfaatkan sumberdaya yang berasal dari hutan di bandingkan dengan waktu lain?	*[SELECT MULTIPLE 1]* Pilih pilihan di bawah

SELECT MULTIPLE 1: 0 = No, it's the same all year round; 1 = Jan; 2 = Feb; 3 = Mar; 4 = Apr; 5 = May; 6 = Jun; 7 = Jul; 8 = Aug; 9 = Sep; 10 = Oct; 11 = Nov; 12 = Dec
Pilih pilihan 1   0 = tidak sama sepanjang tahun 1 = januari 2 = feb 3 = maret 4 = april 5= mei 6 = juni 7= juli   8 = Agustus 9 = September 10: oktober 11= November 12= Desember

Other sources of income

51	Does your household earn income from sources other than your crops, livestock, and forest resources? (e.g. regular or casual employment, businesses that household members own, remittances, renting land or equipment to others). [If **Yes**, continue. Otherwise go to next section.] Apakah keluarga anda memperoleh penghasilan dari sumber lain selain tanaman pangan, ternak, dan sumber daya hutan? (contoh pegawai tetap, usaha yang dimiliki anggota keluarga, pengiriman uang, sewa tanah atau peralatan untuk disewakan ke yg lain?	*0 = No* *1 = Yes* *0 = Tidak* *1 = Ya*
RHO MIS Q16	In total, what proportion of the household's total income is from these other sources? Secara total, seberapa besar proporsi pendapatan yang berasal dari sumber-sumber lain tersebut?	*1 = All or nearly all (81-100%)* *2 = More than half of it (61-80%)* *3 = About half of it (41-60%)* *4 = Less than half of it (21-40%)* *5 = A small amount (1-20%)* *6 = None (0%)* 1 = semua atau mendekati semua (81-100%)

		2 = Lebih dari setengah (61-80%) 3 = Sekitar setengah (41-60%) 4.= kurang dari setengah (21-40%) 5 = Jumlahnya sedikit (1-20 %) 6 = tidak ada

	RHOMIS Q16	Please tell us about any other sources of income you had in the last 12 months Mohon jelaskan tentang sumber-sumber pendapatan lain yang kamu peroleh dalam 12 tahun terakhir			
	Source	a) Does your household earn money from this source? *[CODE 1]* Apakah keluargamu memdapatkan uang dari sumber-sumber lain tersebut?	b) Which months does your household earn money from this source? *[SELECT MULTIPLE 1]* Bulan-bulan kapan saja keluargamu mendapatkan uang dari sumber tsb?	c) How much money does your household make from this source? *[IDR]* Seberapa besar keluargamu mendapatkan uang dari sumber-sumber tersebut?	d) Who decides how to spend the money of this source? *[CODE 2]* Siapa yang memutuskan untuk menghabiskan uang dari sumber-sumber ini?
52	Work on other farms Bekerja pada peternakan lainnya				
53	Work in local business Bekerja pada perusahaan lokal				
54	Work in own business Bekerja pada usaha sendiri				
55	Remittances Jasa pengiriman uang				
56	Work for government or public institution				

	Bekerja pada pemerintah atau institusi umum				
57	Rent out land to others Sewa tanah				
58	Rent out equipment or animals to others Sewa alat atau sewa binatan (kerbau, sapi)				
59	Other Lainnya				

CODE 1: 0 = No; 1 = Yes
Code 1 0 = no 1 = ya

SELECT MULTIPLE 1: 1 = Jan; 2 = Feb; 3 = Mar; 4 = Apr; 5 = May; 6 = Jun; 7 = Jul; 8 = Aug; 9 = Sep; 10 = Oct; 11 = Nov; 12 = Dec

Pilih Pilihan : 1 = Jan; 2 = Feb; 3 = Mar; 4 = Apr; 5 = Mei; 6 = Jun; 7 = Jul; 8 = Agus; 9 = Sep; 10 = Okt; 11 = Nov; 12 = Des

CODE 2: 1 = Adult male; 2 = Adult female; 3 = Male youth; 4 = Female youth=

CODE 2 1 = laki-laki dewasa 2 = perempuan dewasa 3 = pemuda 4 = pemudi

Aspirations

60	What would you like your life to look like in 2 years time? Seperti apa keinginan hidupmu 2 tahun mendatang?	*TEXT:* tulis
61	What would you like your children's livelihoods to look like in 2 years time? Seperti apa keinginan kehidupan anakmu 2 tahun mendatang?	*TEXT:* tulis

62	What could the government do to improve your life? Apa yang dapat pemerintah lakukan untuk meningkatkan taraf hidupmu?	*TEXT:* tulis
63	What could PT-REKI do to improve your life? Apa yang PT ReKI lakukan untuk meningkatkan taraf hidupmu?	*TEXT:* Translate

14.6 Scenarios for the future

SCENARIO INTRODUCTION <u>FOR BATIN SEMBILAN</u> AND <u>MALAY PEOPLE OF KAPAS/SAKO SUBAN</u> ONLY

PT-REKI is exploring the possibility of creating a new agroforestry scheme and would like to learn more about your interest in taking part. The way the scheme would operate is that you would be asked to sign an agreement with PT-REKI. The agreement will be that you will not clear any new land or hunt within the forest. In return, PT-REKI would provide you with seedlings to plant a mix of rubber and other trees that have been agreed with PT-REKI beforehand, including fruit trees. PT-REKI would provide advice and technical assistance, but you would be responsible for caring for the plants. You would be free to harvest the fruits and other products, to tap the rubber and to use them however you wished (e.g. keep them for your own family or sell them). If you choose to sell the products, PT REKI will facilitate the sale of rubber, buying it from you at the market price. The scheme would be entirely voluntary and you would not have to take part if you do not want to.

PT-REKI sedang meneroka kemungkinan untuk menciptakan skema agroforestry baru dan ingin mempelajari lebih lanjut tentang minat anda dalam mengambil bagian. Cara skema ini akan beroperasi adalah bahwa anda akan diminta untuk menandatangani persetujuan dengan PT-REKI. Persetujuan tersebut adalah bahwa anda tidak akan membuka lahan baru atau berburu di dalam hutan. Sebagai imbalannya, PT-REKI akan memberikan anda bibit untuk menanam campuran karet dan pohon lainnya yang telah disepakati dengan PT-REKI terlebih dahulu, termasuk bibit buah. PT-REKI akan memberikan saran dan bantuan teknis, tetapi anda bertanggung jawab untuk menjaga tanaman. Anda akan bebas untuk memanen buah-buahan dan produk lainnya, untuk menyadap karet dan menggunakan produk ini bagaimanpun yang anda suka (misalnya digunakan oleh keluarga anda sendiri atau menjualnya). Jika anda memilih untuk menjual produk, PT REKI akan memfasilitasi penjualan karet, membeli dari anda pada harga pasar. Skema ini akan sepenuhnya sukarela dan anda tidak akan harus mengambil bagian jika anda tidak ingin.

SCENARIO INTRODUCTION FOR ALL OTHER PEOPLE

PT-REKI is exploring the possibility of creating a new agroforestry scheme and would like to learn more about your interest in taking part. The way the scheme would operate is that you would be asked to sign an agreement with PT-REKI. The agreement will be that you will not clear any new land or hunt within the forest. In return, PT-REKI would provide you with seedlings to plant a mix of rubber and other trees that have been agreed with PT-REKI beforehand, including fruit trees. PT-REKI would provide advice and technical assistance, but you would be responsible for caring for the plants. You would be allowed to keep your harvest

for your own family, but not to sell to others. If you choose to sell the products, PT REKI will facilitate the sale of rubber, buying it from you at the market price. The scheme would be entirely voluntary and you would not have to take part if you do not want to.

PT-REKI sedang meneroka kemungkinan untuk menciptakan skema agroforestry baru dan ingin mempelajari lebih lanjut tentang minat anda dalam mengambil bagian. Cara skema ini akan beroperasi adalah bahwa anda akan diminta untuk menandatangani persetujuan dengan PT-REKI. Persetujuan tersebut adalah bahwa anda tidak akan membuka lahan baru atau berburu di dalam hutan. Sebagai imbalannya, PT-REKI akan memberikan anda bibit untuk menanam campuran karet dan pohon lainnya yang telah disepakati dengan PT-REKI terlebih dahulu, termasuk bibit buah. PT-REKI akan memberikan saran dan bantuan teknis, tetapi anda bertanggung jawab untuk menjaga tanaman. Anda akan bebas untuk memanen buah-buahan dan produk lainnya untuk digunakan oleh keluarga anda sendiri, tetapi anda tidak akan dibenarkan untuk menjualnya kepada pihak lain. Jika anda memilih untuk menjual produk anda, PT REKI akan memfasilitasi penjualan karet, membeli dari anda pada harga pasar. Skema ini akan sepenuhnya sukarela dan anda tidak akan harus mengambil bagian jika anda tidak ingin.

We are now going to describe a series of scenarios about possible futures to you. Each scenario will refer to a period of two years and we would like you to think carefully about how you would respond in each case. How would this affect your livelihood, and how would you behave in response? For example, would you change the way you use the land around you? Please also think about whether there are changes that you would like to make, but do not think you would be able to do so. What would prevent you? Finally, please think about how this would affect your willingness to participate in PT-REKI's agroforestry scheme

Kami sekarang menjelaskan sebuah seri sekenario tentang kemungkinan masa depanmu. Setiap sekenario merujuk pada sebuah periode 2 tahun dan kami ingin anda memikirkan secara seksama tentang bagaimana respon anda dari setiap sekenario. Bagaimana ini berdampak pada kehiupanmu, dan bagaimana perilakumu dalam merespon? Sebagai contoh apakah anda akan merubah cara pemanfaatan tanah disekitarmu? Mohon pikirkan tentang apakah ada beberapa perubahan yang akan anda buat? Tetapi jangan berpikir anda dapat melakukannya sendiri. Apa yang anda hindari? Akhirnya mohon pikirkan tentang bagiaman hal tersebut berdampak pada keinginanmu dalam skema agroforestry PT REKI.

Business as usual
In this scenario, I'd like you to imagine that conditions would remain the same as they are now. The prices you currently pay for food and other items would not change, and you would be able to sell your products at the same price. This would last for two years.

Pada scenario ini, Saya menginngkan anda mengimajinasikan condisi yang relative sama seperti sekarang. Harga-harga makanan dan item yang lain yang saat ini tidak akan berubah, dan anda dapat menjual pruduk-[roduk dengan harga yang sama. Ini akan berlangsung selama 2 tahun.

64	Would you change the type of crops you grow? Apakah anda akan merupah jenin tanaman yang akan ditanam?	*0 = No* *1 = Yes* *2 = Don't know* 0 = tidak 1 = ya 2 = tidak tahu

65	Would you move to a new area? Akankah anda berpindah ke areal baru?	*0 = No* *1 = Yes* *2 = Don't know* 0 = tidak 1 = ya 2 = tidak tahu
66	Would you change the size of the plot of land you plant crops on? Apakah anda akan merubah luasan lahan dari tanaman pangan yang ada tanam?	*1 = Yes, increase* *2 = No, keep the same* *3 = Yes, decrease* *4 = Don't know* 1 = ya menambah 2 = tidak tetap sama 3 = ya berkurang 4 = tidak tahu
67	[If "increase" to previous Q] Would you have to clear new land to do this? (jika menambah) Apakah anda memiliki areal baru untuk dibuka?	*0 = No* *1 = Yes* *2 = Don't know* 0 = tidak 1 = ya 2 = tidak tahu
68	Would you rely more heavily or less heavily on resources from the forest? Apakah anda lebih mengandalkan atau kurang mengandalkan sumberdaya yang berasal dari hutan?	*1 = More heavily* *2 = No, about the same* *3 = Less heavily* *4 = Don't know* 1 = lebih mengandalkan 2 = tidak, sama 3 = kurang mengandalkan 4 = tidak tahu

69	How likely is it that you would choose to participate in PT-REKI's new agroforestry project? Seberapa ingin Anda memilih untuk berpartisipasi dalam proyek baru agroforestry?	*1 = Very unlikely* *2 = Quite unlikely* *3 = Quite likely* *4 = Very likely* 1 = sangat suka/ingin 2 = sedikit kurang suka 3 = suka 4 = sangar suka

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Rubber price halves
Now please imagine that the price that you can sell rubber for goes down to half of its current level. In all other respects, conditions would remain the same as they are now. This change would last for two years.

Sekarang, bayangkan bahwa harga karet yang akan anda jual menjadi setengahnya. Di sisi lain, kondisi harga kebutuhan relative sama dari sekanrang. Perubahan ini akan berlangsung untuk dua tahun.

70	Would you change the type of crops you grow? Apakah anda akan merupah jenin tanaman yang akan ditanam?	*0 = No* *1 = Yes* *2 = Don't know* 0 = tidak 1 = ya 2 = tidak tahu
71	Would you move to a new area? Akankah anda berpindah ke areal baru?	*0 = No* *1 = Yes* *2 = Don't know* 0 = tidak 1 = ya 2 = tidak tahu
72	Would you change the size of the plot of land you plant crops on?	*1 = Yes, increase* *2 = No, keep the same*

	Apakah anda akan merubah luasan lahan dari tanaman pangan yang ada tanam?	*3 = Yes, decrease* *4 = Don't know* 1 = ya menambah 2 = tidak tetap sama 3 = ya berkurang 4 = tidak tahu
73	[If "increase" to previous Q] Would you have to clear new land to do this? (jika menambah) Apakah anda memiliki areal baru untuk dibuka?	*0 = No* *1 = Yes* *2 = Don't know* 0 = tidak 1 = ya 2 = tidak tahu
74	Would you rely more heavily or less heavily on resources from the forest? Apakah anda lebih mengandalkan atau kurang mengandalkan sumberdaya yang berasal dari hutan?	*1 = More heavily* *2 = No, about the same* *3 = Less heavily* *4 = Don't know* 1 = lebih mengandalkan 2 = tidak, sama 3 = kurang mengandalkan 4 = tidak tahu
75	How likely is it that you would choose to participate in PT-REKI's new agroforestry project? Seberapa ingin Anda memilih untuk berpartisipasi dalam proyek baru agroforestry?	*1 = Very unlikely* *2 = Quite unlikely* *3 = Quite likely* *4 = Very likely* 1 = sangat suka/ingin 2 = sedikit kurang suka 3 = suka 4 = sangar suka

	Rubber price doubles Now please imagine that the price that you can sell rubber for increases to twice its current level. In all other respects, conditions would remain the same as they are now. This change would last for two years. Sekarang coba dibayangkan bahwa harga karet yang kamu jual akan meningkat dua kali lipat dari harga saat ini. Dalam hal harga-harga yang lain, kondisinya sama seperti sekarang. Perubahan ini akan berlangsung dalam dua tahun	
76	Would you change the type of crops you grow? Apakah anda akan merubah tananaman yang akan ditanam?	*0 = No* *1 = Yes* *2 = Don't know* 0 = tidak 1 = ya 2 = tidak tahu
77	Would you move to a new area? Akankah anda berpindah ke areal baru?	*0 = No* *1 = Yes* *2 = Don't know* 0 = tidak 1 = ya 2 = tidak tahu
78	Would you change the size of the plot of land you plant crops on? Apakah anda akan merubah luasan lahan dari tanaman pangan yang ada tanam?	*1 = Yes, increase* *2 = No, keep the same* *3 = Yes, decrease* *4 = Don't know* 1 = ya menambah 2 = tidak tetap sama 3 = ya berkurang 4 = tidak tahu
79	[If "increase" to previous Q] Would you have to clear new land to do this? (jika menambah)	*0 = No* *1 = Yes*

	Apakah anda memiliki areal baru untuk dibuka?	*2 = Don't know* 0 = tidak 1 = ya 2 = tidak tahu
80	Would you rely more heavily or less heavily on resources from the forest? Apakah anda lebih mengandalkan atau kurang mengandalkan sumberdaya yang berasal dari hutan?	*1 = More heavily* *2 = No, about the same* *3 = Less heavily* *4 = Don't know* 1 = lebih mengandalkan 2 = tidak, sama 3 = kurang mengandalkan 4 = tidak tahu
81	How likely is it that you would choose to participate in PT-REKI's new agroforestry project? Seberapa ingin Anda memilih untuk berpartisipasi dalam proyek baru agroforestry?	*1 = Very unlikely* *2 = Quite unlikely* *3 = Quite likely* *4 = Very likely* 1 = sangat suka/ingin 2 = sedikit kurang suka 3 = suka 4 = sangar suka

Wages paid for working on oil palm plantation halve Now please imagine that the price that the wages you can earn for working on an oil palm plantation were reduced to half of their current level. In all other respects, conditions would remain the same as they are now. This change would last for two years. Sekarang bayangkan bahwa gaji yang ada dapat dari bekerja di perusahaan kelapa sawit berkurang setengahnya dari gaji sekarang. Dalam hal harga-harga yang lain, kondisinya sama seperti sekarang. Perubahan ini akan berlangsung dalam dua tahun		
82	Would you change the type of crops you grow? Apakah anda akan merubah tananaman yang	*0 = No* *1 = Yes*

	akan ditanam?	2 = Don't know 0 = tidak 1 = ya 2 = tidak tahu
83	Would you move to a new area? Akankah anda berpindah ke areal baru?	0 = No 1 = Yes 2 = Don't know 0 = tidak 1 = ya 2 = tidak tahu
84	Would you change the size of the plot of land you plant crops on? Apakah anda akan merubah luasan lahan dari tanaman pangan yang ada tanam?	1 = Yes, increase 2 = No, keep the same 3 = Yes, decrease 4 = Don't know 1 = ya menambah 2 = tidak tetap sama 3 = ya berkurang 4 = tidak tahu
85	[If "increase" to previous Q] Would you have to clear new land to do this? (jika menambah) Apakah anda memiliki areal baru untuk dibuka?	0 = No 1 = Yes 2 = Don't know 0 = tidak 1 = ya 2 = tidak tahu
86	Would you rely more heavily or less heavily on resources from the forest? Apakah anda lebih mengandalkan atau kurang mengandalkan sumberdaya yang berasal dari hutan?	1 = More heavily 2 = No, about the same 3 = Less heavily 4 = Don't know 1 = lebih mengandalkan

		2 = tidak, sama 3 = kurang mengandalkan 4 = tidak tahu
87	How likely is it that you would choose to participate in PT-REKI's new agroforestry project? Seberapa ingin Anda memilih untuk berpartisipasi dalam proyek baru agroforestry?	*1 = Very unlikely* *2 = Quite unlikely* *3 = Quite likely* *4 = Very likely* 1 = sangat suka/ingin 2 = sedikit kurang suka 3 = suka 4 = sangar suka

Wages paid for working on oil palm plantation double
Now please imagine that the price that the wages you can earn for working on an oil palm plantation were increased to twice their current level. In all other respects, conditions would remain the same as they are now. This change would last for two years.

Sekarang silahkan berimajinasi bahwa gaji dari bekerja di perusahaan kelaa sawit meningkat dua kali lipat dari gaji saat ini. Dalam hal harga-harga yang lain, kondisinya sama seperti sekarang. Perubahan ini akan berlangsung dalam dua tahun

88	Would you change the type of crops you grow? Apakah anda akan merubah tananaman yang akan ditanam?	*0 = No* *1 = Yes* *2 = Don't know* 0 = tidak 1 = ya 2 = tidak tahu
89	Would you move to a new area? Akankah anda berpindah ke areal baru?	*0 = No* *1 = Yes* *2 = Don't know* 0 = tidak 1 = ya 2 = tidak tahu

90	Would you change the size of the plot of land you plant crops on? Apakah anda akan merubah luasan lahan dari tanaman pangan yang ada tanam?	*1 = Yes, increase* *2 = No, keep the same* *3 = Yes, decrease* *4 = Don't know* 1 = ya menambah 2 = tidak tetap sama 3 = ya berkurang 4 = tidak tahu
91	[If "increase" to previous Q] Would you have to clear new land to do this? (jika menambah) Apakah anda memiliki areal baru untuk dibuka?	*0 = No* *1 = Yes* *2 = Don't know* 0 = tidak 1 = ya 2 = tidak tahu
92	Would you rely more heavily or less heavily on resources from the forest? Apakah anda lebih mengandalkan atau kurang mengandalkan sumberdaya yang berasal dari hutan?	*1 = More heavily* *2 = No, about the same* *3 = Less heavily* *4 = Don't know* 1 = lebih mengandalkan 2 = tidak, sama 3 = kurang mengandalkan 4 = tidak tahu
93	How likely is it that you would choose to participate in PT-REKI's new agroforestry project? Seberapa ingin Anda memilih untuk berpartisipasi dalam proyek baru agroforestry?	*1 = Very unlikely* *2 = Quite unlikely* *3 = Quite likely* *4 = Very likely* 1 = sangat suka/ingin 2 = sedikit kurang suka 3 = suka 4 = sangar suka

Risk aversion

94	Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks? Apakah anda umumnya seorang yang mempersiapkan diri emngambil resiko atau apakah anda mencoba mengidari resiko?	1 = Very unwilling to try new things 2 = Slightly unwilling to try new things 3 = Slightly willing to try new things 4 = Very willing to try new things 1 = sangat tidak ingin mencoba sesuatu hal baru 2 = sedikit tidak suka dengan hal-hal baru 3 = sedikit suka dengan hal-hal baru 4 = sangat suka dengan hal-hal baru
95	Are you generally a person who is willing to try out new things or do you avoid trying out new things? Apakah anda umumnya seorang yang ini mencoba sesuatu yang baru atau apakah ada menghindari hal-hal baru?	1 = Very unwilling to try new things 2 = Slightly unwilling to try new things 3 = Slightly willing to try new things 4 = Very willing to try new things 1 = sangat tidak ingin mencoba sesuatu hal baru 2 = sedikit tidak suka dengan hal-hal baru 3 = sedikit suka dengan hal-hal baru 4 = sangat suka dengan hal-hal baru

Discount rates

96	For each of the choices below (ST1 - ST20) please tell us whether you would prefer option A (to be paid in 1 month's time) or option B (to be paid in 13 months' time) Untuk masing-masing pilihan di bawah (ST1-ST20), mohon jelaskan apakah anda lebih memilih opsi A (untuk dibayar dalam 1 bulan) atau opsi B (dibayrkan dalam 13 bulan)				
	Choices Pilihan-pilihan	**Option A:** **Paid in 1 month** Opsi A: Dibayrkan dalam 1 bulan	**Option B:** **Paid in 13 months** Opsi B Dibayarkan dalam 13 bulan	Equivalent annual interest rate	**Chosen option** *[A or B]* Pilih opsinya
	ST1	3,500,000 IDR	3,587,500 IDR	2.5%	
	ST2	3,500,000 IDR	3,675,000 IDR	5.0%	
	ST3	3,500,000 IDR	3,762,500 IDR	7.5%	
	ST4	3,500,000 IDR	3,850,000 IDR	10.0%	
	ST5	3,500,000 IDR	3,937,500 IDR	12.5%	
	ST6	3,500,000 IDR	4,025,000 IDR	15.0%	
	ST7	3,500,000 IDR	4,112,500 IDR	17.5%	

	Choices	Option A	Option B	Equivalent annual interest rate	Chosen option
	ST8	3,500,000 IDR	4,200,000 IDR	20.0%	
	ST9	3,500,000 IDR	4,287,500 IDR	22.5%	
	ST10	3,500,000 IDR	4,375,000 IDR	25.0%	
	ST11	3,500,000 IDR	4,462,500 IDR	27.5%	
	ST12	3,500,000 IDR	4,550,000 IDR	30.0%	
	ST13	3,500,000 IDR	4,637,500 IDR	32.5%	
	ST14	3,500,000 IDR	4,725,000 IDR	35.0%	
	ST15	3,500,000 IDR	4,812,500 IDR	37.5%	
	ST16	3,500,000 IDR	4,900,000 IDR	40.0%	
	ST17	3,500,000 IDR	4,987,500 IDR	42.5%	
	ST18	3,500,000 IDR	5,075,000 IDR	45.0%	
	ST19	3,500,000 IDR	5,162,500 IDR	47.5%	
	ST20	3,500,000 IDR	5,250,000 IDR	50.0%	

97	For each of the choices below (MT1 - MT20) please tell us whether you would prefer option A (to be paid in 1 year's time) or option B (to be paid in 6 years' time) Untuk masing-masing pilihan dibawah ini (MT1-MT20) mohon katakana apakah anda lebih cenderung memilih opsi A (untuk dibayarkan dalam 1 tahun) atau opsi B (untuk dibayarkan dalam 6 tahun)				
	Choices Pilihan-pilihan	**Option A: Paid in 1 year** OPSI A Dibayarkan dalam 1 tahun	**Option B: Paid in 6 years** Opsi B Dibayarkan dalam 6 ahun	Equivalent annual interest rate	**Chosen option** *[A or B]* Opsi pilihan (A atau B)
	MT1	5,000,000 IDR	5,657,041 IDR	2.5%	
	MT2	5,000,000 IDR	6,381,408 IDR	5.0%	
	MT3	5,000,000 IDR	7,178,147 IDR	7.5%	
	MT4	5,000,000 IDR	8,052,550 IDR	10.0%	
	MT5	5,000,000 IDR	9,010,162 IDR	12.5%	
	MT6	5,000,000 IDR	10,056,786 IDR	15.0%	

	Choices	Option A	Option B	Equivalent annual interest rate	Chosen option
	MT7	5,000,000 IDR	11,198,487 IDR	17.5%	
	MT8	5,000,000 IDR	12,441,600 IDR	20.0%	
	MT9	5,000,000 IDR	13,792,737 IDR	22.5%	
	MT10	5,000,000 IDR	15,258,789 IDR	25.0%	
	MT11	5,000,000 IDR	16,846,936 IDR	27.5%	
	MT12	5,000,000 IDR	18,564,650 IDR	30.0%	
	MT13	5,000,000 IDR	20,419,702 IDR	32.5%	
	MT14	5,000,000 IDR	22,420,167 IDR	35.0%	
	MT15	5,000,000 IDR	24,574,432 IDR	37.5%	
	MT16	5,000,000 IDR	26,891,200 IDR	40.0%	
	MT17	5,000,000 IDR	29,379,495 IDR	42.5%	
	MT18	5,000,000 IDR	32,048,670 IDR	45.0%	
	MT19	5,000,000 IDR	34,908,413 IDR	47.5%	
	MT20	5,000,000 IDR	37,968,750 IDR	50.0%	

| | 98 | For each of the choices below (LT1 - LT20) please tell us whether you would prefer option A (to be paid in 5 years' time) or option B (to be paid in 20 years' time)
 Untuk masing-masing pilihan dibawah ini (LT 1-LT20) mohon katakana apakah anda lebih cenderung memilih Opsi A (untuk dibayarkan dalam 5 tahun) atau opsi B (untuk dibayarkan dalam 20 tahun) |

	Choices Pilihan-pilihan	Option A: Paid in 5 years Opsi A: Dibayarkan dalam 5 tahun	Option B: Paid in 20 years Opsi B: Dibayarkan dalam 20 tahun	Equivalent annual interest rate	Chosen option [A or B] Pilihan opsi (A or B)
	LT1	35,000,000 IDR	50,690,436 IDR	2.5%	
	LT2	35,000,000 IDR	72,762,486 IDR	5.0%	
	LT3	35,000,000 IDR	103,560,707 IDR	7.5%	
	LT4	35,000,000 IDR	146,203,686 IDR	10.0%	

	LT5	35,000,000 IDR	204,812,228 IDR	12.5%	
	LT6	35,000,000 IDR	284,797,157 IDR	15.0%	
	LT7	35,000,000 IDR	393,220,403 IDR	17.5%	
	LT8	35,000,000 IDR	539,245,755 IDR	20.0%	
	LT9	35,000,000 IDR	734,698,875 IDR	22.5%	
	LT10	35,000,000 IDR	994,759,830 IDR	25.0%	
	LT11	35,000,000 IDR	1,338,815,760 IDR	27.5%	
	LT12	35,000,000 IDR	1,791,506,255 IDR	30.0%	
	LT13	35,000,000 IDR	2,383,999,821 IDR	32.5%	
	LT14	35,000,000 IDR	3,155,546,409 IDR	35.0%	
	LT15	35,000,000 IDR	4,155,358,679 IDR	37.5%	
	LT16	35,000,000 IDR	5,444,883,345 IDR	40.0%	
	LT17	35,000,000 IDR	7,100,533,970 IDR	42.5%	
	LT18	35,000,000 IDR	9,216,967,962 IDR	45.0%	
	LT19	35,000,000 IDR	11,911,003,412 IDR	47.5%	
	LT20	35,000,000 IDR	15,326,286,163 IDR	50.0%	

14.7

14.8   Other characteristics: Generalised trust

	Please tell us how much you agree or disagree with the following statements: Mohon katakana seberapa besar anda setuju atau tidak setuju dengan pernyataan berikut:	
99	In general, you can trust people Pada umumnya, anda dapat mempercayai orang	1 = disagree strongly 2 = disagree somewhat 3 = agree somewhat 4 = agree strongly 1 = sangat tidak setuju 2 = agak tidak setuju 3 = agak setuju 4 = setuju sekali
100	Nowadays, you can't rely on anybody	1 = disagree strongly 2 = disagree somewhat 3 = agree somewhat 4 = agree strongly

	Saat ini, anda tidak dapat mengandalkan siapapun	1 = sangat tidak setuju 2 = agak tidak setuju 3 = agak setuju 4 = setuju sekali

Trust in institutions

101	How much do you trust the national government? Seberapa besar anda mempercayai pemerintah?	1 = no trust at all 2 = little trust 3 = quite a bit of trust 4 = a lot of trust 1 = tidak percaya sama sekali 2 = sedikit percaya 3 = percaya 4 = sangat percaya
102	When dealing with the national government, it's better to be cautious before trusting them. Ketika berhadapan /deal dengan pemerintah, sebaiknya berhati hati sebelum mempercayai mereka	1 = disagree strongly 2 = disagree somewhat 3 = agree somewhat 4 = agree strongly 1 = sangat tidak setuju 2 = agak tidak setuju 3 = agak setuju 4 = setuju sekali
103	How much do you trust your community leaders? Seberapa besar anda mempercayai pemimpin masyarakat?	1 = no trust at all 2 = little trust 3 = quite a bit of trust 4 = a lot of trust 1 = tidak percaya sama sekali 2 = sedikit percaya 3 = percaya 4 = sangat percaya
104	When dealing with your community leaders, it's better to be cautious before trusting them. Ketika berhadapan/deal dengan pemimpin masyarakat, lebih baik anda berhati-hati sebelum mempercayai mereka,	1 = disagree strongly 2 = disagree somewhat 3 = agree somewhat 4 = agree strongly 1 = sangat tidak setuju 2 = agak tidak setuju 3 = agak setuju 4 = setuju sekali
105	How much do you trust PT-REKI?	1 = no trust at all 2 = little trust 3 = quite a bit of trust

		4 = a lot of trust
	Seberapa besar anda percaya pada PT REKI?	1 = tidak percaya sama sekali 2 = sedikit percaya 3 = percaya 4 = sangat percaya
106	When dealing with PT-REKI, it's better to be cautious before trusting them.	1 = disagree strongly 2 = disagree somewhat 3 = agree somewhat 4 = agree strongly
	Ketiak berhadapan dengan PT REKI. Lebih baik berhati-hatis ebelum mempercayai mereka	1 = sangat tidak setuju 2 = agak tidak setuju 3 = agak setuju 4 = setuju sekali

Additions

107	Have you receive support for your livelihood from the PT-REKI in the last year: Apakah anda menerima dukungan kehidpanmu dari PT REKI dalam satu tahun terakhir?	0 = No 1 = Yes If **Yes** [CODE 1] _____

CODE 1: 1 = Food; 2 = Agricultural inputs; 3 = Animals; 4 = Cash; 5 = other

108	If you have an agreement with PT-REKI to do agroforestry, what percentage of your profits are you willing to share with them? Translate Jika anda memiliki kesepakatan dengan PT-REKI untuk agroforestry, berapa persen keuntungan anda yang anda mau untuk berbagi kepada mereka?	_____%

Annex 5: Rubber Agroforestry Conceptual Model (Proposed Systems)

1. Background

A number of features make natural rubber (*Hevia brasiliensis*) an ideal smallholder crop: (i) latex harvesting is labour demanding and, because tapping takes place in the early morning, requires that the tappers live near to their plots; (ii) following initial processing, which is low-tech, rubber can be stored; (iii) rubber trees grow well on relatively poor soils and, although the price of natural rubber fluctuates, long-term average returns are favourable compared to agricultural crops on similar land; (iv) when prices are low farmers can postpone tapping which through increased tree growth actually increases the life-time yield from a tree; (v) at the end of the tapping life of trees (25-35 years depending on the tapping intensity) the rubber wood can be harvested, which based on average prices adds approximately 20% to the total life-time value of the crop; (vi) rubber can be inter-cropped in the early years (before canopy closure) with a wide variety of annual crops, enabling farmers to off-set establishment costs and produce an income during the period before latex can be harvested; and (vii) rubber can be inter-cropped with wide variety of perennial crops during the mature phase, which enables farmers to increase returns from land and diversify incomes, thereby insuring themselves against low natural rubber prices. This last feature also makes rubber an attractive option for restoration, because rubber-based analogue forests can be structurally diverse and ecosystem service provisioning may be similar to advanced natural regeneration. Rubber can also serve as an income-generating nurse crop for slow growing native timber species or natural regeneration. The purpose of this report is develop a set of conceptual models for different rubber agroforestry systems, which will be implemented at Hutan Harapan, an Ecosystem Restoration Concession in Sumatra, Indonesia.

2. Objectives of rubber agroforestry at Hutan Harapan

1. Provide income generating opportunities for local communities that are compatible with restoration goals.
2. Provide income generating opportunities for PT REKI, the company managing Hutan Harapan, through primary production and value added processing.
3. Demonstrate the validity of an agroforestry approach to restoration.

3. Rubber agroforesty models

3.1 Rubber

Rubber trees should be planted at a density of 420-470 trees per hectare. Our models will use double row alley planting (Figure 1), as this creates greater variation in the light environment and hence increases inter-cropping options. Each row of rubber trees is planted with 2.7 m spacing between trees, the gap between the rows is 2.34 m and the planting in each row is offset (1.35 m). This results in a minimum gap between all rubber trees within the alley of 2.7 m (Figure 1). The distance between alleys is 15 m. A 0.75 m gap will be maintained on either side of the alley to permit easy access for tapping and to assuage potential competition with inter-crops (Figure 2-5).

Locally adapted high-yielding clones should be planted and locally advised levels of fertilisation applied over the first 6 years. In line inter-planting of rubber trees with bananas (0.5 m distance) can improve the growth in early years through protection from excessive sun and improved soil moisture conditions. Fertilisation is not required after the trees reach maturity. Use of herbicides should be

avoided. When required, weeding should be applied to control competition. Because of potential damage from pigs, plantings will need to be fenced for the first 1-2 years. If competition is managed, tree should reach tappable size in their 6th year. From year eight, expected yield per hectare is 1250-1500 kg.
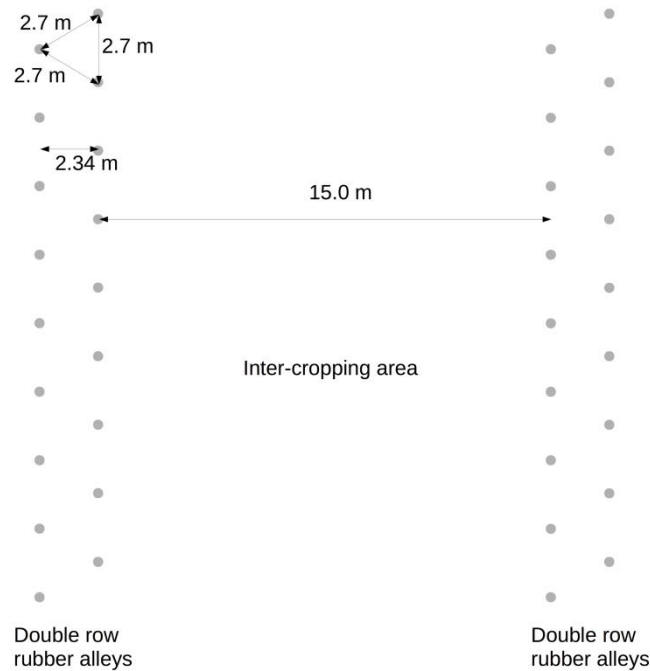
Figure 1. Diagram of rubber planting. Rubber should be planted in double row alleys with 15 m between alleys. In line planting is every 2.7 m and the gap between rows is 2.34 m. With rows offset this gives a minimum inter-tree distance of 2.7 m. This results in a planting density of 427 trees per hectare.

3.2   Early phase inter-cropping

During the first 3-4 years of growth the rubber is inter-cropped to provide a rapid return on the investment of preparing the land, weeding and fertilisation (Figure 2). These crops are phased out after 3-4 years when the rubber canopy closes and hence the light environment is no longer suitable. We will examine the viability of *Citronella*, Cassava, vegetables and Maize as early phase inter-crops. As mentioned above, a gap of 0.75 m should be left between the inter-crop and the rubber alley. If timber species are planted along with the rubber, a gap of 0.75 m between timber trees and inter-crop should be maintained (Figure 2b).
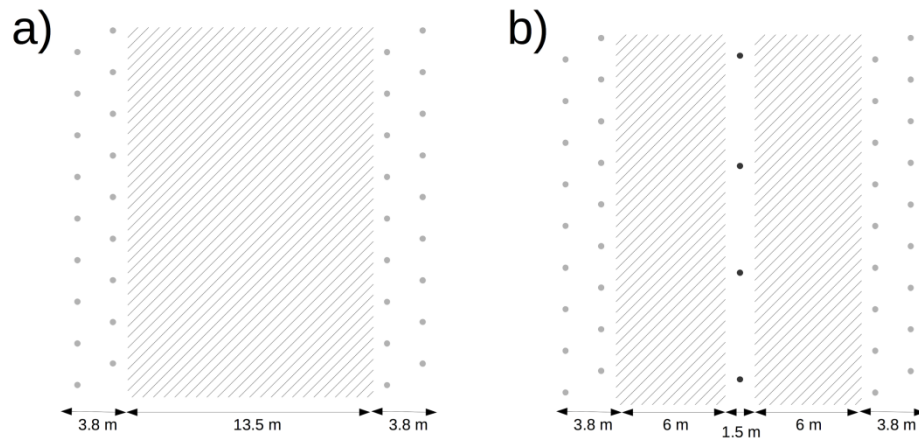
Figure 2. Inter-cropping annuals in the pre-canopy closure phase (a) without inter-crop trees and (b) with inter-crop trees (•). A gap of 0.75 m is left between the rubber or inter-crop trees and the crop to prevent competition. Crop area for (a) equals 7,785 m^2 per hectare (78%) and for (b) equals 6,920 m^2 per hectare (69%). If three rows of trees are grown the system would look like Figure 4b and the crop area would be 5,190 m^2 per hectare (52%).

3.3   Mature phase inter-cropping

During the mature phase rubber can be inter-cropped with a wide variety of perennial plants. Tree species are planted at the same time as rubber, whereas dense cover crops, such as gingers, palms or bamboos, are planted immediately following cessation of the early phase inter-cropping. We will develop three inter-crop systems (a) simple inter-cropping with 1-2 species designed to give a steady economic return, (b) complex inter-cropping with 6+ species, including both fast and slow growing timber species; and (c) enriched natural regeneration, where slower growing timber species and non-timber forest products are combined with natural regeneration.

(a) Simple inter-cropping

The inter-alley area is divided into three equal width strips of 4.5 m (Figure 3). The outer two stripes are planted with a shade tolerant species and the central strip with more light demanding species. Shade tolerant options, include Cardamom, *Gnetum*, Salak, Turmeric, *Robusta* coffee, Jerngang, Jengkol, Iles Iles, Kabau, bamboo and Jernang. These options are planted after the early phase inter-cropping is finished. Light demanding options are usually fruit trees, including Mangosteen, Mango, Durian, Pete and Gaharu. However, because of the risk of crop raiding by macaques, we recommend avoiding crops such as Mangosteen and Mango.

Inter-plant distances need to be selected that are appropriate to the crop. For fruit trees a 5 m spacing can be used as a rule-of-thumb. As with the early phase inter-cropping a 0.75 m minimum gap should be left between the inter-crop and rubber alleys. For large plants (e.g. salak or bamboo) a single strip should be planted.

(b) Complex inter-cropping

Three lines of trees are planted between the rubber alleys (Figure 4). The first and third lines are planted with fast growing pioneer species that are harvested early (7-10 years). The central line is planted with slow growing high value timber species. These grow up under the rubber canopy and are allowed to continue growing for 10-20 years after the rubber wood is harvested. Selection of appropriate slow growing species can provide a harvest of fruit (e.g. Durian) or NTFPs while the timber grows. A minimum of two pioneer species and four slow growing species should be planted. Timber species may also be combined with understorey crops, such as Cardamon or Tumeric.
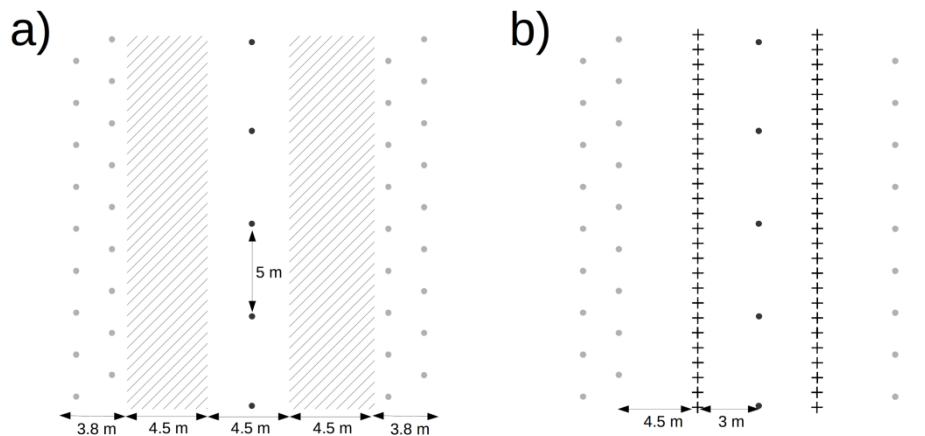
Figure 3. Mature phase simple inter-cropping with (a) shade tolerant crops (e.g. Cardamon) and fruit trees (•) and (b) understorey shrubs (+) (e.g. Salak or *Robusta* coffee) and fruit trees. In both fruit tree density is 115 per hectare. For (a) the crop area is 5,190 m^2 per hectare (52%). For (b) the length of the shrub lines is 1,153 m per hectare. In both systems different crops or shrubs can be grown on each side of the gap.

Separating fast growing and slow growing species to separate lines, enables line thinning of the fast growing species which will minimise damage to both rubber and slow growing timber species during harvesting. Suitable fast growing timber species include Jabon, Pulai, Kamiri and Gaharu. Suitable slow growing species include Durian hutan, Tenkawang, Kemenyang, Medang labu, Sendok sendok, Meranti bunga, Sangal, Jelutong, Balam merah, *Shorea pinanga*, *Shorea palembanica*, *Shorea stenoptera*, Keruing, Merbau, Petanang and Merawang.
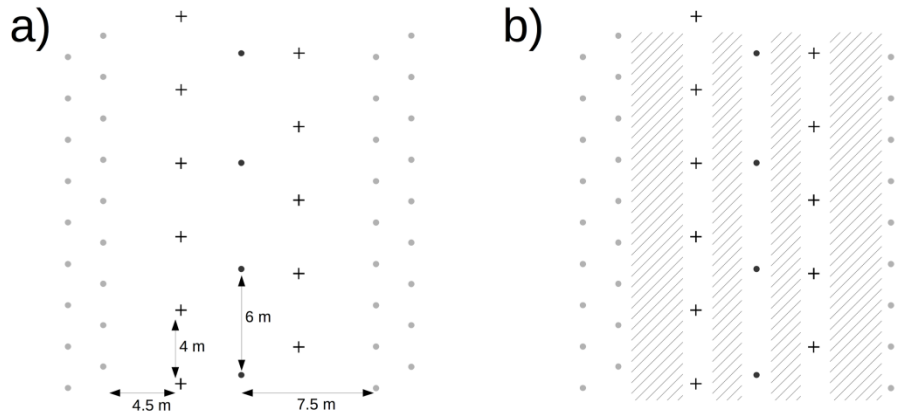
Figure 4. Mature phase complex inter-cropping. In (a) two lines of fast growing pioneers (+) are grown with a line of slow growing high value timber species (•). Different species of pioneer should be grown in each line and potentially harvested at different times (e.g. after 7 years and after 10 years). At least four species of slow growing high value timber species are grown in the central line. These are harvested 10-20 years after the rubber wood is harvested. In (b) the system is essentially the same but with a shade tolerant crop grown among the trees. In both (a) and (b) the density of each pioneer species is 144 trees per hectare and the combined density (all species) of high value timber species is 96 trees per hectare. The crop area in (b) is 5,190 m^2 per hectare (52%).

Cultivation of Gaharu has been attempted numerous times throughout SE Asia with limited success, because of high caterpillar infestations. However, observations suggest it can grow well with rubber and suffers lower pest infestations, possibly because of the shadier conditions. Nevertheless, we recommend planting Gaharu at relative low densities to reduce the risk of pest transmission. We suggest planting it as every 10th tree in the pioneer rows, which would result in a density of 30 trees per hectare.

(c) Enriched natural regeneration

In this system only a single line of slow growing high value timber species is planted between the rubber alleys (Figure 5). NTFPs such as Jernang may be planted and selection of the intercrop species may focus more on those providing NTFP resources, such as Durian hutan and Jelutong. At least one species should be favourable for encouraging seed dispersers, such as *Ficus varigata*. Six plus species are planted at the same time as the rubber. Following the termination of early phase inter-cropping, the area between the rubber alleys is allowed to regenerate naturally. After the harvest of the rubber wood the area may be assigned as conservation forest, or if revenue is required the slow growing timber species can be harvested after a further 10-20 years.
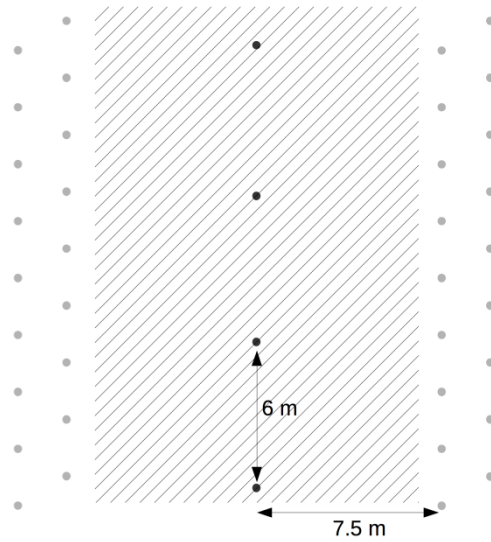
Figure 5. Rubber with enriched natural regeneration. A mixture of slow growing high value timber species and non-timber forest product species are grown in the centre of the of the gap. Once the trees are well established (e.g. after early phase inter-cropping) the gap is allowed to regenerate naturally. A gap of 0.75 m is maintained next to the rubber to reduce potential competition and facilitate tapping. The combined planted tree density is 96 trees per hectare and the regenerating area is 7,785 m^2 per hectare (78%).

Konsep dan Rencana Implementasi Agroforestri di Hutan Harapan

(drafted by Zelvin NH, Jomi S, Toto S, Mangara S, Sulaimon)

Source : Rhett H, Tom S

Draft 26 Oktober 2016

1.   BAB 1 PENDAHULUAN

1.1   1.1 Latar Belakang

Salah satu pilar dalam upaya restorasi ekosistem di Hutan Harapan adalah pengembangan sosial ekonomi masyarakat yang terintegrasi dalam rencana pengelolaan strategis Hutan Harapan. Agroforestri berbasis karet merupakan salah satu konsep yang dipandang dapat meningkatkan pendapatan masyarakat, disamping penyelamatan biodiversitas dan sesuai dengan kegiatan restorasi ekosistem.

Hutan Harapan memiliki luas areal 98.555 ha dimana 20%nya telah dimanfaatkan oleh masyarakat pendatang dan lokal untuk pengelolaan pertanian, kebun kelapa sawit, dan tanaman holtikultura. Masyarakat lokal (Batin Sembilan dan Melayu) telah menerapkan cocok tanam komoditas karet alam dengan kondisi secara turun-temurun. Berbagai alternatif pegembangan dan peningkatan produktivitas, namun produktivitas tetap berkurang.   Hal tersebut disebabkan oleh kurangnya pemeliharaan, pemilihan kualitas bibit yang baik, dan umur karet yang tidak produktif. Sementara itu para pendatang umumnya menerapkan sistem cocok tanam dengan monokultur dengan komoditas kelapa sawit, tanaman holtikultura, dan karet. Komoditas tersebut tidak sesuai dengan mandat pengelolaan restorasi ekosistem. Untuk itu salah satu upaya yang sesuai dengan kegiatan restorasi dan juga peningkatan ekonomi masyarakat dapat melalui pendekatan sistem agroforestri.

Agroforestri adalah sistem pengelolaan lahan berkelanjutan dan mampu meningkatkan produksi lahan secara keseluruhan, merupakan kombinasi produksi tanaman pertanian (termasuk tanaman tahunan) dengan tanaman hutan dan/atau hewan (ternak), baik secara bersama atau bergiliran, dilaksanakan pada satu bidang lahan dengan menerapkan teknik pengelolaan praktis yang sesuai dengan budaya masyarakat setempat.

Pengklasifikasian agroforestri yang paling umum, tetapi juga sekaligus yang paling mendasar adalah ditinjau dari komponen yang menyusunnya. Ditinjau dari komponennya agroforestri dapat diklasifikasikan sebagai berikut:

A. **Agrisilvikultur:** Agrisilvikultur adalah sistem agroforestri yang mengkombinasikan komponen kehutanan (atau tanaman berkayu/*woody plants*) dengan komponen pertanian (atau tanaman non-kayu)

B. **Sylvopastura:** Sistem agroforestri yang meliputi komponen kehutanan (atau tanaman berkayu) dengan komponen peternakan (atau binatang ternak/*pasture*)

C. **Agrosylvopastura:** Agrosilvopastura adalah pengkombinasian komponen berkayu (kehutanan) dengan pertanian (semusim) dan sekaligus peternakan/binatang pada unit manajemen lahan yang sama.

1.2   1.2 Tujuan

Tujuan dari pembuatan konsep agroforestri ini sebagai panduan teknis dalam mengembangkan kegiatan agroforestri di Hutan Harapan. Selain itu sehubungan dengan program Darwin Inisiatif dengan judul Investing in Agroforestry Options for Forest Restoration in Indonesia. Konsep ini dibuat berdasarkan diskusi dengan tim Darwin rogram, dan diskusi dengan masyarakat.

2.   BAB 2 KONSEP AGROFORESTRI

Berdasarkan diskus dengan tim Darwin (ICRAF, Universitas Kent, Universitas Edinburg, Burung Indonesia, PT REKI, RSPB, dan masyarakat) ada 4 model agroforestri yang akan dikembangkan di Hutan Harapan, yakni :

2.1 Monoculture

1 Jenis tanaman utama yaitu Karet. Diperbolehkan menanam tanaman-tanaman sisipan (jangka pendek) diantara tanaman karet tersebut. Jenisnya tergantung kebutuhan masyarakat, tapi direkomendasikan oleh pihak PT REKI juga sehingga komoditi yang ditanam mudah diterima pasar, tidak merusak konservasi tanah, dan bernilai ekonomis, diantaranya padi, umbi-umbian, sayuran, jagung, buah-buahan, kunyit, jahe, cabe, dan/atau kacang tanah.
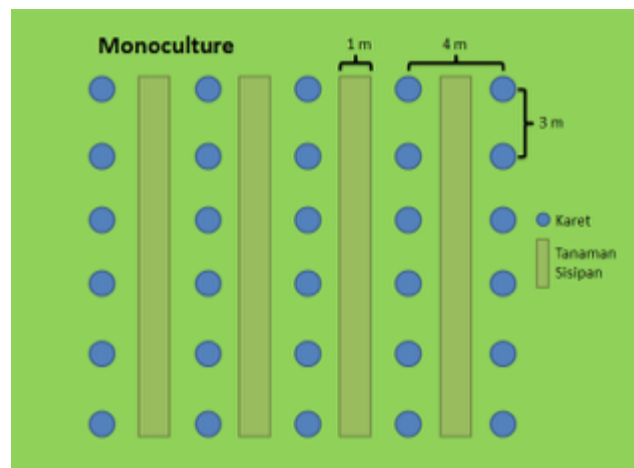
Gambar 1 Rencana pola tanam Monoculture

Produktivitas tanaman karet yang spektakuler dicapai setelah dihasilkan beberapa klon unggul baru selama tiga siklus periode seleksi. Penggunaanklon unggul baru dapat meningkatkan produktivitas menjadi 5 kali lipat lebih baik dari500 kg/ha/th dengan menggunakan tanaman semaian menjadi 2000 2500 kg/ha/thdengan pemakaian bahan tanam unggul baru (Azwar, 1998). Varietas karet yang diusulkan

adalah klon PB 260 Sembawa. PB 260 merupakan klon karet unggul penghasil getah yang dikeluarkan dari hasil penelitian badan penelitian tanaman karet Malaysia. PB sendiri merupakan singkatan dari Perang Besar yang merupakan nama salahsatu daerah di Malaysia.

2.1   2.2 Agroforestri sederhana

Agroforestri sederhana *(simple agroforestry)* merupakan pole tanam dengan menggunakan 2 jenis tanaman utama **(Karet dan jenis fast growing species seperti melinjo/jengkol/petai)**. Diperbolehkan menanam tanaman-tanaman sisipan (jangka pendek) diantara tanaman karet tersebut. Jenisnya tergantung kebutuhan masyarakat, tapi direkomendasikan oleh pihak REKI juga sehingga komoditi yang ditanam mudah diterima pasar, tidak merusak konservasi tanah, dan bernilai ekonomis, diantaranya padi, umbi-umbian, sayuran, jagung, buah-buahan, kunyit, jahe,cabe, dan/atau Kacang Tanah.
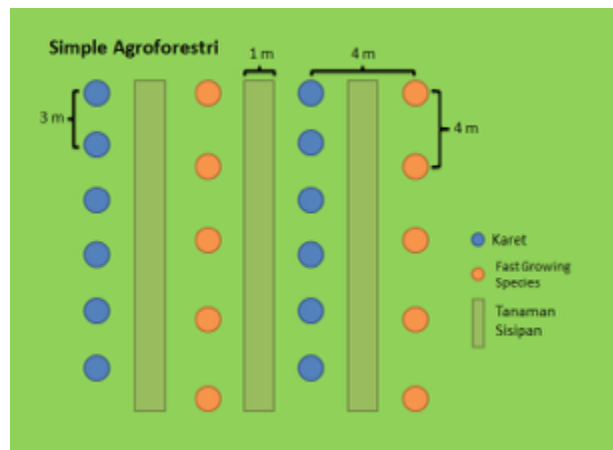
Gambar 2 Rencana pola tanam Simple Agroforestri

Jenis Petai dan Jengkol merupakan jenis asli Sumatera termasusk di Hutan Harapan. Oleh karena itu kedua jenis ini lebih direkomendasikan sebagai tanaman utamama mendampingi tanaman karet pada lahan *Agroforestri sederhana*. Tinggi pohon petai (*Parkia speciosa*) termasuk dalam famili Fabaceae. Tingginya dapat mencapai 20m, buahnya dapat diproduksi dan laku dipasaran. Buahnya dapat dikonsumsi langsung atau diolah menjadi berbagai macam makanan. Bahkan terdapat beberapa informasi menarik dari petai, contohnya Menurut riset dalam "The New England Journal of Medicine," makan pete sebagai bagian dari makanan sehari-hari akan menurunkan resiko kematian karena stroke sampai 40%.

Jengkol (*Archidendron jiringa*) tarmasuk dalam famili Fabaceae, juga merupakan jenis asli yang ada di Hutan Harapan. Pohonnya dapat tumbuh hingga 27 m. Sama halnya seperti petai, jengkol juga merupakan tanaman yang terkenal dan dapat dikonsumsi buahnya. Jengkol di Indonesia merupakan jenis yang sangat terkenal. Harganya di pasaran memang turun naik, namun peminat jengkol di Indonesia tidak pernah turun. Selain itu, pohon jengkol juga memiliki akar yang dalam sehingga mampu menyerap air tanah. Hal tersebut bermanfaat positif bagi konservasi air dan tanah. Pohon jengkol bisa

ditumbuhkan dari bijinya ataupun dengan cara cangkok. Tanaman jengkol yang ditanam melalui biji atau bibit akan mulai berbuah apabila telah berumur lima tahun atau lebih. Apabila pohon jengkol tumbuh melalui proses cangkok, maka jangka waktu berbuahnya akan jauh lebih pendek (Anonim, 2014).

2.3 Complex Agroforestry

Complex Agroforestry merupakan pola tanam menggunakan perpaduan antara jenis Karet, jenis pioneer dan slow growing species. Jenis pioneer yang direkomendasikan yaitu **gaharu, pulai, dan jabon**, sementara jenis slow growing species yang direkomendasikan adalah **Meranti bunga, Pinang, Durian-durian hutan, dan Tengkawang**. Diperbolehkan menanam tanaman-tanaman sisipan (jangka pendek) diantara tanaman karet tersebut. Jenisnya tergantung kebutuhan masyarakat, tapi direkomendasikan oleh pihak PT REKI juga sehingga komoditi yang ditanam mudah diterima pasar, tidak merusak konservasi tanah, dan bernilai ekonomis, diantaranya padi, umbi-umbian, sayuran, jagung, buah-buahan, kunyit, jahe, dan/atau Kacang Tanah
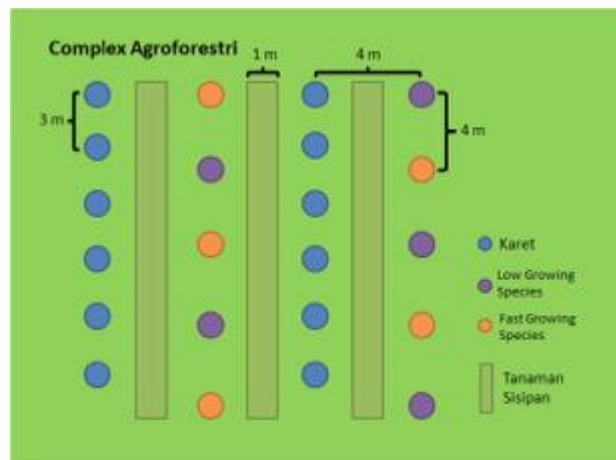
Gambar 3 Rencana pola tanam Complex Agroforestry

Fast Growing Species yang ditawarkan untuk Complex Agroforestri merupakan jenis-jenis yang kayunya bernilai ekonomi. Gaharu (*Aquilaria malacensis*) meupakan jenis yang hangat dibicarakan saat ini, pasalnya permintaan pasar baik untuk bibit ataupun produk gaharu selalu menunjukan progres. Tanaman gaharu tergolong ke dalam jenis tanaman yang mudah dibudidayakan karena dapat tumbuh pada tanah dengan jenis apapun. Tidak ada kriteria khusus jenis tanah yang dibutuhkan untuk budidaya yang satu ini. Semua jenis tanah dapat dijadikan lahan budidaya gaharu, asal bukan tanah yang terendam air seperti lumpur dan rawa.

Satu lagi tanaman yang diusulkan sebagai fast growing species yakni jabon (Neolamarckia cadamba). Jabon juga merupakan jenis asli yang tumbuh di HH. Jabon adalah tanaman kayu yang cepat tumbuh, Tanaman yang termasuk famili Rubiaceae ini tumbuh baik pada ketinggian 0 – 1000 mdpl. Pada umur 3 tahun tingginya dapat mencapai 9 M dengan diameter (garis tengah ingkar batang) 11 cm. Pada usia antara 5 dan 6 tahun lingkar batangnya bisa mencapai 150 cm (diameter 40 cm sampai 50 cm), diameter

pertumbuhan antara 5 cm sampai 10 cm/tahun. Di pasaran kayu jabon di gunakan untuk bahan dasar pulp, kayu lapis, kertas, furniture, dan lain-lain.

Jenis slow growing speces seperti Meranti bunga, Pinang, Durian hutan, dan Tengkawang merupakan jenis asli HH. Jenis-jenis tersebut dipilih karena memiliki nilai ekonomis yang tinggi untuk penjualan buah, kayu, bahkan getahnya (meranti menghasilkan damar). Contohnya meranti bunga (*Shorea leprosula*), Rataan riap diameter *Shorea leprosula* adalah 1,37 cm/tahun, sehingga kayu meranti dapat dipanen pada umur 30 tahun setelah ditanam. Jika riap diameter meranti mencapai 1,8-2,0 cm/tahun, maka kayu dapat dipanen pada umur 25 tahun. Meranti pada umumnya berbunga dan berbuah 4-7 tahun sekali yang disebut dengan musim berbuah masal. Dari data fenoologi HH, meranti bunga berbuah pada bulan Januari-Februari.

2.4 Natural Regeneration

Natural regeneration yaitu menggabungkan berbagai jenis tanaman karet dan jenis buah-buahan yang ada ditingkatkan kualitasnya, dan diperkaya dengan tanaman yang bernilai ekonomis. Diantaranya **Meranti bunga, Durian hutan, Tengkawang, Petai, Pinang, Jengkol, Jernang, Cempedak.** Model natural regeneration hampir mirip dengan pengayaan tanaman dalam hutan, hanya saja konteks utamanya untuk agroforesti.
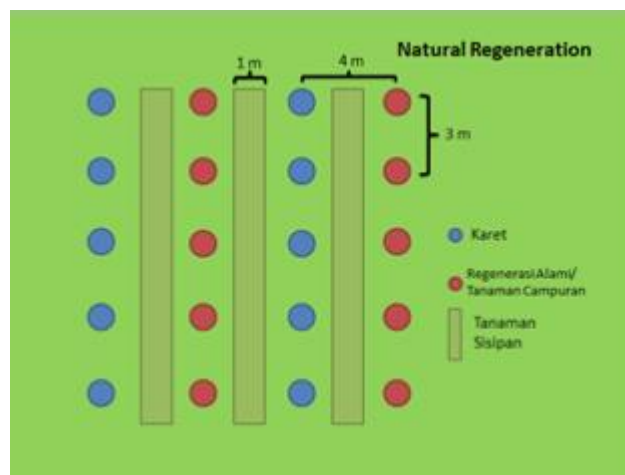
Gambar 4 Rencana pola tanam Natural Regeneration

Dalam tipe ini, tanaman utama yang disandingkan dengan karet merupakan jenis-jenis asli yang tumbuh di lokasi perencanaan penanaman agroforestri. Adapun penambahan tanamannya menggunakan berbagai tipe jenis baik itu *fast growing atau slow growing species*. Jenis-jenis tersebut dipandang bernilai ekonomi bagi masyarakat dan perusahaan. Terdapat satu jenis yang cukup menarik yang direkomendasikan, yakni cempedak (*Artocarpus integer*). Buah cempedak cukup laku dipasaran, aroma dan rasanya yang mirip buah nangka cukup disukai banyak orang. buahnya dapat dimakan langsung atau diolah menjadi berbagai macam makanan. Kayunya berkualitas baik, kuat dan awet, sehingga kerap digunakan sebagai kayu bangunan, bahan perabotan rumah, atau bahan perahu. Kulit kayunya yang berserat dapat digunakan sebagai bahan tali, dan getahnya untuk memukat burung. Dari kayunya juga

dapat dihasilkan bahan pewarna kuning. Artinya seluruh bagian dari jenis ini dapat dimanfatkan. Hal tersebut tentu menaikan nilai ekonomi yang bisa dihasilkan dari cempedak .

3.   BAB 3 UJI COBA 4 MODEL AGROFORESTRI

Model penggunaan areal minimal 10 ha untuk percobaan agroforestri adalah sebagai berikut:
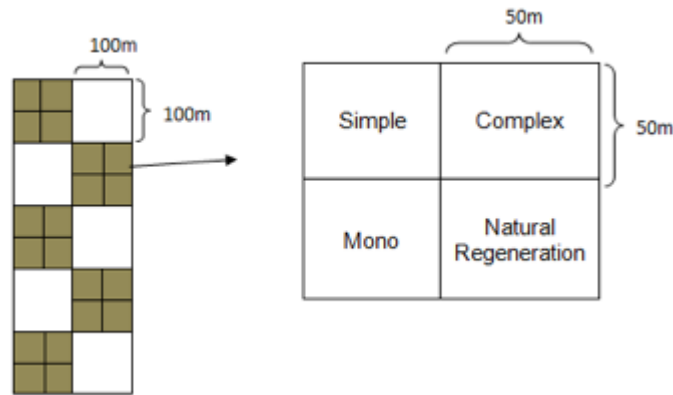
Gambar 5 Model percobaan agroforestri

Dan dari keseluruhan model agroforestry menjadi pilihan penerapan nantinya menitik beratkan pada fokus komodity Karet dan jenis kayu-kayu an serta buah yg berbasis kayu sebagai tanggung jawab restorasi disertai mendapatkan keuntungan dari hasil panen komodity tanam dan tentunya juga keuntungan bagi masyarakat dari profit sharing bekerjasama.

Alternatif lain dalam pengembangan konsep adalah menguji coba ke 4 konsep di atas ke beberpa kelompok masyarakat yang sudah mencapai kesepakatan pengelolaan ruang (Mitrazone, Simpang Macan luar, Tanding, Gelinding, dan kelompok Trimakno Kunangan Jaya 2).

4.   BAB 4 NILAI TAMBAH AGROFORESTRI

Agroforestri merupakan sistem tersendiri dan bukan sekedar campuran tanaman pertanian-kehutanan-peternakan. Keberhasilan pemapanan agroforestri tergantung pada ketepatan memilih bentuk dan menentukan sasaran menurut kebutuhan setempat dan ketergabungannya dengan kebiasaan petani setempat. Ini berarti bahwa agroforestri merupakan suatu penyelesaian suatu penyelesaian baik menurut tempat maupun waktu.

Agroforestri memiliki banyak manfaat baik secara ekonomi, ekologi dan sosial. Manfaat dan peranan agroforestri akan dibahas dalam poin-poin berikut :

4.1 Ekonomi

PT Reki akan berusaha melakukan proses nilai tambah pada setiap produk yang dihasilkan oleh masarakat dari kegiatan usaha secara agroforestri. Oleh sebab itu PT Reki akan mengembangkan teknologi pada proses budidaya/*on farm* maupun pasca panen/*off farm*, sedemikian rupa sehingga tercipta nilai tambah dari suatu produk agroforestri. Sebagai contoh:

Produk Karet

PT Reki akan melakukan peningkatan mutu dan kualitas produksi karet:

1. Perbaikan cara penyadapan karet, sehingga didapat getah karet/latex bersih
2. Penggunaan bahan kimia anti koagulan atau koagulan yang baik sehingga dihasilkan produk karet yang berkualitas tinggi
3. Pembangunan pabrik mini *rubber sheet* pada kelompok tani karet

Dari *latex* bersih akan diproses menjadi lembaran karet kering dengan harga lebih tinggi bila dibandingkan dengan *sleb*/bongkahan karet.

4.2 Ekologi

Peranan agroforestri terhadap sifat fisik tanah

Lapisan tanah atas adalah bagian yang paling cepat dan mudah terpengaruh oleh berbagai perubahan dan perlakuan. Kegiatan selama berlangsungnya proses alih-guna lahan segera mempengaruhi kondisi permukaan tanah. Penebangan hutan atau pepohonan mengakibatkan permukaan tanah menjadi terbuka, sehingga terkena sinar matahari dan pukulan air hujan secara langsung. Berbagai macam gangguan langsung juga menimpa permukaan tanah, seperti menahan beban akibat menjadi tumpuan lalu lintas kendaraan, binatang dan manusia dalam berbagai kegiatan seperti menebang dan mengangkut pohon, mengolah tanah, menanam dan seterusnya. Dampak langsung dari berbagai kegiatan tersebut adalah menurunnya porositas tanah yang ditandai oleh peningkatan nilai berat isi. Tanah (umumnya lapisan atas) menjadi mampat karena ruangan pori berkurang (terutama ruang pori yang berukuran besar). Berkurangnya ruangan pori makro mengakibatkan penurunan infiltrasi (laju masuknya air ke dalam tanah), penurunan kapasitas menahan air dan kemampuan tanah untuk melewatkan air (daya hantar air). Sistem agroforestri pada umumnya dapat mempertahankan sifat-sifat fisik lapisan tanah atas sebagaimana pada sistem hutan.

Sistem agroforestri mampumempertahankan sifat-sifat fisik tanah melalui:

- Menghasilkan seresah sehingga bisa menambahkan bahan organik tanah
- Meningkatkan kegiatan biologi tanah dan perakaran
- Mempertahankan dan meningkatkan ketersediaan air dalam lapisan

Peranan agroforestri terhadap kondisi hidrologi kawasan

Hidrologi berhubungan dengan tata air dan aliran air dalam suatu kawasan, misalnya hujan, penguapan, sungai, simpanan air tanah, dan sebagainya. Satuan kawasan yang sering dipergunakan untuk analisis

hidrologi adalah DAS atau daerah aliran sungai (*watershed, catchment*). Penggundulan hutan seringkali dituduh sebagai penyebab utama timbulnya masalah-masalah hidrologi seperti perubahan pola hujan, peningkatan limpasan permukaan dan banjir. Seringkali hubungan tersebut terlalu disederhanakan, sehingga orang beranggapan bahwa untuk memperbaiki kerusakan hutan dan fungsi hidrologi adalah dengan cara penghutanan kembali atau penghijauan.

Agroforestri memiliki beberapa persamaan dengan 'hutan alam' khususnya yang berkaitan dengan susunan vegetasi, pengaruh terhadap kondisi tanah dan kondisi bentang lahan seperti:

- Memelihara dan mempertahankan kualitas air
- Mengatur jumlah air dalam kawasan
- Menyeimbangkan jumlah air dan sedimentasi dalam kawasan DAS.

Peran Agroforestri dalam fungsi hidrologis kawasan meliputi:

Susunan vegetasi

Aspek terpenting dalam komponen vegetasi adalah susunan tajuk dari sistem agroforestri yang berlapis-lapis, jenis pohon dan tanaman bawah. Komposisi vegetasi ini terkait dengan peran dan fungsi terhadap evaporasi dan transpirasi, intersepsi hujan, dan iklim mikro. Dalam hal ini beberapa sistem agroforestri memiliki kemiripan dengan hutan.

Kondisi tanah

Aspek terpenting dalam komponen tanah adalah sifat fisik lapisan atas, kemampuan sistem agroforestri untuk mempertahankan kehidupan dan kegiatan makro-fauna, menjaga kemantapan dan kontinyuitas ruangan pori serta mendorong daya hantar air atau laju infiltrasi yang tinggi.

Bentang lahan

Aspek terpenting dalam kaitan dengan bentang lahan adalah menjaga kekasaran permukaan (relief semi-makro) sehingga dalam kawasan masih dipertahankan adanya cekungan dan saluran yang dapat menahan air sementara. Adanya cekungan-cekungan alami memberi manfaat ganda:

- Meningkatkan kapasitas menahan air sementara di permukaan tanah (*surface storage*), sehingga air ini tidak segera hilang mengalir di permukaan tetapi secara berangsur akan masuk ke dalam tanah walaupun hujan sudah berhenti.
- Menyaring sedimen yang terangkut dalam limpasan permukaan dengan jalan mengendapkannya pada saat air menggenang (sebagai filter) Pemahaman terhadap siklus hidrologi suatu kawasan dan fungsi serta peran setiap komponen hutan maupun agroforestri mengarahkan kita kepada pengetahuan yang benar akan fungsi hiduologi hutan dan agroforestri.

Peranan agroforestri dalam mengurangi gas rumah kaca dan mempertahankan cadangan karbon

Gas rumah kaca adalah gas-gas di atmosfer yang dapat menimbulkan perubahan dalam kesetimbangan radiasi sehingga mempengaruhi suhu atmosfer bumi. Gas-gas tersebut dinamakan Gas Rumah Kaca (GRK) karena kemampuannya dalam menyerap dan memantulkan kembali radiasi gelombang panjang yang bersifat panas seperti yang dilakukan oleh kaca, sehingga menimbulkan efek pemanasan yang disebut Efek Rumah Kaca (ERK).

Banyak hasil penelitian telah dilaporkan bahwa alih-guna lahan hutan menjadi lahan pertanian menurunkan cadangan karcon (C). Penurunan tersebut antara lain disebabkan oleh: (a) Hilangnya atau berkurangnya jumlah tegakan pohon per luasan; (b) Perbedaan komponen penyusun sistem penggunaan lahan yang baru; (c) Pengelolaan residu panen.

Salah satu tawaran untuk meningkatkan cadangan C terutama pada tanahtanah terdegradasi adalah melalui usaha Agroforestri, suatu sistem pertanian berbasis pepohonan yang bertujuan untuk meningkatkan pendapatan petani dan mempertahankan kelestarian alam. Bila ditinjau dari cadangan C, sistem agroforestri ini lebih menguntungkan daripada sistem pertanian berbasis tanaman semusim. Hal ini disebabkan oleh adanya pepohonan yang memiliki biomasa tinggi dan masukan seresah yang bermacam-macam kualitasnya dan terjadi secara terus menerus.

4.3 Sosial

Secara luas telah dipahami, bahwa tujuan utama pengembangan agroforestri baik secara umum ataupun di Indonesia adalah dalam rangka menekan degradasi hutan alam dan lingkungan hidup (aspek ekologi), serta upaya untuk memecahkan problema sosial-ekonomi masyarakat, dalam hal ini adalah masyarakat Bathin Sembilan.

Konsep agroforestri secara keseluruhan menempatkan manusia (masyarakat) sebagai subyek, yang secara aktif berupaya dengan daya dan kapasitas yang dimiliki untuk turut memecahkan permasalahan kebutuhan, menghadapi tantangan, dan memanfaatkan peluang kehidupan. Mengolah lahan beserta unsur lingkungan hayati dan non-hayati lainnya dari sekedar elemen alami menjadi sumber daya yang bernilai, bertujuan menjaga eksistensi dan meningkatkan taraf kehidupan pribadi, keluarga, dan komunitasnya. Beberapa aspek sosial-budaya yang langsung maupun tidak langsung dipengaruhi oleh agroforestri adalah:

A. Pelestarian Identitas Kultural Masyarakat

Hutan dan terutama pohon-pohonan memiliki keterkaitan erat dengan identitas kultural masyarakat. Apalagi kalau mau mempelajari lebih dalam mengenai asal-usul manusia dalam kepercayaan beberapa kelompok masyarakat lokal tradisional, maka kedua komponen tersebut tidak bisa dipisahkan begitu saja. Sehingga tidak mengherankan, bilamana masyarakat Dayak memberikan simbol hutan dengan burung rangkong (*hornbill*), yang merupakan bagian lambang budaya mereka yang tertinggi, dan dengan demikian sangat dihormati untuk tidak semena-mena dieksploitasi (Alqadrie, 1994).

Agroforestri berbasis hutan (*forest-based agroforestry*) sebagaimana pada sistem kebun hutan pada masyarakat tradisional (lihat *budidaya lembo* - Sardjono, 1990), juga banyak yang dibangun sekaligus dimaksudkan untuk mengamankan tempat-tempat yang 'dikeramatkan' atau 'dihormati', seperti makam-makam leluhur, dan bekas-bekas tempat yang tinggal bersama (rumah panjang). Di samping itu beberapa jenis pohon dan tanaman lainnya yang hadir pada kebun hutan juga memiliki nilai penting bagi keberlangsungan identitas kultural masyarakat. Beberapa contoh adalah pohon-pohon madu (*Koompasia spp*.) yang sekaligus juga berfungsi untuk melestarikan budaya lomba memanjat pohon di kalangan generasi muda pada beberapa kelompok masyarakat Dayak, pohon-pohon produksi yang sekaligus juga berkualitas baik untuk peti mati (misalnya durian/*Durio zibethinus*), jenis-jenis tanaman hias tetapi juga berfungsi untuk ritual (misalnya pinang/*Areca catechu*). *Forest-based agroforest* seperti *lembo* juga merupakan medan untuk melestarikan kegiatan tradisional masyarakat asli yaitu berburu satwa liar, terutama saat musim-musim buah besar.

Dari apa yang diuraikan di atas, dapat pula dikemukakan bahwa pemahaman akan nilai-nilai kultural dari suatu aktivitas produksi hingga peran berbagai jenis pohon atau tanaman lainnya di lingkungan masyarakat lokal amatlah penting dalam rangka keberhasilan pemilihan desain dan kombinasi jenis pada bentuk-bentuk agroforestri modern yang akan diperkenalkan atau dikembangkan di suatu tempat.

B. Kelembagaan Lokal

Salah satu ciri dari masyarakat tradisional adalah terdapatnya kelembagaan lokal yang mengatur kehidupan sehari-hari anggota komunitas di samping peraturan perundangan resmi yang dikeluarkan oleh pemerintah. Oleh karenanya tidak mengherankan bahwa pada banyak masyarakat asli atau masyarakat yang tinggal di wilayah-wilayah/desa-desa terpencil di Indonesia akan dikenal dua pimpinan, yaitu kepala desa (*village head*) yang mengurusi administratif pemerintahan serta kepala adat (*traditional leader*) yang lebih terkait dengan hubungan kehidupan antar warga sehari-hari, termasuk dalam hal pemanfaatan lahan seperti agroforestri. Keberlangsungan praktek agroforestri lokal tidak hanya melestarikan fungsi dari kepala adat, tetapi juga norma, sangsi, nilai, dan kepercayaan (yang keempatnya merupakan unsurunsur dari kelembagaan) tradisional yang berlaku di lingkungan suatu komunitas.

C. Pelestarian Pengetahuan Tradisional

Ketrampilan, serta (3) teknologi berbagai hal. Aspek pengetahuan tradisional amatlah penting dalam agroforestri, karena memang sistem penggunaan lahan ini berhubungan erat dengan kehidupan masyarakat pedesaan di Indonesian yang sebagian besar merupakan komunitas tradisional. Mengenai keterkaitan agroforestri dengan pengetahuan tradisional akan dibahas lebih detil dan secara khusus pada Bahan Ajaran 7. Akan tetapi dalam kesempatan ini hanya akan ditampilkan satu contoh peran agroforestri terkait dengan pelestarian pengetahuan tradisional mengenai pengobatan.

5.   BAB 5 RENCANA IMPLEMENTASI

5.1 Persiapan Lahan

Pengolahan tanah dalam usaha budidaya pertanian bertujuan untuk menciptakan keadaan tanah olah yang siap tanam baik secara fisis, kemis, maupun biologis, sehingga tanaman yang dibudidayakan akan tumbuh dengan baik. Lahan yang digunakan untuk membangun kebun karet dengan sistem agroferestry bisa berasal dari lahan bekas kebun karet tua, hutan sekunder, bawas muda/semak belukar atau lahan bekas alang-alang. Sejarah penggunaan lahan tersebut akan menentukan persiapan lahan yang harus dilakukan oleh masyarakat Batin Sembilan serta pengelolaan kebun selanjutnya.

A. Pembukaan Lahan

Pada dasarnya, penyiapan lahan untuk budidaya tanaman karet berbasis agroforestry bertujuan untuk memberi kondisi pertumbuhan yang baik bagi tanaman karet dan tanaman lain (slow growing, fast growing, dan tumbuhan pertanian). Selain itu persiapan lahan juga berfungsi untuk mengurangi sumber infeksi/inokulan yang menyebabkan penyakit. Sisa-sisa akar pohon, terutama bekas tanaman karet dan kayu bekas kebakaran, terlebih dahulu harus diangkat ke permukaan tanah agar terkena panas matahari dan dikeluarkan dari lahan yang akan ditanami.

Pembukaan lahan untuk pengembangan demplot tanaman kehidupan (livelihood) berbasis agroforestry dapat dilakukan dengan teknik tebas-tebang-bakar dan tebas-tebang-tanpa bakar. Pada umumnya, masyarakat Batin Sembilan sampai sekarang masih melakukan pembukaan lahan dengan teknik tebas-tebang-bakar. Namun dengan timbulnya berbagai isu lingkungan akibat pembakaran hutan maka pemerintah melarang pembukaan lahan dengan teknik tebas-tebang-bakar. Upaya yang dilakukan untuk mengganti teknik tebas-tebang-bakar adalah teknik tebas-tebang-tanpa bakar. Hal ini dilakukan untuk menghindari kerusakan lingkungan. Untuk pembukaan lahan ini akan dilakukan oleh masyarakat Batin Sembilan dan dibantu oleh PT. REKI.

B. Pengolahan tanah

Pengolahan tanah dilakukan di semua bagian lahan atau hanya di barisan atau jalur yang sudah dibersihkan. Pengolahan tanah dapat dilakukan dengan menggunakan cangkul dan atau parang untuk membolak-balikkan tanah dan membuat jalur tanam (guludan), menggemburkan tanah atau sekaligus membuat teras di barisan tanaman terutama kebun yang berada di lahan miring dan pembuatan lubang tanah. kegiatan dini dilaksanakan setelah lahan selesai dibersihkan. Kondisi lahan harus benar-benar bersih sebelum dilakukan perlakuan/diolah tanahnya. Lebar guludan adalah sepanjang 1 m untuk setiap tanaman selang. Panjang guludan tergantung dari bentuk kebun itu sendiri.

Jika lokasi pembuatan agroforestri memliliki topografi yang curam atau berbukit, maka dianjurkan untuk mebuat terasering. Tujuan pembuatan teras adalah untuk mengurangi kecepatan aliran permukaan (run off) dan memperbesar peresapan air, sehingga kehilangan tanah berkurang. Terdapat berbagai cara mekanik dalam menahan erosi air dan angin. Cara utama adalah dengan membentuk mulsa tanah dengan cara menyusun campuran dedaunan dan ranting pohon yang berjatuhan di atas tanah, dan membentuk penahan aliran air, misalnya dengan membentuk teras-teras di perbukitan (terasering) dan pertanian berkontur. Penanaman pada terasering dilakukan dengan membuat teras-teras untuk

mengurangi panjang lereng dan menahan atau memperkecil aliran permukaan agar air dapat meresap kedalam tanah.

C. Membuat Sistem Irigasi

Irigasi adalah sistem untuk mengairi suatu lahan dengan cara membendung sumber air. Atau bisa juga diartikan sebagai usaha penyediaan, pengaturan, dan pembuangan air untuk menunjang pertanian dan sejenisnya. Didunia pertanian ini tidak bisa dipungkiri bahwa fungsi dari irigasi ini sangatlah penting. Irigasi biasa dimanfaatkan oleh petani khususnya petani pada lahan persawahan untuk mengairi dan memberikan pasokan air di lahan pertanian mereka. Begitu pun dalam sistem agroforestri, perencanaan irigasi yang baik akan berpengaruh baik dalam hasil produksi dan keberhasilan partumbuhan tanaman, baik tanaman kehutanan maupun tanaman pertaniannya.

Sistem irigasi yang disarankan untuk agoforestri bathin sembilan ini adalah Irigasi Aliran, Sistem Manual, Sistem Sprinkler, dan Sistem Otomastis.

- **Irigasi Aliran** yaitu mengalirkan air secara gravitasi dari sumber air ketempat lahan pertanian. Sistem irigasi inilah yang sekarang digunakan oleh para petani untuk mengairi lahan pertaniannya.
- **Sistem Manual** memiliki prinsip kerjanya yaitu air dihisap dari sumber menggunakan mesin khusus lalu dialirkan melalui pipa menuju kebun. Nantinya ada pekerja yang akan menyiramkan selang air ini ke tanaman-tanaman sawit secara menyeluruh.
- **Sistem Sprinkler** yakni menggunakan alat penyiram khusus yang dinamakan sprinkler. Jadi air akan dihisap dari sumber air dan dialirkan melalui pipa induk. Dari pipa induk, air diteruskan ke beberapa pipa utama kemudian dialirkan lagi ke pipa distribusi yang ada di antara barisan tanaman. Berikutnya air akan diteruskan ke atas melalui pipa-pipa yang dipasang secara tegak setiap 2-3 meter. Dari pipa tegak inilah air bakal memancar keluar dan menyirami sekitarnya.
- **Sistem Otomatis** pada dasarnya mirip sekali dengan sistem sprinkler, perbedaan hanya terletak pada campur tangan manusia, di mana sistem otomatis berjalan sesuai rekayasa penyiraman air yang sudah dirancang sebelumnya. Walaupun biaya instalasinya cukup mahal, tetapi sistem ini akan mempermudah pekerja dalam merawat tanaman yang dibudidayakan.

5.2 Persiapan Bibit dan Benih

Dengan mengetahui dan memahami pemilihan benih, penyiapan persemaian, pengolahan tanah, cara semai, cara tanam yang baik, maka akan mendapatkan tanaman yang sehat, produktivitas yang tinggi dengan pembiayaan yang rendah. Tanaman yang sehat merupakan persyaratan utama yang harus dipenuhi agar produktivitas tinggi. Untuk itu, sejak awal tanaman harus di perlakukan sebaik mungkin, agar air dan hara dalam tanah yang tersedia dapat di manfaatkan maksimal.

A. Benih dan Bibit Bermutu/Varietas Unggul

Benih dan bibit bermutu merupakan salah satu komponen teknologi yang penting untuk meningkatkan produksi dan pendapatan usahatani juga agroforestri. Saat ini dapat diperoleh berbagai varietas unggul yang memiliki karakteristik sesuai dengan kondisi wilayah dan keinginan pasar. Varietas unggul

mempunyai keunggulan sepeti potensi hasil tinggi, tahan terhadap hama dan penyakit, toleran terhadap cekaman lingkungan. Dengan menggunakan benih bermutu/varietas unggul akan diperoleh bibit sehat, tegar (vigor tinggi) dengan perakaran banyak, bibit lebih cepat tumbuh dan bibit tumbuh seragam. Untuk benih pertanian, cara memilih benih yang baik dimana benih direndam dalam larutan ZA 20 gr/liter air, kemudia benih yang mengambang/mengapung dibuang.

B. Persiapan Persemaian

Karet dan Tanaman Kehutanan: Dalam persiapan bibit karet dan tanaman kehutanan ada 2 opsi yang bisa dilakukan:

- Pertama dengan melakukan perbenihan dan pembibitan sendiri di persemaian Hutan Harapan. Disini tanaman kehutanan memiliki sumber benih generatif yang baik, karena Hutan Harapan memiliki banyak pohon induk yang di tandai dan sering diambil regenerasi/anakan alamnya. sementara untuk karet bisa meembeli benih karet unggul dari berbagai jasa penjualan yang terpercaya. Perkecambahan dilakuakan dalam bedeng benih yang tersedia di persemaian Hutan Harapan.
- Opsi ke dua yakni membeli semua bibit baik itu karet ataupun tanaman kehutanan. Jumlah kebutuhan bibit yang banyak jika tidak disertai fasilitas dan SDM yang baik akan sulit dipantau kualitasnya, khususnya jika melakukan pembibitan sendiri. Antisipasinya adalah dengan membeli semua kebutuhan bibit yang akan di tanam (karet dan tanaman kehutanan). Pembelian bisa dilakukan di perodusen bibit yang terpercaya, lebih diutamakan di sekitar Jambi agar jarak tempuh tidak terlalu jauh dan tanaman terhindar dari stres selama dipindahkan.

Tanaman Pertanian: Buat bedengan dengan lebar 1 -1,2 m dan panjang disesuaikan dengan keperluan. Luas persemaian untuk 1 hektar lahan agroforestri adalah 200m² (2 % dari luas tanam), dan drainase harus baik. Tambahkan bahan organik seperti kompos, pupuk kandang, serbuk kayu dan sekam yang sudah melapuk/abu. Persemaian dilakukan 25 hari sebelum masa tanam, persemaian dilakukan pada lahan yang sama atau berdekatan dengan petakan kebun yang akan ditanami, hal ini dilakukan agar bibit yang sudah siap dipindah, waktu dicabut dan akan ditanam mudah diangkut dan tetap segar. Benih yang hendak disemai sebelumnya harus direndam terlebih dahulu secara sempurna sekitar 2 x 24 jam, dalam ember atau wadah lainnya. Hal ini dilakukan agar benih dapat mengisap air yang dibutuhkan untuk perkecambahannya.

5.3 Penanaman

Setelah persiapan lahan beres maka bibit pun siap ditanam. Penanaman karetdan tanaman kehutanan dilakukan pada awal musim penghujan yang secara umum dimulai pada bulan September, sehingga sebelum awal musim kemarau penanaman sudah selesai. Penanaman bibit karet dan tanaman lainnya akan dilakukan swadaya oleh masyarakat Batin Sembilan dan akan didampingi oleh PT. REKI dalam melakukan penanaman. Untuk awal, Luas lahan yang akan ditanam dengan tanaman karet dan tanaman lainnya di pengembangan demplot tanaman kehidupan adalah 2 Ha.

5.4 Perawatan

Dalam pengembangan tanaman kehidupan (livelihood) berbasis agroforestry hal yang penting untuk diperhatikan adalah melakukan perawatan, untuk menghindari tanaman dari penyakit dan gangguan hama lainnya seperti babi, monyet dll. Warring (jaring) akan dipasang di demplot tanaman kehidupan untuk mengantisipasi gangguan dari binatang terhadap tanaman. Perawatan tanaman akan dilakukan oleh masyarakat Batin Sembilan yang akan didampingi oleh tim PT. REKI (*Community Partnership* dan Reshut). Untuk pengawasan tanaman dari gangguan monyet, babi dan gangguan penyakit, masyarakat akan membuat pondok-pondok di areal demplot tanaman kehidupan sehingga bisa mengontrol gangguan terhadap tanaman tersebut setiap hari. Selain mengawasi tanaman dari gangguan hama dan penyakit, tanaman juga akan diberikan pupuk yang pembiayaannya adalah dari PT. REKI dan swadaya dari masyarakat, dan sebaiknya pupuk yang digunakan adalah pupuk kandang untuk menjaga kesuburun tanah.

A. Pemupukan

Tanah yang dibudidayakan cenderung kekurangan unsur hara bagi tanaman, oleh karena itu diperlukan penambahan unsur hara yang berasal dari pupuk organik maupun pupuk anorganik. Agar efektif dan efisien penggunaan pupuk disesuaikan dengan kebutuhan tanaman dan ketersediaan hara dalam tanah.

Untuk karet dan tanaman kehutanan pupuk yang dibutuhkan adalah pupuk kandang, urea, dan NPK. Penggunaan dan jangka waktu nya menyesuaikan dengan jenis yang akan ditanam.

B. Penyiangan (pengendalian gulma)

Terdapat dua cara pengendalian gulma tanaman yang direkomendasikan dalam pengelolaan agroforestri bersama masyarakat Bathin Sembilan. Diantaranya adalah :

- **Pengendalian gulma secara fisik (pengolahan tanah dan pembabatan)**
    - **Pengolahan tanah** menggunakan alat-alat seperti cangkul, garu, bajak, traktor yang berfungsi untuk memberantas gulma. Efektifitas alat-alat pengolah tanah di dalam memberantas gulma tergantung beberapa faktor seperti siklus hidup dari gulma, penyebaran akar, umur dan ukuran infestasi.
    - **Pembabatan** umumnya hanya efektif untuk mematikan gulma setahun dan relatif kurang efektif untuk gulma tahunan. Efektivitas cara ini tergantung pada waktu pemangkasan, interval (ulangan) Pembabatan sebaiknya dilakukan pada waktu gulma menjelang berbunga atau pada waktu daunnya sedang tumbuh dengan hebat.
- **Pengendalian gulma secara kimia**
    - Pengendalian gulma secara kimiawi adalah pengendalian gulma dengan menggunakan herbisida. Yang dimaksud dengan herbisida adalah senyawa kimia yang dapat digunakan untuk mematikan atau menekan pertumbuhan gulma, baik secara selektif maupun non selektif. Macam herbisida yang dipilih bisa kontak maupun sistemik, dan penggunaannya bisa pada saat pratanam, pratumbuh atau pasca tumbuh. Keuntungan pengendalian gulma secara kimiawi adalah cepat dan efektif, terutama untuk areal yang luas. Beberapa segi negatifnya ialah bahaya keracunan tanaman, mempunyai efek

residu terhadap pencemaran lingkungan. Sehubungan dengan sifatnya ini maka pengendalian gulma secara kimiawi ini harus merupakan pilihan terakhir apabila cara-cara pengendalian gulma lainnya tidak berhasil, khususnya untuk Hutan Harapan yang merupakan kawasan restorasi yang mengedepankan nilai-nilai konservasi kawasan.

5.5 Pemanenan

Panen akan dilakukan swadaya oleh masyarakat Batin Sembilan dan didampingi oleh PT. REKI, Warsi dan CAPPA. Dan untuk pemasaran akan difasilitasi/dibantu oleh PT. REKI. Hasil panen tanaman karet dan tanaman non karet (tanaman semusim dan tanaman non karet) dari demplot tanaman kehidupan, PT. REKI bisa membeli langsung dari masyarakat Batin Sembilan. Pembagian persentase (%) keuntungan dari hasil panen akan disepakati antara PT. REKI dengan masyarakat Batin Sembilan.

5.6 Pemasaran Agroforestri

PT Reki, akan membangun jaringan pemasaran sendiri pada setiap produk agroforestri, sehingga rantai pemasaran menjadi sangat pendek, yaitu produk dari petani dibeli oleh PT Reki kemudian dijual ke konsumen akhir/Pengecer ke konsumen langsung. PT Reki harus memiliki kebijaksanaan dan mampu menerapkan jaminan pembelian pada petani dengan memberikan harga pasar bahkan diusahakan dengan harga yang lebih tinggi dari pasar.

5.7 Pola Kerjasama dan Kesepakatan Dengan Masyarakat

Terdapat beberapa tahapan kerjasama dalam rencana pembentukan Agroforestri bersama masyarakat (Bathin Sembilan). Tahapan yang dibuat nantinya akan menjadi acuan dalam pengembangan pola kerjasama bersama masyarakat Bathon Sembilan. Rencana pola kerja sama yang dibuat adalah sebagai berikut:

- **Kesepakatan**

Kesepakatan dibuat bersama masyarakat untuk menentukan lokasi lahan dan luas lahan yang akan dijadikan agroforestry. Persiapan untuk pembukaan lahan dan penanaman juga disepakati dengan masyarakat. Kesepakatan dibuat tertulis dan dituangkan dalam berita acara yang ditandatangani antara PT. REKI dengan masyarakat.

- **Persiapan pembukaan lahan**

Persiapan didiskusikan dan disepakati bersama masyarakat untuk pembukaan lahan untuk agroforestry. Lahan yang akan digunakan untuk membangun kebun karet dengan sistem agroferestry dapat berasal dari lahan bekas kebun karet tua, hutan sekunder, bawas muda/semak belukar atau lahan bekas alang-alang.

- **Penyediaan bibit**

Pada sistem agroforestry, selain bibit tanaman karet juga perlu dipersiapan bibit tanaman non-karet yang akan ditanam bersama dengan tanaman karet. Bibit tanaman non-karet dapat berupa tanaman semusim dan pohon non-karet (pohon buah-buahan, pohon penghasil kayu atau resin). Pemilihan jenis tanaman non-karet yang akan digunakan sebagai tanaman sela didasarkan pada kesesuaian lahan,

tujuan penanaman dan kesesuaian tanaman bila ditanam bersama dengan karet. Selain itu juga menanam Jenis tanaman semusim yaitu padi, jagung, kacang-kacangan, cabe dan sayur-sayuran. Tanaman semusim ini dapat ditanam bersamaan dengan karet selama dua sampai tiga tahun setelah karet ditanam. Untuk penyediaan bibit karet bisa disiapkan oleh PT. REKI dan untuk tanaman palawija disiapkan oleh masyarakat.

- **Penanaman**

Penanaman karet dilakukan pada awal musim penghujan yang secara umum dimulai pada bulan September, sehingga sebelum awal musim kemarau penanaman sudah selesai. Penanaman dilakukan swadaya oleh masyarakat dan didampingi oleh PT. REKI. Jenis tanaman dan jarak antar tanaman disepakati dengan masyarakat.

- **Pemeliharaan**

Pemeliharaan dilakukan oleh masyarakat dengan dibantu dan didampingi oleh PT. REKI. Pemeliharaan dan kontrol terhadap tanaman yang sudah ditanam akan dilakukan setiap hari, dengan mendirikan pondok disekitar lahan yang sudah ditanam dengan tanaman.

6. BAB 6 Penutup

Agroforesty merupakan suatu sistem penggunaan lahan terpadu, yang memiliki aspek sosial dan ekologi, dilaksanan melalui pengkombinasian pepohonan dengan tanaman pertanian dan/atau ternak (hewan) baik secara bersama-sama atau bergiliran, sehingga dari satu unit lahan tercapai hasil total nabati atau hewan yang optimal dalam arti berkesinanmbungan. Secara umum agroforestri berfungsi protektif dan produktif. Melihat komposisinya yang beragam, maka agroforestri memiliki fungsi dan peran yang lebih dekat kepada hutan dibandingkan dengan pertanian, perkebunan, lahan kosong atau terlantar. Sampai batas tertentu agroforestri memiliki beberapa fungsi dan peran yang menyerupai hutan baik dalam aspek biofisik, lingkungan,sosial maupun ekonomi. Agroforestri merupakan salah satu sistem penggunaan lahan yang diyakini oleh banyak orang dapat mempertahankan hasil pertanian secara berkelanjutan. Harapannya dengan dibentuk agroforestri ini dapat menjadi sebuah awal kerjasama yang baik dengan masyarakat hutan, serta menjadi solusi ekonomi untuk masyarakat hutan, dalam hal ini adalah masyarakat Batin Sembilan. Pengelolaan terpadu yang mengedepankan kerjsama akan menjadi ikatan baik yang terjalin antara PT REKI dan masyarakat Batin Sembilan.

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Annex 6: Standard Operating Procedure for Rubber Agroforestry at Hutan Harapan (Draft)

PT Restorasi Ekosistem Indonesia	**HARAPAN RAINFOREST** **PT. RESTORASI EKOSISTEM INDONESIA**	HUTAN HARAPAN

SOP NO. .../REKI/SML/CP/II/V/2017		
JUDUL	**STANDAR OPERASIONAL PROSEDUR** **PENGEMBANGAN AGROFORESTRY DI HUTAN HARAPAN**	
TGL DITERBITKAN	1 Maret 2017	TGL REVISI TERAKHIR
DI SAHKAN	DISIAPKAN OLEH: **Syahbarul A Munthe** Supervisor Agrofoestry	PERSETUJUAN HOD PT. REKI **ADAM AZIZ** Head Of Departement Strategic Partnership

1. Daftar revisi

No	Bagian/Halaman	Uraian Revisi	Tanggal Revisi

2.

3. Peringatan

Dokumen ini dalam pengendalian PT .REKI. Tidak dibenarkan untuk mengubah, memperbanyak, memiliki dan/atau tindakan sejenis tanpa mendapatkan ijin PT . REKI. Dokumen yang sah adalah

dokumen yang ditandatangani oleh pimpinan Unit Manajemen dan diberikan stempel pengesahan oleh PT. REKI

I.0. TUJUAN	1. Sebagai acuan dan panduan teknis dalam mengembangkan **Agroforestry** di Hutan Harapan untuk meningkatkan perekonomian masyarakat di Hutan Harapan yang telah melakukan proses MoU dengan PT. REKI.
	2. Implementasi tanggung jawab sosial perusahaan terhadap masyarakat sesuai dengan amanat program pemertintah tentang Perhutanan Sosial.
	3. Menerapkan salah satu butir pejanjian kerjasama (MoU) antara PT. REKI dengan masyarakat dalam kawasan konsesi restorasi Hutan Harapan.
	4. Merealisasikan program Departemen Kemitraan Masyarakat PT. REKI
2.0. DEFINISI	**Agroforestry** adalah sistem pengelolaan lahan berkelanjutan dan mampu meningkatkan produksi lahan secara keseluruhan, merupakan kombinasi produksi tanaman pertanian (termasuk tanaman tahunan) dengan tanaman hutan dan/atau hewan (ternak), baik secara bersama atau bergiliran, dilaksanakan pada satu bidang lahan dengan menerapkan teknik pengelolaan praktis yang sesuai dengan budaya masyarakat setempat.
	Perhutanan Sosial adalah sistem pengelolaan hutan lestari yang dilaksanakan dalam kawasan hutan negara atau hutan hak/hutan adat yang dilaksanakan oleh masyarakat setempat atau masyarakat hukum adat sebagai pelaku utama untuk meningkatkan kesejahteraannya, keseimbangan lingkungan, dan dinamika sosial budaya dalam bentuk kemitraan kehutanan.
	Kemitraan Kehutanan adalah kerjasama antara masyarakat setempat dengan pengelola hutan, pemegang izin usaha, pemanfaatan hutan/ jasa hutan, izin pinjam pakai kawasan hutan, atau pemegang izin usaha industri primer hasil hutan.
	Perusahaan adalah PT. Restorasi Ekosistem Indonesia
	Departemen Kemitraan adalah Departement yang ada di lingkup manajemen PT. REKI yang dipimpin oleh Kepala Departement dan memiliki beberapa orang staff dibawah posisinya yang mempunyai peran dan tugas mengembangkan dan mengimplementasikan program perhutanan sosial, pengembangan bisnis, ekowisata termasuk juga mendorong program penyelesaian konflik lahan di kawasan restorasi ekosistem.

	Kelompok Tani Hutan adalah Kelompok Tani Hutan (KTH) adalah kumpulan petani atau perorangan warga negara Indonesia beserta keluarganya yang mengelola usaha di bidang kehutanan di dalam dan diluar kawasan hutan yang meliputi usaha hasil hutan kayu, hasil hutan bukan kayu dan jasa lingkungan, baik di hulu maupun di hilir.
3.0 RUANG LINGKUP	**Ruang Lingkup Agroforestry adalah :** 1. *Agrisilvikultur* (kehutanan dan pertanian). 2. *Agropastura* (pertanian dan peternakan). 3. *Silvopastura* (kehutanan dan peternakan) 4. *Agrosilvopastura* (pertanian, kehutanan, dan peternakan). 5. *silvofishery* (kehutanan dan perikanan) 6. *apiculture* (budidaya lebah yang dihasilkan dalam kegiatan atau komponen kehutanan). 7. *Serikulture* (pohon dan ulat sutera).

4.0 REFERENSI	1. Undang-undang Nomor 41 Tahun 1999 tentang Kehutanan
	2. Undang-Undang Nomor 32 Tahun 2009 tentang Perlindungan dan Pengelolaan Lingkungan Hidup.
	3. Undang-Undang Nomor 18 Tahun 2004 tentang Perkebunan.
	4. Undang-undang Nomor 39 Tahun 2014 Tentang Perkebunan
	5. Peraturan Pemerintah No.6 tahun 2017 jo. PP No.. 3 Tahun 2008 tentang Tata Hutan Dan Penyusunan Rencana Pengelolaan Hutan, Serta Pemanfaatan hutan.
	6. Peraturan Menteri Negara Lingkungan Hidup Nomor 10 Tahun 2010 tentang Mekanisme Pencegahan Pencemaran dan/atau Kerusakan Lingkungan Hidup yang Berkaitan dengan Kebakaran Hutan dan/atau Lahan.
	7. PermenLHK P. 83 Tahun 2016 Tentang Perhutanan Sosial
	8. Surat Keputusan Menteri Kehutanan Nomor : 293/Menhut-II/2007 dan 327/Menhut-II/2010 tentang IUPHHK-RE an. PT. Restorasi Ekosistem Indonesia, wilayah Provinsi Sumatra Selatan dan Provinsi Jambi
5.0 Model Agroforestry	**1. Monoculture** adalah Mengembangkan satu Jenis tanaman utama yaitu Karet. Diperbolehkan menanam tanaman-tanaman sisipan (jangka pendek) diantara tanaman karet tersebut. Jenisnya tergantung kebutuhan masyarakat, tapi direkomendasikan oleh pihak REKI juga sehingga komoditi yang ditanam mudah diterima pasar, tidak merusak konservasi tanah, dan bernilai ekonomis, diantaranya padi, umbi-umbian, sayuran, jagung, buah-buahan, kunyit, jahe, cabe, dan/atau Kacang Tanah.
	Jarak penanaman karet yakni 5 x 7 m, untuk pola tanam agroforestri jarak ini cukup ideal khususnya untuk karet yang memerlukan asupan hara yang baik. Dengan jarak tanam ini maka setiap hektar membutuhkan bibit karet sebanyak 286 bibit. Sementara untuk jalur tanaman sisipan/palawija memiliki lebar 3 m setiap jalurnya, artinya memiliki jarak 2 m kiri dan kanan dari tanaman karet.
	2. Simple Agroforestry adalah menggunakan 2 jenis tanaman utama (Karet dan jenis fast growing species seperti melinjo/jengkol/petai). Diperbolehkan menanam tanaman-tanaman sisipan (jangka pendek) diantara tanaman karet tersebut. Jenisnya tergantung kebutuhan masyarakat, tapi direkomendasikan oleh pihak REKI juga sehingga komoditi yang ditanam mudah diterima pasar, tidak merusak konservasi tanah, dan bernilai ekonomis, diantaranya padi, umbi-umbian, sayuran, jagung, buah-buahan, kunyit, jahe,cabe, dan/atau Kacang Tanah.
	Pola penanaman Simple Agroforestri memiliki jarak tanam 5 x 5 m untuk setiap pohonnya. Jenis tanaman dibagi menjadi 2 yakni karet dan fast growing species. Dengan jarak tanam tersebut bibit yang dibutuhkan sebanyak 400 bibit setiap hektar, artinya dibutuhkan masing-masing 200 bibit untuk jenis karet dan fast growing species. Lebar dari penanaman

	tanaman sisipan yakni 2 m, artinya jarak dari tanaman utama yaitu 1,5 m. 3. **Complex Agroforestry** adalah menggunakan perpaduan antara jenis Karet, jenis pioneer dan slow growing species. Jenis pioneer yang direkomendasikan yaitu gaharu, pulai, dan jabon, sementara jenis slow growing species yang direkomendasikan adalah Meranti bunga, Pinang, Durian-Durian hutan, dan Tengkawang. Diperbolehkan menanam tanaman-tanaman sisipan (jangka pendek) diantara tanaman karet tersebut. Jenisnya tergantung kebutuhan masyarakat, tapi direkomendasikan oleh pihak REKI juga sehingga komoditi yang ditanam mudah diterima pasar, tidak merusak konservasi tanah, dan bernilai ekonomis, diantaranya padi, umbi-umbian, sayuran, jagung, buah-buahan, kunyit, jahe, dan/atau Kacang Tanah. 4. **Natural Regeneration** adalah menggabungkan berbagai jenis tanaman karet dan jenis buah-buahan yang ada ditingkatkan kualitasnya, dan diperkaya dengan tanaman yang bernilai ekonomis. Diantaranya Meranti bunga, Durian hutan, Tengkawang, Petai, Pinang, Jengkol, Jernang, Cempedak. Model natural regeneration hampir mirip dengan pengayaan tanaman dalam hutan, hanya saja konteks utamanya untuk agroforesti. Natural Regeneration memiliki jarak tanam yang sama dengan simple dan complex agroforestri, lebar jalur penanaman tanaman sisipan/palawija pun sama. Jarak penanaman pohon yaitu 5 x 5 m, dengan kebutuhan total bibit per hektar yakni 400 bibit. Jumlah tersebut diantaranya 200 bibit karet, dan 200 bibit bermacam jenis asli dan bernilai ekonomi.

6.0. TUGAS DAN TANGUNG JAWAB	1. Head of Strategig Parthersihip
	
	    a. Memastikan terpenuhinya kewajiban sebagaimana tercantum pada SK Menteri Kehutanan.
	    b. Memastikan rencana program berlandaskan kepada Rencana Kerja Umum dan Rencana Kerja Tahunan
	    c. Memastikan adanya pembiayaan untuk kegiatan agroforestry.
	    d. Memastikan kegiatan agroforestry tercapai sesuai dengan konsep dan SOP
	    e. Melaporkan perkembangan ke DOO
	
	2. Manager Kemitraan
	
	    a. Memastikan pengembangan agroforestry sesuai dengan arahan HoD
	    b. Mengkordinasikan pelaksanaan kegiatan agroforestry kepada manajemen Hutan Harapan.
	    c. Mereview budget kegiatan agroforestry.
	    d. Melakukan monitoring dan evaluasi pekerjaan supervisor.
	    e. Melaporkan perkembangan kegiatan agroforestry ke HoD

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3. Supervisor Agroforestry
   a. Merancang program dan pentahapan program agroforestry untuk mencapai tujuan berdasarkan SOP.
   b. Melakukan evaluasi tahunan terhadap pelaksanaan program agroforestry.
   c. Melakukan sosialisasi konsep dan model agroforesty yang akan dikembangkan di Hutan Harapan.
   d. Melakukan Sosialisasi pola kemitraan yang akan dibangun anatara PT. REKI dan kelompok masyarakat yang sudah ber MoU.
   e. Memastikan penanaman dan pengembangan agroforestry serta melakukan Monitoring dan Evaluasi secara berkala.
   f. Melaporkan perkembangan kegiatan agroforestry ke Manager Kemitraan.

4. Fasilitator (Community Organizer)
   a. Melakukan Fasilitasi dan Pendampingan.
   b. Mengawal secara intensif perjalanan program agroforestry di Lapangan.
   c. Bekerjasama dengan masyarakat lokal dalam mengelola kegiatan agroforesty di komunitas masyarakat.
   d. Melaporkan perkembangan kegiatan agroforestry ke Supervisor.

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7.0 PROSEDUR	Proses pelaksanaan kegiatan :
	1.Kerjasama Masyarakat
	Tahapan rencana pola kerja sama yang dibuat adalah sebagai berikut: **1.1 Kesepakatan**
	Kesepakatan dibuat bersama masyarakat dengan PT. REKI untuk :
	• **Menentukan lokasi lahan dan luas lahan** yang akan dijadikan agroforestry. Persiapan untuk pembukaan lahan dan penanaman juga disepakati dengan masyarakat serta sistem bagi hasil antara masyarakat dengan PT. REKI. Kesepakatan dibuat tertulis dan dituangkan dalam berita acara yang ditandatangani antara PT. REKI dengan masyarakat yang tergabung dalam Kelompok Tani Hutan.
	• **Persiapan pembukaan lahan** Persiapan didiskusikan dan disepakati bersama masyarakat untuk pembukaan lahan untuk agroforestry. Lahan yang akan digunakan untuk membangun kebun karet dengan sistem agroferestry dapat berasal dari lahan bekas kebun karet tua, hutan sekunder, bawas muda/semak belukar atau lahan bekas alang-alang.
	• **Penyediaan bibit/benih** Pada sistem agroforestry, selain bibit/benih tanaman karet juga perlu dipersiapan bibit/benih tanaman non-karet yang akan ditanam bersama dengan tanaman karet. Bibit/benih tanaman non-karet dapat berupa tanaman semusim dan pohon non-karet (pohon buah-buahan, pohon penghasil kayu atau resin). Pemilihan jenis tanaman non-karet yang akan digunakan sebagai tanaman sela didasarkan pada kesesuaian lahan, tujuan penanaman dan kesesuaian tanaman bila ditanam bersama dengan karet. Selain itu juga menanam Jenis tanaman semusim yaitu padi, jagung, kacang-kacangan, cabe dan sayur-sayuran. Tanaman semusim ini dapat ditanam bersamaan dengan karet selama dua sampai tiga tahun setelah karet ditanam. Untuk penyediaan bibit karet bisa disiapkan oleh PT. REKI dan untuk tanaman palawija disiapkan oleh masyarakat.
	• **Penanaman** Penanaman karet dilakukan pada awal musim penghujan yang secara umum dimulai pada bulan September, sehingga sebelum awal musim kemarau penanaman sudah selesai. Penanaman dilakukan swadaya oleh masyarakat dan didampingi oleh PT. REKI. Jenis tanaman dan jarak antar tanaman disepakati dengan masyarakat.
	• **Pemeliharaan**

Pemeliharaan dilakukan oleh masyarakat dengan dibantu dan didampingi oleh PT. REKI. Pemeliharaan dan kontrol terhadap tanaman yang sudah ditanam akan dilakukan setiap hari, dengan mendirikan pondok disekitar lahan yang sudah ditanam dengan tanaman.

- **Sistem Bagi Hasil**

  Sistem bagi hasil dilakukan antara masyarakat dan PT. REKI berdasarkan kesepakatan bersama. Kesepakatan dibuat tertulis dituangkan dalam berita acara yang di tandatangani oleh PT. REKI dan masyarakat yang tergabung dalam Kelompok Tani Hutan.

2. Persiapan bibit dan benih

Sumber bibit alami
Bibit diperoleh berbagai varietas unggul yang memiliki karakteristik sesuai dengan kondisi wilayah dan keinginan pasar. Varietas unggul mempunyai keunggulan seperti potensi hasil tinggi, tahan terhadap hama dan penyakit, toleran terhadap cekaman lingkungan. Dengan menggunakan benih bermutu/varietas unggul akan diperoleh bibit sehat, tegar (vigor tinggi) dengan perakaran banyak, bibit lebih cepat tumbuh dan bibit tumbuh seragam.

1. Untuk benih pertanian (Padi Gogo), cara memilih benih yang baik dimana benih direndam dalam larutan ZA 20 gr/liter air, kemudia benih yang mengambang/mengapung dibuang atau menggunakan larutan garam dimana telur bebek sebagai indikator jika telur bebek dimasukkan kedalam larutan garam mengapung larutan tersebut bisa di gunakan untuk menyeleksi benih padi yang mengambang/mengapung dibuang.Selanjutnya ditiriskan dan di kering anginkan lalu dapat langsung di tanam dengan cara penugalan pada lokasi tanaman.

2. Untuk bibit pertanian (Ubi Kayu) : Gunakan varietas unggul yang mempunyai potensi hasil tinggi, disukai konsumen, dan sesuai untuk daerah penanaman. Sebaiknya varietas unggul yang dibudidayakan memiliki sifat toleran kekeringan, toleran lahan pH rendah dan/atau tinggi, toleran keracunan Al, dan efektif memanfaatkan hara P yang terikat oleh Al dan Ca. Ubi Kayu berasal dari tanaman induk yang cukup tua (10-12 bulan). Ubi Kayu harus dengan pertumbuhannya yang normal dan sehat serta seragam, batang telah berkayu dan berdiameter ± 2,5 cm lurus, belum tumbuh tunas-tunas baru. Selanjutnya sebelum di tanam ke lokasi bibit di beri perlakuan dicelup beberapa detik bibit ke dalam air yang telah di campur obat pestisida starban untuk

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membunuh hama yang barangkali ada menempel di batang bibit. bisa juga di dalam air di tambahkan pupuk gandasil B atau dicelup dalam larutan Pupuk Organik Cair multi guna.

3. Untuk benih pertanian (Jagung) : Benih dengan kualitas (hibrida maupun komposit) yang prima (daya tumbuh dan Vigornya cukup tinggi) diperlukan untuk memacu keseragaman dan kecepatan pertumbuhan. Benih dengan kualitas fisiologi yang tinggi (daya tumbuh minimal 90%) juga lebih toleran pada kondisi lingkungan tumbuh yang kurang optimal dibanding benih dengan kualitas fisiologi yang lebih rendah, serta lebih efektif memanfaatkan pupuk dan hara lain yang ada di dalam tanah. Pada lingkungan pertumbuhan yang sama dengan menipulasi hara yang sama, benih dengan vigor yang tinggi akan tumbuh lebih baik dibanding dengan pertumbuhan tanaman dari benih yang kurang vigor.

4. Benih Karet

- Untuk Benih karet kita lakukan seleksi benih dengan memisah kan benih yang kecil, sedang dan besar dan sebaiknya digunakan yang sedang dan yang besar lalu benih dimasukan dalam karung dan direndam pada air yang mengalir selama 4 hari selanjutnya benih di tiriskan dan di kering anginkan selanjutnya didederkan pada media yang lembab dan tidak terkena sinar mata hari langsung untuk mempermudah proses perkecambahan.
- Bedengan pendederan diberi pasir atau serbuk gergaji, dan diberi naungan. Benih dapat didederkan dengan cara berjajar dengan jarak antar biji satu cm atau ditebar dengan posisi biji tengkurap.
- Benih yang telah di dederkan akan berkecambah dengan kondisi terbaik 5 – 14 hari.
- Pencabutan kecambah dilakukan secara hati-hati agar tidak merusak bakal akar dan pemindahan kecambah ke polybag sebaiknya di lakukan pada pagi atau sore hari.
- Dilakukan perawatan dan pemeliharan di pembibitan karet dengan kegiatan penyiraman (pagi dan sore hari) penyulaman bibibit yang mati di bawah umur sebulan, pemupukan dengan interval 1x sebulan dengan menggunakan pupuk organic cair (POC) Multi Guna dengan dosis 1 liter POC dilarutkan

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	dalam 100 liter air lalu di semprotkan pada bibit karet secara merata, pengendalian gulma dan hama penyakit secara mekanis maupun kimiawi.

	Persiapan Karet dan Tanaman Kehutanan
	1. Pembelian bisa dilakukan di produsen bibit yang terpercaya, lebih diutamakan di sekitar Jambi agar jarak tempuh tidak terlalu jauh dan tanaman terhindar dari stres selama dipindahkan. Gunakan bibit karet yang sehat dan bebas dari Jamur Akar Putih.
	    a. Karet: membeli semua bibit sebagai 'high yielding grafted'. Varietas karet yang diusulkan adalah klon PB 260 Sembawa. PB 260 merupakan klon karet unggul penghasil getah yang dikeluarkan dari hasil penelitian badan penelitian tanaman karet Indonesia.
	    b. Tanaman kehutanan bisa dibeli sebagai bibit
	Perlakuan bibit pada proses pengiriman sangat penting untuk menjaga bibit agar tetap segar dan memiliki kualitas yang baik.
	    a. Pemilihan bibit sebelum pengiriman : memiliki pertumbuhan bibit yang seragam, memiliki akar, batang, dan daun yang kokoh, tidak terlihat terserang hama dan penyakit.
	    b. Perlakuan bibit setelah pengiriman : siram dengan air sampai media tanam benar-benar basah, untuk 5-6 hari tempatkan bibit pada tempat yang teduh atau ternaungi sampai tanaman terlihat segar dan benar-benar sehat, selanjutnya tempatkan tanaman pada lokasi yang cukup terkena sinar matahari
	
	Persiapan Tanaman Pertanian
	1. Persemaian dilakukan 25 hari sebelum masa tanam, persemaian dilakukan pada lahan yang sama atau berdekatan dengan petakan kebun yang akan ditanami, hal ini dilakukan agar bibit yang sudah siap dipindah.
	2. Sebelum benih disebar, direndam dengan larutan Previcur N dengan konsentrasi 0,1 % selama ± 2 jam. Selanjutnya benih disebar merata pada bedengan persemaian, dengan media semai setebal ± 7 cm dan disiram.
	3. Media semai dibuat dari pupuk organik dan tanah yang telah dihaluskan dengan perbandingan 1 : 1. Benih yang telah disebar ditutup dengan media semai, selanjutnya ditutup dengan alang-alang atau jerami kering selama 2-3 hari. Bedengan persemaian

	tersebut sebaiknya diberi naungan.
	4. Buat bedengan dengan lebar 1 -1,2 m dan panjang disesuaikan dengan keperluan. Luas persemaian untuk 1 hektar lahan agroforestri adalah 200m² (2 % dari luas tanam)
	5. Drainase harus baik
	6. Tambahkan bahan organik seperti kompos, pupuk kandang, serbuk kayu dan sekam yang sudah melapuk/abu.

$$ $$

Waktu dicabut dan akan ditanam mudah diangkut dan tetap segar. Benih yang hendak disemai sebelumnya harus direndam terlebih dahulu secara sempurna sekitar 2 x 24 jam, dalam ember atau wadah lainnya. Hal ini dilakukan agar benih dapat mengisap air yang dibutuhkan untuk perkecambahannya.

Penanaman

1. Dilakukan pada awal musim penghujan yang secara umum dimulai pada bulan September, sehingga sebelum awal musim kemarau penanaman sudah selesai.
2. Sebelum bibit dipindahkan kelahan, kondisi tanah diperiksa dahulu. Bila kondisi tanah kering harus diberi air terlebih dahulu untuk memudahkan penanaman karena pada tanah yang kering akan mengakibatkan kerusakan bibit terutama melukai akar.
3. Memasang ajir (tiang pancang) untuk mengatur jarak tanam.
4. Menggali lubang tanam dengan ukuran 40 x 40 x 40 cm. Ketika menggali lubang tanam, pisahkan tanah lapisan atas dengan tanah lapisan bawah, dan biarkan lubang tanam tersebut selama 2–3 bulan. Cara ini bertujuan supaya binatang, jamur, dan sumber–sumber penyakit yang terdapat di dalam lubang tanam berkurang atau mati karena terkena cahaya matahari.
5. Pastikan daun teratas dari bibit karet dalam polybag tersebut sudah tua.
6. Saat menanam, letakkan bibit di tengah-tengah lubang, lalu buka plastik polybag dengan hati hati agar struktur tanah di sekitar perakaran tidak rusak dan terganggu.
7. Tutup lubang dengan menggunakan tanahlapisan bawah dan lapisan atas.
8. Tekan secukupnya pada tanah sekeliling bibit dengan tangan dan hindari penginjakan tanah karena bisa menyebabkan kerusakan perakaran bibit dan kematian.
9. Bila ada karet yang mati selama kurun waktu 3 bulan setelah tanam, segera lakukan penyulaman

	bibit karet.
	10. Penanaman bibit karet dan tanaman lainnya akan dilakukan swadaya oleh masyarakat Batin Sembilan dan akan didampingi oleh PT. REKI dalam melakukan penanaman. Penanggung jawab dan pendamping dari PT REKI dalam hal ini merupakan tim dari Community and Partnership yang dipimpin oleh Manager Kemitraan.
	11. Tanaman karet dan tanaman lainnya ditanam saat waktu awalnya; sayuran dll. ditanam setalah penanaman pohon sudah selesai.
	12. A. Pola Monokultur Agroforestry : Tanaman utama Karet. Dengan jarak tanam 5 x 7 m dengan kebutuhan bibit 286 bibit/ha, dikombinasikan dengan tanaman diantaranya padi, umbi-umbian, sayuran, jagung, buah-buahan, kunyit, jahe, cabe, dan/atau Kacang Tanah. untuk jalur tanaman sisipan/palawija memiliki lebar 3 m setiap jalurnya, artinya memiliki jarak 2 m kiri dan kanan dari tanaman karet. B. Pola Simple Agroforestry : Tanaman utama Karet dengan jarak tanam 5x5 m dan jenis tanaman fast growing seperti, melinco, jengkol, petai dan tanaman sisipan yang berumur pendik seperti padi, jagung, ubi kayu dan lain-lain. Lebar dari penanaman tanaman sisipan yakni 2 m, artinya jarak dari tanaman utama yaitu 1,5 m. C. Pola Kompleks Agroforestry : Menggunakan perpaduan antara jenis Karet, jenis pioneer dan slow growing species. Jenis pioneer yang direkomendasikan yaitu gaharu, pulai, dan jabon, sementara jenis slow growing species yang direkomendasikan adalah Meranti bunga, Pinang, Durian-Durian hutan, dan Tengkawang serta menanam tanaman sisip berumur pendek padi, ubi kayu, jagung , cabe dll. D. Pola Natural Regeration : menggabungkan berbagai jenis tanaman karet dan jenis buah-buahan yang ada ditingkatkan kualitasnya, dan diperkaya dengan tanaman yang bernilai ekonomis. Diantaranya Meranti bunga, Durian hutan, Tengkawang, Petai, Pinang, Jengkol, Jernang, Cempedak. Model natural regeneration hampir mirip dengan pengayaan tanaman dalam hutan, hanya saja konteks utamanya untuk agroforesti. Natural Regeneration memiliki jarak tanam yang sama dengan simple dan complex agroforestri, lebar jalur penanaman tanaman sisipan/palawija pun sama. Jarak penanaman pohon yaitu 5 x 5 m, dengan kebutuhan total bibit per hektar yakni 400 bibit. Jumlah tersebut diantaranya 200 bibit karet, dan 200 bibit bermacam jenis asli dan bernilai ekonomi.

3. Persiapan lahan

1. Buka lahan melalui teknis tebas-tebang-tanpa bakar di awal musim hujan mulai.
   a. Dilarang buka lahan melalui teknik tebas-tebang-bakar
   b. Tebas-tebang-jalur Pada praktik ini pembersihan lahan tidak dilakukan secara keseluruhan, hanya menebas pada jalur yang akan ditanami karet saja. Praktik tebas-tebang-jalur biasanya dilakukan pada lahan-lahan sekunder di mana hanya terdapat semak belukar dan bukan pohon-pohon besar.

Bangun pagar dan pondok

. Pagar dibangun bahan kayu dan jaringan hitam, dengan tinggi minimal 1.5 m, menggunakan kayu bekas pembukaan jalur tanam

Pengolahan tanah

- Tugas ini harus dilakukan maksimal lima hari sebelum penanaman.
- Lahan terlebih dahulu diolah dengan cangkul sedalam 20-30 cm supaya gembur, setelah itu dibuat bedengan dengan arah membujur dari Barat ke Timur agar mendapatkan cahaya penuh. Bedengan sebaiknya dibuat dengan ukuran lebar 100-120 cm, tinggi 30 cm dan panjang sesuai kondisi lahan. Jarak antar bedengan + 30 cm. Lahan yang asam (pH rendah) lakukan pengapuran dengan kapur kalsit atau dolomite 2-4 minggu sebelum tanam dengan dosis 1,5 t/ha.
- Dilakukan dengan menggunakan cangkul dan atau parang untuk membolak-balikkan tanah.
- Untuk tanaman pohon membuat lubang selebar dan dalam 40 x 40 x 40 cm
- Untuk sayuran dll. membuat jalur tanam (guludan) degan lebar 1 m
- Membentuk mulsa tanah cara menyusun campuran dedaunan dan ranting pohon. Pemulsaan dilakukan disekitar lubang tanam
- Jika lokasi pembuatan agroforestri memliliki topografi yang curam atau berbukit, maka dianjurkan untuk mebuat terasering.

Membuat sistem irigasi

Sistem irigasi yang digunakan adalah sistem irigasi aliran dengan memanfaatkan air sungai. Irigasi aliran merupakan sistem irigasi yang menyadap air langsung di sungai melalui bangunan bendung maupun melalui bangunan pengambilan bebas (free intake), atau embung. kemudian air irigasi dialirkan secara gravitasi melalui saluran sampai ke lahan pertanian agroforestri. Di sini dikenal saluran primer, sekunder, dan tersier. Pengaturan air ini dilakukan dengan pintu air. Prosesnya adalah gravitasi, tanah yang tinggi akan mendapat air lebih dulu.

Membuat sarana berupa jalan, baik untuk pemeliharaan tanaman maupun kegiatan produksi. Jalan tersebut di antaranya jalan utama, jalan antar blok, jalan kontrol, dan jalan pengangkutan lateks.

4. Pemiliharaan

Pemupukan
1. Karet dan Tanaman Kehutanan

Aplikasi pemupukan pertama yang diberikan pada tanaman karet dilakukan dengan berpedoman pada dosis pemupukan yang dianjurkan oleh Balai Penelitian Karet Sembawa (2003), yaitu dengan dosis :
Urea   : 175 gram/pohon/aplikasi,
SP-36   : 130 gram/pohon/aplikasi, dan
KCl: 150 gram/pohon/aplikasi.
Pemupukan dilakukan dengan cara sebagai berikut :
   a. membuat parit atau alur memanjang pada gawangan atau di tengah-tengah antara barisan tanaman,
   b. membersihkan gulma disekitar parit/alur, pupuk ditaburkan ke dalam parit sesuai dosis dengan syarat pupuk Sp-36 dan Urea tidak boleh dicampurkan tempatnya.
   c. Pupuk diberikan secara tugal melingkar batang dengan jarak 100-125 cm dari pokok batang, parit yang sudah ditaburi pupuk ditutup kembali dengan tanah.
   d. Waktu pemupukan dilakukan dua kali per tahun dengan interval waktu 6 bulan, yaitu awal musim hujan (Maret -Mei) dan akhir musim hujan (Oktober -Nopember).Pemupukan pertama sudah dilakukan pada bulan Mei tahun 2009.

2. Tanaman Pertanian

Tiga hari sebelum tanam berikan pupuk organik padat dengan dosis 2-4 kg/m2. Dua minggu setelah tanam dilakukan pemupukan susulan Urea

150 kg/ha (15 gr/m2). Agar pemberian pupuk lebih merata, pupuk Urea diaduk dengan pupuk organik kemudian diberikan secara larikan di samping barisan tanaman. Selanjutnya dapat ditambahkan pupuk cair 3 liter/ha (0,3 ml/m2) pada umur 10 dan 20 hari setelah tanam.

Penyulaman

Evaluasi kegiatan penanaman dimaksudkan untuk mengetahui keberhasilan penanaman dan untuk menentukan kegiatan penyulaman. Keberhasilan tanaman di lapangan biasanya dilihat dari persentase kematian/hidup tanaman. Oleh karena itu, perlu adanya penyulaman, yaitu kegiatan penanaman kembali untuk mengganti tanaman pokok yang rusak atau mati sehingga jumlah tanaman per hektar yang tumbuh sesuai dengan standar yang telah ditentukan.

- ✓ Jika persen jadi tanaman mencapai 100% pada areal tersebut tidak perlu ada sulaman.
- ✓ Pada 80% - 100% perlu ada sulaman ringan.
- ✓ Antara 60% - 80% dilakukan sulaman intensif.
- ✓ Di bawah 60% perlu dilakukan penanaman ulang.

Penyiangan (pengendalian gulma)

Terdapat dua cara pengendalian gulma tanaman yang dapat digunakan dalam pengelolaan agroforestri bersama masyarakat Bathin Sembilan. Diantaranya adalah:

1. Pengendalian gulma secara fisik (pengolahan tanah dan pembabatan)
   a. Pengolahan tanah menggunakan alat-alat seperti cangkul, garu, bajak, traktor yang berfungsi untuk memberantas gulma.
   b. Pembabatan secara langsung menggunakan arit ataupun
      Pengendalian gulma secara kimia menggunaka herbisida alami

(karena Hutan Harapan merupakan kawasan restorasi yang mengedepankan nilai-nilai konservasi kawasan)

5. Pemanenan

Panen akan dilakukan swadaya oleh masyarakat Kelompok Tani Hutan dan didampingi oleh PT. REKI. Dan untuk pemasaran akan difasilitasi/dibantu oleh PT. REKI. Hasil panen tanaman karet dan tanaman non karet (tanaman semusim dan tanaman kehutanan) dari demplot tanaman kehidupan, PT. REKI bisa membeli langsung dari masyarakat

	Batin Sembilan. Pembagian persentase (%) keuntungan dari hasil panen akan disepakati antara PT. REKI dengan masyarakat Kelompok Tani Hutan.
	
	Tanda-tanda kebun mulai disadap untuk tanaman karet:
	1. Umur rata-rata 6 tahun atau 55% dari areal 1 hektar sudah mencapai lingkjar batang 45 Cm sampai dengan 50 Cm. Disadap berselang 1 hari atau 2 hari setengah lingkar batang, denga sistem sadapan/rumus S2-D2 atau S2-D3
	2. Pengolahan lateks sebagai berikut :
	  • Standar karet kebun diturunkan dari rata-rata 32% menjadi 16% dengan jalan memberi air yang bening atau yang bersih.
	  • Kemudian dicampur dengancuka/setiap 1 Kg karet kering 350 s/d 375 Cc larutan 1% cuka.
	  • Dibiarkan sampai beku.Kemudian digiling dalam gilingan polos dan kembang, kemudian direndam rata-rata 60 menit.
	  • Kemudian dihasilkan dalam bentuk RSS I, II, III dan IV of Sheet.

BAGAN ALUR KEGIATAN AGROFORESTRY DI HUTAN HARAPAN

```
MoU Antara PT. REKI dan Kelompok Masyarakat dalam Kawasan Hutan
        ↓
Formulir Pengajuan Pengembangan Agroforestry
(Informasi KK, Aset Rumah Tangga peserta agroforestry, Pendapatan dan pengeluaran Rumah Tangga)
        ↓
Pengajuan Permohonan Rencana Lokasi
        ↓
Kesepakatan Sistem Bagi Hasil
(Berita Acara Kesepakatan)
        ↓
Pemetaaan Lahan
(...)
        ↓
Persiapan dan Pembersihan Lahan  →  Penyediaan Bibit/ Benih (Berita Acara Penyerahan Bantuan)
                                              ↑
                                        Persiapan Bibit/ Benih
                                              ↑
                                        Penanaman
                                              ↑
                                        Pemeliharaan
                                        (Penyulaman, Pemupukan, Pengendalian Gulma, Pengendalian Hama dan Penyakit secara Terpadu)
                                              ↑
                                        Pemanenan
                                              ↑
                                        Penanganan Pasca Panen dan Pemasaran
```

| 8.0. Koordinasi antar Departemen dan Pihak Terkait | 1. Manager Kemitraan mengkoordinasikan kegiatan kepada Departemen Reshut berkaitan dengan biodiversity pada kegiatan agroforestry
2. Manager Kemitraan mengkoordinasikan kepada Departemen Perencanaan untuk perencanaan kegiatan agroforestry dan memastikan kegiatan tersebut sesuai dengan RKU dan RKT Hutan Harapan
3. Manager Kemitraan mengkoordinasikan kepada Departemen Linhut untuk memastikan wilayah kegiatan pengembangan agroforestry aman dan terkendali dari gangguan dari berbagai |

	pihak. 4. Manager Kemitraan memastikan terjalinnya koordinasi yang baik terhadap para pihak multisteakholder terutama para pendamping kelompok masyarakat.
9.0. FORM	1. Formulir Pengajuan Pengembangan Agroforestry 2. Formulir Pemetaan Lahan 3. Lembar Disposisi 4. Berita Acara Serah Terima Bantuan 5. Berita Acara Kesepakatan Bersama antara PT. REKI dan Masyarakat
10. DOKUMEN REFERENSI	1. Mou Antara PT. REKI dengan Masyarakat/ Kelompok Tani Hutan 2. Dokumen RKU dan RKT perusahaan Hutan Harapan. 3. Peraturan Pemerintah mengenai Kemitraan di hutan produksi. 4. Aturan internasional mengenai hak-hak masyarakat tradisional mengenai akses sumberdaya alam dalam menjalani kehidupan.

FORMULIR PENGAJUAN

PENGEMBANGAN AGROFORESTRY

A. DATA PRIBADI

Nama		**Jenis Kelamin**	
TTL		**Agama**	
Alamat		**Suku**	
Asal		**Pendidikan**	

B. INFORMASI ANGGOTA KELUARGA

Nama	JK	Umur	Status di Rumah Tangga (RT)	Pendidikan Terakhir	Pekerjaan
	1 2		1 2 3 4 5	1 2 3 4 5	0 1 2 3 4 5
	1 2		1 2 3 4 5	1 2 3 4 5	0 1 2 3 4 5
	1 2		1 2 3 4 5	1 2 3 4 5	0 1 2 3 4 5
	1 2		1 2 3 4 5	1 2 3 4 5	0 1 2 3 4 5
	1 2		1 2 3 4 5	1 2 3 4 5	0 1 2 3 4 5

Keterangan:
- Jenis Kelamin: **1**. Laki-laki   **2**. Perempuan
- Status di Rumah Tangga: **1**.Kepala Keluarga **2**. Ibu RT   **3**. Anak   **4**. Orang Tua **5**.Lainnya
- Pendidikan : **1**. Tidak Sekolah **2**. SD **3**. SMP **4**. SMA, 5. Sarjana
- Pekerjaan : **0.** Tidak Bekerja **1**. Petani **2**. Pedagang **3**. PNS **4**. Buruh **5**. Lainnya (Tuliskan)

C. ASET RUMAH TANGGA
1. Perkebunan:

Jenis Tanaman	Umur (Thn)	Luas Lahan (ha)	Banyak (Batang)	Periode Panen	Produksi Perperiode (Kg)	Produksi Perbulan (Kg)	Produksi Pertahun (Kg)
Karet							
Sawit							
Lainnya							

2. Rumah, Peralatan dan Perlengkapan Rumah Tangga :

No.	Aset	Ada/Tidak Ada	Keterangan
1.	Rumah	1. Ada 0. Tidak	
2.	Mobil	1. Ada 0. Tidak	
3.	Motor	1. Ada 0. Tidak	
4.	Sepeda	1. Ada 0. Tidak	
5.	TV	1. Ada 0. Tidak	
6.	HP	1. Ada 0. Tidak	
7.	Kompor Gas/Minyak Tanah	1. Ada 0. Tidak	

D. PENDAPATAN RUMAH TANGGA

Sumber penghasilan	Jenis Pekerjaan/Usaha	Jumlah Penghasilan	
		Rp/Hari	**Rp/Bulan**
Utama			
Tambahan			
Total			

E. PENGELUARAN RUMAH TANGGA

No	Jenis Pengeluaran	Rp/hari	Rp/Bulan
1	Biaya Makan		
2	Biaya Pendidikan		
3	Biaya Listrik		
4	Komunikasi		
5	Transportasi		
6	Kesehatan		
7	Kredit/Hutang		
	Total		

F. RENCANA LOKASI TANAMAN AGROFORESTRI

1. Lokasi Tanaman Kehidupan   :

2. Luas Lahan   :   Ha

Camp Hutan Harapan,   Maret 2017
Pemohon,   Disetujui,

_____   _____
Nama&Tandatangan   Manager Departemen
Kemitraan

Lampiran 2

FORM PEMETAAN LAHAN

Nama Surveyor		Nama Penggarap	
Tanggal Survei		Id Photo Penggarap	
Id GPS		Id Photo Rumah	
Id Kamera		Wpt / XY Rumah	
Lokasi Survei		Id Photo Pondok Kerja	
TTD		Wpt / XY Pondok kerja	

Peta /Sketsa Lahan	Koordinat/Route GPS		
	Wpt	X	Y

Berbatasan dengan :
Utara :
Selatan :
Timur :
Barat :

Kondisi Lahan   :

Catatan   :

Penggarap

_____

Nama & Tanda Tangan

Lampiran 3

LEMBAR DISPOSISI

Nomor:	Tanggal:

Surat dari :

Tanggal :

Nomor Surat :

Perihal :

Diajukan Kepada	Isi Disposisi	Paraf

Lampiran 4

<u>BERITA ACARA SERAH TERIMA BANTUAN</u>

NO.   C/REKI/   /2017

Pada Hari Ini .... Tanggal ....Bulan......... Tahun ....telah diserahkan oleh :

Nama:

Jabatan:

Bantuan Pengembangan Agroforestri berupa ……………Kepada :

Nama:

Jabatan:

Demikian Berita Acara ini dibuat untuk dipergunakan seperlunya.

Yang Menyerahkan,   Yang Menerima,

(   )   (   )
Saksi Pertama,   Saksi Kedua,

(   )   (   )

Lampiran 4

<u>BERITA ACARA KESEPAKATAN BERSAMA</u>

NO.   C/REKI/   /2014

Pada Hari Ini .... Tanggal ....Bulan......... Tahun ....telah disepakati oleh :

Nama   :

Jabatan :

Disebut sebagai Pihak Pertama :

Nama   :

Jabatan   :

Disebut sebagai Pihak Kedua :

Pihak Pertama dan Pihak Kedua sepakat untuk :

1.

2.

3.

dst

Demikian Berita Acara ini dibuat untuk dipergunakan seperlunya.

Pihak Pertama,   Pihak Kedua,

(_____)   (_____)

Saksi Pertama,   Saksi Kedua,

(_____)   (_____)

Annex 7: Map showing the land verification process with local communities to identify land available for agroforestry planting

Trimakno group:
Bufer and AgroforestryProject

1. 10 Ha agroforestry di batas area wilyah kelola Trimakno Group
2. Buffer/Batas area wilayah kelola dan kawasan
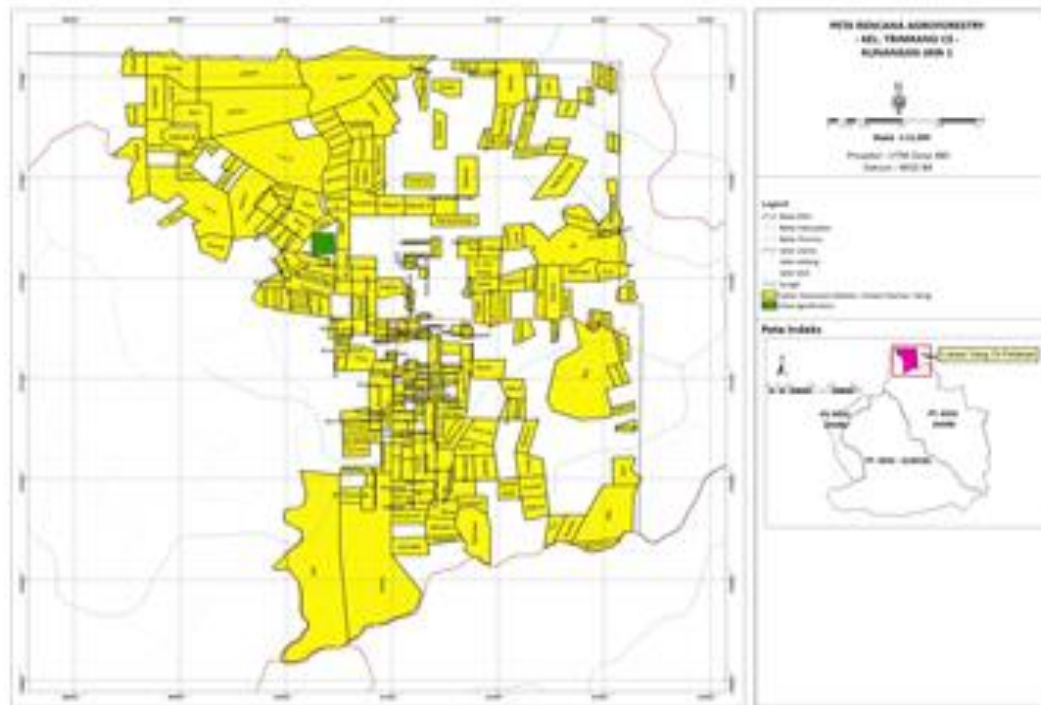
Annex 8: Project Implementation Plan

ACTIVITY		Y1 2016/17	Y2 2017/18	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
		Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
	Who?	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1.1 Develop gender disaggregated baseline household livelihoods survey instrument and train enumerators from PT-REKI.	AK/ FSJ	■	■				■	■	■												
1.2 Conduct household socio-economic survey of 500 households	JS/ ZNH								■	■											
1.2.1 To appoint PhD student as lead enumerator	MS					■	■														
1.2.2 Recruit 4-6 people for household survey training (training in early March under 1.1)	JS/ ZNH					■	■														
1.3 Conduct analysis of household data	AK/ FSJ										■	■	■								
1.4 Develop a farms systems survey instrument and train	AK/ FSJ	■	■				■	■													

Activity	Responsible
enumerators from PT-REKI.	
1.5 Conduct farms system survey for 250 farms	JS/ ZNH
1.6 Analysis of farm systems data	AK/ FSJ
1.7 Design experimental economic games to assess impediments to agroforestry uptake and train REKI staff to implement	AK/ FSJ
1.8 Conduct experimental economic games in at least 8 focal group sessions	JS/ ZNH
1.9 Analyse and write up results of experimental economic games	AK/ FSJ
1.10 Develop and analyse gender disaggregated livelihoods impact survey instrument to be utilised throughout project to monitor impacts.	AK/ FSJ

Activity	Resp.
1.11 Conduct livelihoods impact survey of 150 participating and 150 non-participating families	JS/ ZNH
1.12 Analyse livelihoods impact of project interventions against baseline.	AK/ FSJ
2.1 Develop computer models for rubber, gaharu and native timber species for agroforestry options	RH/AA/ZNH
2.2 Conduct stakeholder workshops in communities ensuring gender balance is considered in design, to refine proposed options and agree on an implementation plan	JS/ SF
2.2.1 Participatory sessions with farmers to explain plan and seek acceptance to	JS/ SF

Activity	Lead
take part in agroforestry work	
2.2.2 Develop options for agroforestry in consultation with the local communities and finalise an implementation plan	JS/ SF
2.3 Assess attitudes to and understanding of forest clearance and illegal activity drivers using randomised response techniques.	JS/ MS
2.3.1 Develop the randomised response technique	AK/FSJ
2.3.2 Carry out survey	JS/ ZNH
2.3.3 Analyse data from survey	AK/ FSJ
2.4 Develop and sign agreements with 500 families for the development of agroforestry systems on 500 ha	JS/ SF/ TSO

Activity	Responsible																							
2.4.1 Take steps to start implementation of agroforestry with Batin Sembilan and Mitrazone, where agreements have been obtained	JS																							
2.4.2 Negotiate agreements with other communities for agroforestry development	JS																							
2.5 Establish on-farm trials on 500 ha in focal area and train farmers including women and monitor throughout project	TSO/ JS																							
2.5.1 Hold initial meeting re on-farm trials with farmers in focal areas (6 ha for Batin 9, then 64ha, finally 181ha)	JS/SF																							
2.5.2 Train farmers (including women) in specific areas of agroforestry - 60ha buffer	JS/SF																							

Activity	Responsible
rubber in KJ2, then 120ha, finally 181ha?; also to include 60ha for Trimakno)	
2.5.3 Monitor on-farm trials during project	JS
2.6 Develop manuals for agroforestry management, rubber tapping etc and distribute to participating farmers as appropriate and encourage farmer to farmer sharing through community meetings and workshops.	RH/ AA/ ZNH/ JS
2.6.1 Develop manuals for agroforestry	RH/ AA/ ZNH/ JS
2.6.2 Use existing farmer groups to transfer knowledge and establish new ones where they do not exist	JS/ SF
2.6.3 Organise meetings and workshops to	JS/ SF

Activity	Responsible																						
encourage the sharing of information among farmers																					▓		
2.7 Develop biodiversity survey protocols	TS/ RH/ ZNH/ AA									▓	▓												
2.8 Conduct before agroforestry trial biodiversity surveys in project focal areas	TS/ RH/ ZNH/ AA										▓	▓	▓	▓	▓	▓							
2.9 Conduct after agroforestry trial biodiversity surveys in project focal areas and analyse findings.	TS/ RH/ ZNH/ AA										▓												
2.10 Analysis of biodiversity data from trials	TS/ RH/ ZNH/ AA										▓	▓	▓	▓									
2.11 Baseline and endline remote sensing analysis of focal areas and HRF as a whole	TS/ RH/ ZNH/ AA		▓	▓	▓	▓	▓																
2.12 Develop business plans and standard operating procedures for each focal species.	TSO/ JS/ RH													▓									
3.1 ERC policy forum workshop	AA/ MS														▓								

Activity	Responsible																								
on livelihood development in ERCs																■									
3.2 ERC policy recommendations and lessons learnt developed and submitted by BI and FORDA to MoEF	AA/ MS																								
3.3 Lessons shared with ERC Association and other key stakeholders via papers and workshops	AA/ MS/ TSO/ RH																	■							
3.4 Guidelines on community development in ERCs developed and circulated to key stakeholders.	AA/ MS																								
4.1 Project Management																									
4.1.1 Launch of Project and completion workshop	all	■	■																						
4.1.2 Monitoring of Project outputs and indicators (in logframe)	MS		■	■			■	■					■	■				■	■

| 4.1.3 Reporting - progress reports and end of project report (including financial reporting) | RH/ TS/ AK/ FSJ/ JS/ MS/ SK | | | | | ■ | | | | ■ | | | | | | | ■ | | | | ■ |

Aidan Keane   AK
Freya St John   FSJ
Rhett Harrison   RH
Tom Swinfield   TS
Shashi Kumaran   SK
Mangara Silalahi   MS
Jomi Suhendri   JS
Toto Suwito   TSO
Asep Ayat   AA
Zelvin   ZNH
Syafrizal   SF

ACTIVITY		Y3 2018/19												Y4 2019			
		Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
	Who?	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
1.1 Develop gender disaggregated baseline household livelihoods survey instrument and train enumerators from PT-REKI.	AK/ FSJ																
1.2 Conduct household socio-economic survey of 500 households	JS/ ZNH																
1.2.1 To appoint PhD student as lead enumerator	MS																
1.2.2 Recruit 4-6 people for household survey training (training in early March under 1.1)	JS/ ZNH																
1.3 Conduct analysis of household data	AK/ FSJ																
1.4 Develop a farms systems survey instrument and train enumerators from PT-REKI.	AK/ FSJ																
1.5 Conduct farms system survey for 250 farms	JS/ ZNH																
1.6 Analysis of farm systems data	AK/ FSJ																
1.7 Design experimental economic games to assess impediments to agroforestry uptake and train REKI staff to implement	AK/ FSJ																
1.8 Conduct experimental economic games in at least 8 focal group sessions	JS/ ZNH																
1.9 Analyse and write up results of experimental economic games	AK/ FSJ																
1.10 Develop and analyse gender disaggregated livelihoods impact survey instrument to be utilised throughout project to monitor impacts.	AK/ FSJ																

Activity	Resp.
1.11 Conduct livelihoods impact survey of 150 participating and 150 non-participating families	JS/ ZNH
1.12 Analyse livelihoods impact of project interventions against baseline.	AK/ FSJ
2.1 Develop computer models for rubber, gaharu and native timber species for agroforestry options	RH/AA/ZNH
2.2 Conduct stakeholder workshops in communities ensuring gender balance is considered in design, to refine proposed options and agree on an implementation plan	JS/ SF
2.2.1 Participatory sessions with farmers to explain plan and seek acceptance to take part in agroforestry work	JS/ SF
2.2.2 Develop options for agroforestry in consultation with the local communities and finalise an implementation plan	JS/ SF
2.3 Assess attitudes to and understanding of forest clearance and illegal activity drivers using randomised response techniques.	JS/ MS
2.3.1 Develop the randomised response technique	AK/FSJ
2.3.2 Carry out survey	JS/ ZNH
2.3.3 Analyse data from survey	AK/ FSJ
2.4 Develop and sign agreements with 500 families for the development of agroforestry systems on 500 ha	JS/ SF/ TSO

Activity	Lead
2.4.1 Take steps to start implementation of agroforestry with Batin Sembilan and Mitrazone, where agreements have been obtained	JS
2.4.2 Negotiate agreements with other communities for agroforestry development	JS
2.5 Establish on-farm trials on 500 ha in focal area and train farmers including women and monitor throughout project	TSO/ JS
2.5.1 Hold initial meeting re on-farm trials with farmers in focal areas (6 ha for Batin 9, then 64ha, finally 181ha)	JS/SF
2.5.2 Train farmers (including women) in specific areas of agroforestry - 60ha buffer rubber in KJ2, then 120ha, finally 181ha?; also to include 60ha for Trimakno)	JS/SF
2.5.3 Monitor on-farm trials during project	JS
2.6 Develop manuals for agroforestry management, rubber tapping etc and distribute to participating farmers as appropriate and encourage farmer to farmer sharing through community meetings and workshops.	RH/ AA/ ZNH/ JS
2.6.1 Develop manuals for agroforestry	RH/ AA/ ZNH/ JS
2.6.2 Use existing farmer groups to transfer knowledge and establish new ones where they do not exist	JS/ SF
2.6.3 Organise meetings and workshops to encourage the sharing of information among farmers	JS/ SF

Activity	Responsible
2.7 Develop biodiversity survey protocols	TS/ RH/ ZNH/ AA
2.8 Conduct before agroforestry trial biodiversity surveys in project focal areas	TS/ RH/ ZNH/ AA
2.9 Conduct after agroforestry trial biodiversity surveys in project focal areas and analyse findings.	TS/ RH/ ZNH/ AA
2.10 Analysis of biodiversity data from trials	TS/ RH/ ZNH/ AA
2.11 Baseline and endline remote sensing analysis of focal areas and HRF as a whole	TS/ RH/ ZNH/ AA
2.12 Develop business plans and standard operating procedures for each focal species.	TSO/ JS/ RH
3.1 ERC policy forum workshop on livelihood development in ERCs	AA/ MS
3.2 ERC policy recommendations and lessons learnt developed and submitted by BI and FORDA to MoEF	AA/ MS
3.3 Lessons shared with ERC Association and other key stakeholders via papers and workshops	AA/ MS/ TSO/ RH
3.4 Guidelines on community development in ERCs developed and circulated to key stakeholders.	AA/ MS
4.1 Project Management	
4.1.1 Launch of Project and completion workshop	all
4.1.2 Monitoring of Project outputs and indicators (in logframe)	MS

| 4.1.3 Reporting - progress reports and end of project report (including financial reporting) | RH/ TS/ AK/ FSJ/ JS/ MS/ SK | | | | | | | | | | ■ | | | | ■ | | | | ■ |

Annex 9

Rubber agroforestry biodiversity and ecosystem service monitoring plan*

Gbadamassi G.O. Dossa[1, 2, 3] Tom Swinfield[4, 5] Rhett D. Harrison[3, 6]

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[*]This document is still being updated, if you have any questions or suggestion please contact us at: dossa@mail.kib.ac.cn or r.harrison@cgiar.org

This document provides a monitoring plan for biodiversity and ecosystem services once the agroforestry trials have been setup.

For the Plot design see "Experimental approach" section of concept notes not included here)

Hypotheses

1. Increasing diversity of the agroforestry system will lead to a net financial gain for farmers
    1. Per hectare/tree rubber yields will increase or remain unchanged
    2. Rubber tree growth will increase or remain unchanged
    3. Return to labour will increase
    4. Return to capital will increase
    5. Rubber disease will decrease
    6. Farm revenue will increase
2. Increasing diversity of the agroforestry system will support higher ecosystem service provisioning (benefitting the wider community)
    1. Habitat complexity will increase with the diversity of the agroforestry system and therefore:
        1. Stand basal area,
        2. Native tree basal area,
        3. Native tree stem density,
        4. Woody plant species richness,
        5. Woody plant functional diversity,
        6. Diversity of recruiting woody plants,
        7. Density of recruiting woody plants … will all increase with the diversity of the agroforestry system
    2. Ecosystem service provision will increase with habitat complexity and therefore:
        1. Soil cumulative carbon mass,
        2. Soil nutrient status,
        3. Decomposition rate (tea bag and rubber),
        4. Soil macrofauna species richness and functional diversity,
        5. Infiltration … will all increase with the diversity of the agroforestry system
        6. Soil erosion on slopes will decrease with the diversity of the agroforestry system

Strategy

Year 1:

Economic assessment

- To be carried out by a team of 2; visits initially monthly (first 3 months), then quarterly
- 10 replicates of each treatment (i.e. <40 farms)

Flora

- Repeated t_0 and t_2
- Team of four people travelling by bike: 1.5 subplots per day
    - Baseline (1 hour)

- ○ Woody plant census (2 hours)
  - ○ Regeneration (1 hour)

Soil

- Repeated t_0 and t_2
- Team of four people dropped off by car: 4 subplots per day
- Team 1: 2 people
  - ○ Macrofauna sample (30 mins)
  - ○ Soil texture and chemistry (45 mins)
- Team 2: 2 people
  - ○ Infiltration (2.5 hours) - set up two at a time

Ecosystem function

- Repeated t_0 and t_2 - the rubber decomposition requires 4 revisits
- Team of 2 on a motor bike: 4 subplots per day
  - ○ Erosion (45 mins)
  - ○ Tea bag (15 mins)
  - ○ Rubber decomposition (15 mins)

Baseline data

An initial interview with the farmer should aim to gauge the land management history, especially the condition of the land prior to agricultural development and the techniques used for land conversion.

Frequency: y0

Equipment needed: pencils, eraser, questionnaire, GPS, compass, 50 m tape measure

Productivity

Economic assessment

Costs and revenues for all major farm level inputs and returns will be assessed. The cost of land preparation, planting, re-planting (beating-up), fertilisation, pest control and harvesting will be recorded. These will be split broadly into a record of planting stock (Appendix table 2), inputs (Appendix table 3) and human resources (Appendix table 4).

Revenue, will be recorded as the total yield from individual crops from the treatment plots as well as the eventual sale price (Appendix table 5).

Frequency: Yearly

Equipment required: Data forms, pencils

Rubber trees

Method: Latex yield will be measured and recorded from the 40 monitored rubber trees in each treatment plot (Appendix table 6). Latex yield will be measured every two months during the tapping season.

Frequency: yearly

Equipment required: pencil, eraser, data sheet, 2 D.P. digital balance (battery powered); calibrated 500 ml plastic measuring jug; silicone spatula

Flora

Baseline data will be collected according to Appendix table 1. Permanent monitoring transects for flora will be established as soon as possible after the establishment of trials. These will be permanent and be censused at the same time each year, to assess tree growth (diameter / height increment) for rubber and intercrop trees, as well as natural regeneration.

Woody trees

Sampling design: planted trees

Trees will be sampled by functional group to ensure that a sufficient sample is taken to accurately measure growth and density. Efforts should be made to offset the trees sampled in each row (Figure 1).

- **Cash crops (~1 m apart):** For each species up to a maximum of three species: every fifth plant for 2 rows (~20 plants)
- **Rubber (~3m apart):** every third tree for 4 rows (~24 trees); trees will also assessed for infection according to visible extent on the panel and leaves (Appendix Table 7)
- **Fast growing timber (~4m apart):** every tree in 2 rows (~26 trees)
- **Slow growing timber (~4m apart):** Every tree within the treatment plot (~27 trees)

Sampling design: natural regeneration

A 2 x 20 m transect will be established through the centre of the central intercrop row with planted trees at the centre of the transect (Figure 1). All woody plants taller than 1 m tall will be censused. Permanent posts (ideally concrete filled 1 m long, 10 cm diameter PVC pipe, but hollow pipe would also be acceptable) should be installed at either end of the transect to mark its location.

Method:

1. The transect should be given a unique number within the plot, which is recorded at the top of the monitoring sheet.
2. Trees are paint marked (red) at the point-of-measurement (POM: 2.5 m for rubber trees and 1.3 m for all other woody trees), which should be ascertained as in Figure 2.
3. Trees should be tagged with a unique identifier (preferably a sequentially numbered aluminium tag and corrosion resistant nail). DBH is measured at the paint marked position.
4. Paint should be reapplied as necessary.

5. Height should be measured using a 4 m measuring stick for all trees <4 m in height.
6. For multi-stemmed trees, the tree tag should be attached to the largest stem (at its initial census) but all stems > 1 cm DBH should have their diameter be measured.
7. For woody plants < 1cm DBH, height, collar diameter and identity are recorded.
8. If the species is unknown, one botanical collection should be made for each species within the plot; all other instances of the species within the plot should refer to the collection.

For grass-like cash crops (sprouting leaves from a single crown in the ground; e.g. citronella, cardamom), the three longest leaves should be measured. Brightly coloured plastic tags should be attached with copper wire.

Frequency: year 1, year 3, year 5, … , subsequently every five years.

Equipment required: data sheets, pencils, eraser, 50 m tape measure , 3 m diameter tape, 4 m measuring stick, sequentially numbered aluminium tags, large galvanised nails, small galvanised nails, copper wire, 4 m ladder.

Legend

▲ Cash crop
· Rubber
• Fast timber
⋆ Slow timber
▭ Regeneration transect
▢ Decomposition plot
  • Tea bag
  • Rubber
■ Soil plot

12.5 m
12.5 m
12.5 m
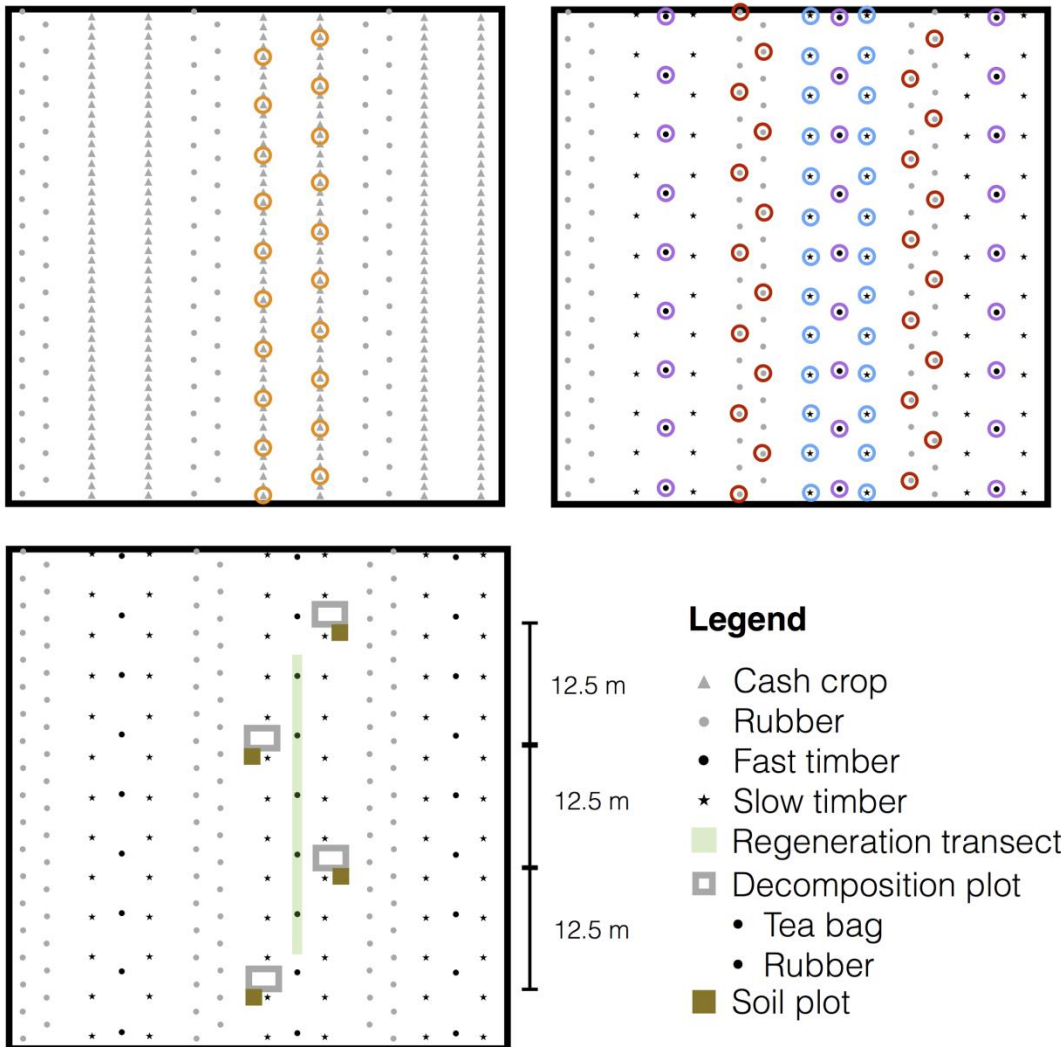
Figure 1. The sampling design for cash crops (orange), rubber (red), fast (blue) and slow (purple) growing timber. The location of the regeneration transect, decomposition and soil plots are also shown. Please note that the exact trees sampled will depend upon the number of species within each functional group.
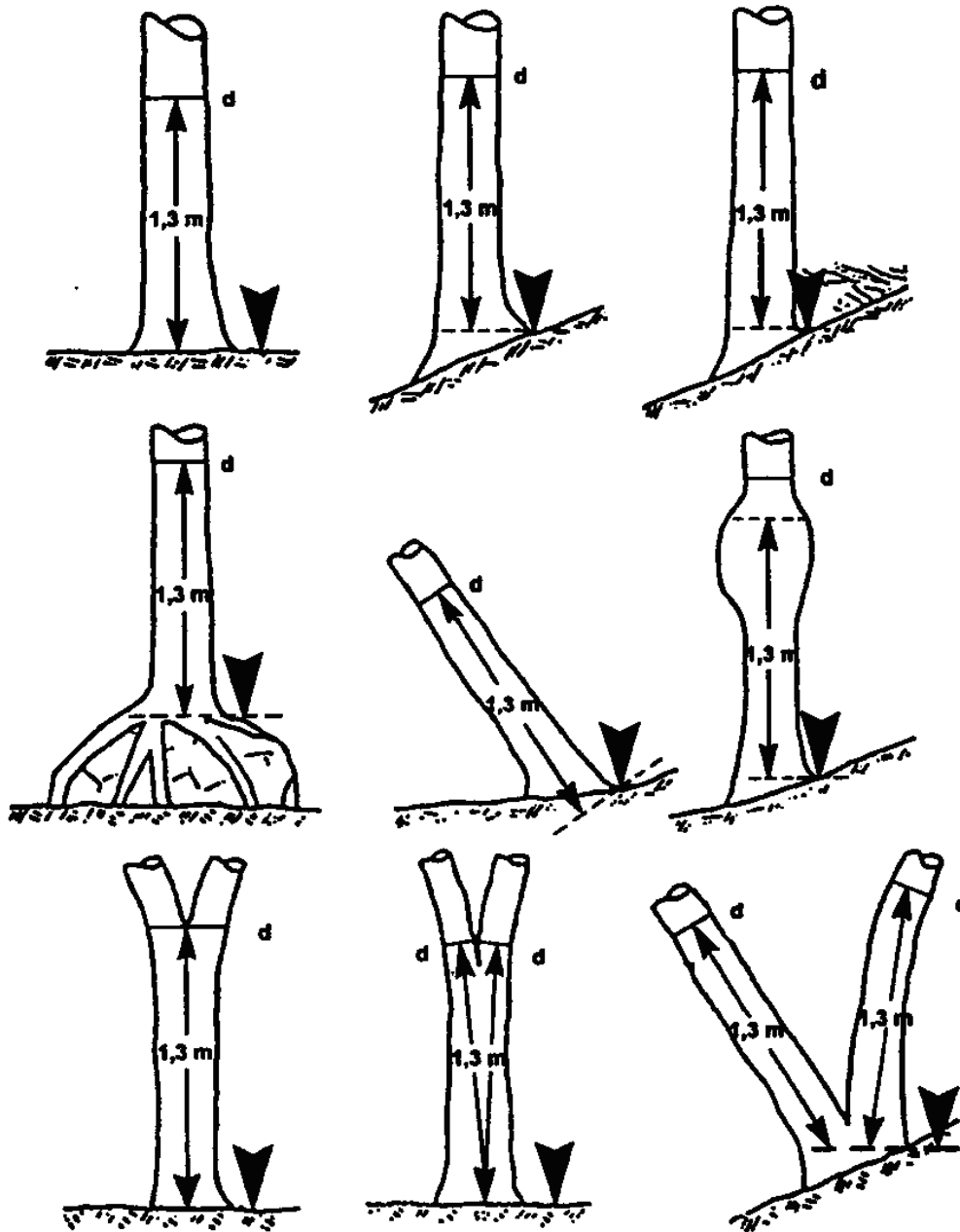
Figure 2. Instructions for accurate diameter at breast height (DBH) measurement. d indicates the point of measurement (POM), whereas the downward facing arrow indicates the position from the ground that should be used for ascertaining the POM.

Fauna

Soil macrofauna

Invertebrates are good for monitoring biodiversity and its change within and across ecosystems.

Method:

We can use the facilities at the CRC990 UNJA laboratory, since nothing is planned before the late summer (2017).

The collecting equipment needs to be wiped clean. Sprayed with alcohol and then flamed between samples.

16x16 cm samples of litter and soil to 5 cm depth should be collected in three subplots (5x5 m) within each treatment plot. These samples should then be sieved to manual collecting the animals. These can then be put in 96% alcohol for barcoding.

Everything needs to be sterilised between every sample.

[See this guide for DNA extraction protocol](#)

Frequency: year 1, year 3

Equipment required: denatured alcohol (95%), squirty bottles, lighters, water, clothes

Soil

Soil texture and chemistry

Soil texture and chemistry will be assessed following the [land degradation surveillance framework protocol](#) (LDSF).

Topsoil (0-20 cm) and subsoil (20-50) will be collected from four locations within each treatment plot. The locations should be selected so that they are between the rubber rows surveyed for rubber growth etc. In order to maximise the sampling coverage, the minimum distance between any two locations should be 12.5 m. Ideally, these should also be chosen on alternate sides of the central intercrop row. The four samples will be thoroughly mixed within each layer to form a composite sample for sub and for top soil. An auger will be used to collect samples. Yearly collections should be made at similar times as previous years.

1. Conduct field soil texture tests using the texture by feel method (see Appendix) for each topsoil and subsoil sample.
2. Pool composite samples in one bucket (topsoil and subsoil samples should be in different buckets).
3. Mix the soil thoroughly in the buckets.

4. Take a representative ~700 g sub-sample and place it in a labelled plastic bag. **IMPORTANT: Plot name, treatment name, depth and date should all be written clearly on the bag. The same information should be written on a piece of paper inside the bags.**
5. 10% of the samples will be selected at random for wet chemical analysis. Samples will be air dried for at least 3 days. Elements such as C, N, K, Ca, P, Mg, etc along with organic matter content, cation exchange capacity and pH will be measured.
6. The results from the wet chemistry will be used to calibrate and estimate the chemistry of the remaining (90% of total collected samples). However, all of the collected soil samples (both top and sub) will be analyzed using near infrared spectroscopy.

Frequency: Yearly

Equipment: Data sheets, pencils, eraser, permanent markers, soil auger marked at 20, 50, 80 and 110cm, sturdy plastic bags, a mixing trowel, labels and buckets (you will need buckets with different colors for topsoil and subsoil samples).

Soil cumulative mass (CM)

Soil Cumulative mass is useful in quantifying nutrient content ratio per soil mass and total nutrient content of the soil profile. Soil cumulative mass will be assessed following the land degradation surveillance framework protocol (LDSF).

Method: One soil cumulative mass sample will be collected at the second soil sample plot (see above). A sampling plate is used to easily capture any soil that falls out of the auger before transferring it to the bucket and to prevent collapse of the auger hole.

Caution: You must auger straight down. If your augering becomes slanted so that you are augering at an angle, stop and start again in a new location because this will not be an accurate measurement of the depth. Do not overfill the auger when taking a cumulative mass sample as this will distort the volume of the auger hole. To avoid this, empty the auger regularly (after approximately every 3 turns).

1. Press the sampling plate firmly onto the soil, so the plate is flush with the soil surface.
2. Place the auger in the centre of the hole in the plate and begin to auger straight down.
3. Auger down to 20 cm, collecting ALL of the soil from the auger into the bucket. Then transfer all of the soil to a clearly labeled plastic bag.
4. The next samples to be collected are from 20-50, 50-80 and 80-110 cm. Depending on soil texture, a clay, combination or sand auger can be used, but use the same auger for the entire depth (profile). Changing augers may change the volume of the auger hole. Record auger diameter!
5. **IMPORTANT: Plot name, treatment name, depth and date should all be written clearly on the bag. The same information should be written on a piece of paper inside the bags.**

Frequency: yearly

Equipment required: Data sheets, pencils, eraser, permanent markers, soil auger marked at 20, 50, 80 and 110 cm, sampling plate, sturdy plastic bags, a mixing trowel, a permanent marker, labels and buckets (you will need buckets with different colors for topsoil and subsoil samples).

Soil infiltration

Method: One measurement per treatment plot. The soil infiltration protocol will follow the one explained in [LDSF](#). Repeated measurements should be done at same period of the year (**Appendix Table 12**). Soil infiltration measurements are the most time consuming aspect of the field measurements, so these should be set up as soon as possible.

1. The infiltration ring should be placed at the center of the treatment plot.
2. To ensure that the ring does not leak, drive it at least 2 cm into the soil taking care not to disturb the soil surface too much.
3. Remove any vegetation, litter and large stones from inside the ring, but make sure not to disturb the soil surface (e.g. by digging out large stones or uprooting vegetation). If the soil surface is accidentally disturbed, reset the ring at another location.
4. Pre-wet the soil with 2-3 liters of water. Let this soak in for at least 15-20 minutes. Then slowly pour water into the ring to a level of 20 cm, again making sure not to disturb the soil surface.
5. The infiltration rates at the beginning of the test will be quite variable. So for the first half-hour record at 1-5 minute intervals. Note that it will be easier to process the data if you record time in minutes since initiation of the test rather than as clock time.
6. After each recording top up the water level to 20 cm.
7. After the first half hour record at 10-20 minute intervals for an additional 2 hours, or until the infiltration rates have stabilized. Top-up the water level to 20 cm after each reading (see infiltration field data entry sheet in the Appendix).

Frequency: yearly

Equipment required: a 17 cm outer diameter, 20 cm in height infiltration ring, a sledge hammer, approximately 25 liters of water, and an infiltration field recording sheet.

Soil erosion (only on slopes greater than 15°)

Soil erosion is commonly listed as impact due to rubber monoculture. Having an agroforestry rubber intercropping system might improve soil structure and therefore could potentially reduce soil erosion under these systems.

Method: Soil erosion should be assessed visually as either: not present, sheet erosion, rill erosion or gully erosion. However, where slopes are greater than 15° empirical measurements should be made by installing sediment traps to measure overland flow. Steel plates will be installed and connected to jars for runoff water collection as shown in

Frequency:

Equipment required:

Figure 3. Diagram for collecting runoff water and drained soil. The blue steel frame inserted firmly in soil and the plastic jar is used for collecting water and soil. [I think we can improve on the design of this trap. The bottle needs to be bigger and connected to the sheet with a pipe. The bottle is dug into the soil 1-2 m below the trap to minimise disturbance. The sheet could also be better (flatter with edges down the sides]

Surface fluxes and soil profile greenhouse-gases enumeration (optional)

Method: At each treatment plot, chambers will be permanently installed for CO_2, CH_4 and N_2O flux measurements. CO_2, CH_4 and N_2O fluxes will be measured bi-monthly over a two to three-year period. CO_2 efflux will be measured using a portable infrared gas analyzer every two months. Concentrations of CH_4 and N_2O in the headspace will be determined using a closed chamber technique in conjunction with laboratory gas chromatography (GC) analyses.

At each depth in the soil profiles sub-surface soil air tubes will be installed horizontally. The samplers will be constructed of 50 cm long polyvinylchloride (PVC) tubes perforated by drill holes in the backmost 20 cm, thereby allowing free gas exchange between the cylinder volume and the soil atmosphere. Stainless steel tubes will be connected at right angles with the tubes and lead to the soil surface. Evacuated glass bottles (100 ml) will be used for the manual gas sampling every two months. Samples of ambient air (n = 3) will also be collected on the respective sampling dates. Gas concentrations will be determined using GC analyses. In addition, for two sample periods in the middle of the dry and wet season, respectively, we will analyse the $^{13}C/^{12}C$, $^{15}N/^{14}N$ and $^{18}O/^{16}O$ ratios of CH_4 and N_2O gas, respectively, using a gas chromatograph-isotope ratio mass spectrometer.

Frequency: Every 2 months

Equipment required: soil CO_2 portable infrared gas analyzer (Licor 8100), syringes, glass bottles, stainless steel, PVC tubes.

Ecosystem services

Tea bag index

Method: the experiment will follow the protocol described in Keuskamp et al. (2013). A detailed protocol is available on the tea bag index website, thus only simple description is given here.

We will use Green tea (EAN 87 22700 05552 5) and Rooibos tea (EAN 87 22700 18843 8) bags from Lipton. One replicate will consist of a bag of each. Since decomposition varies spatially and by substrate, we will establishing four $6m^2$ decomposition plots within each treatment plot. These will be located in association with soil sampling plots (Figure 4).

The mass of each tea bag (including mesh) should be measured, to a precision of 0.001g before being buried. Tea bags should be incubated a depth of 8cm in the plot for 2 months. Tea bags should be marked on the white surface of the yellow label with permanent marker and unique identifier, making sure that the string from each bag is hanging on a metal peg above ground. Soon after retrieval, dirt and foreign material should be brushed from the tea bags (without using water which will lead to lost fine particles).

Frequency: year 1, year 3

Equipment required: data sheets, pencils, eraser, trowel, green tea bags, rooibos tea bags, permanent marker, tent pegs, balance (3 d.p.), zip lock plastic bags.
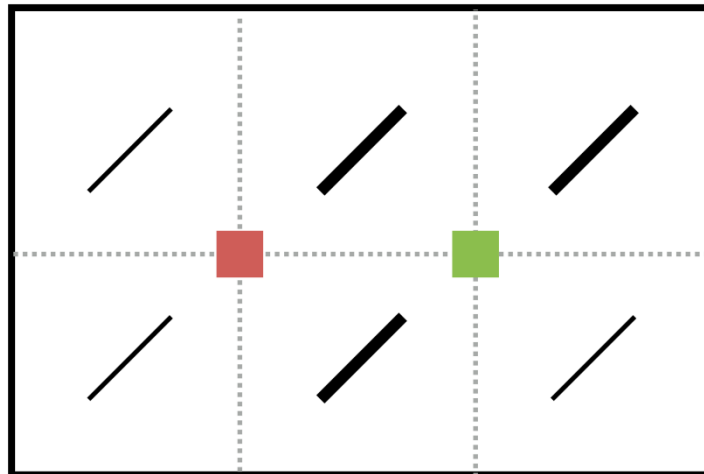
Figure 4. Decomposition plot design. The 6 m^2 plot is split into six 1 m^2 subplots (dashed lines). Within each subplots thick (10 cm diameter) or thin (5 cm diameter) rubber stems are laid on a NE bearing. Green and Rooibos tea bags are buried at the centre of the as shown by the red and green squares (the exact position should be randomised).

Rubber wood decomposition

Method: Branches of two uniform sizes (5 cm and 10 cm diameter and 0.5 m length) will be placed within the four decomposition plots. Three Branches will be placed on the diagonal NE direction, 1 m apart from each other (Figure 4), with their position within the decomposition plot randomly allocated. A single branch of each size will be harvested at random from each plot after 6, 12, and 24 months (Dossa et al. 2016). After harvesting branches, mud, moss and insect frass should be brushed off before fresh and dry (after oven dried to constant mass) mass is measured with a balance (2 d.p.) A 2 cm thick disc should be cut from the middle and 5 cm from both ends to measure wood specific gravity following Williamson & Wiemann (2010). Since we anticipate changes in plots conditions over time, we will initiate a new rubber branch experiment at 0 mo and at 12 mo.

Frequency: year 1, year 2

Equipment required: data sheets, pencils, eraser, rubber branches, metallic tags, copper wire, paint (black), brush, callipers, compass, dbh tape, galvanised nails, balance (2 d.p.)

Reference cited

Braun-Blanquet, J. (1932) Plant Sociology, Transl. G. McGraw-Hill, New York.

Dossa, G.G.O., Paudel, E., Cao, K., Schaefer, D. & Harrison, R.D. (2016) Factors controlling bark decomposition and its role in wood decomposition in five tropical tree species. Scientific Reports, 6, 34153.

Keuskamp, J.A., Dingemans, B.J.J., Lehtinen, T., Sarneel, J.M. & Hefting, M.M. (2013) Tea Bag Index: A novel approach to collect uniform decomposition data across ecosystems. Methods in Ecology and Evolution, 4, 1070–1075.

Williamson, G.B. & Wiemann, M.C. (2010) Measuring wood specific gravity...Correctly. American Journal of Botany, 97, 519–524.

Appendices

Table 1: Baseline data

Surveyor:

Monitoring date:

Plot name: **Treatment(s):**

Questions for farmer

- Farmer's name: Age: Gender: M ▢   F ▢ (tick as appropriate)

When was the forest first cleared?	Year of clearance:	Second rotation ▢	Don't know ▢
How long was the period between clearing the forest and planting the trees?	Number of months:		Don't know ▢
When was the rubber planted?	Month / Year:		Don't know ▢
What variety of rubber was planted?	Variety (percentage):	Variety (percentage):	Don't know ▢
Were any intercrop trees planted? [highest percentage first]	Variety (percentage):	Variety (percentage):	Variety (percentage):
	Variety (percentage):	Variety (percentage):	Don't know ▢
What is the total area of the plantation?	Area (ha):		Don't know ▢

Completed by the team (also complete the planting measurements form)

Slope	Flat ▢ ; Gentle slope ▢ ; Steep slope ▢
Aspect (compass direction slope faces)	N ▢ ; NE ▢ ; E ▢ ; SE ▢ ; S ▢ ; SW ▢ ; W ▢ ; NW ▢
Elevation (m ASL)	
GPS coordinate of corner #1	
GPS coordinate of corner #2	
GPS coordinate of corner #3	
GPS coordinate of corner #4	

Table 2: Planting record

A record of all crops (including rubber) planted on the farm and the direct costs of the seedlings. Please complete a form for each treatment

Farmer's name:

Plot name: **Treatment:**

Activity: (**F**) first planting / (**B**) beating up (replanting

Date	Species / variety	Activity	Number of seedlings	Per seedling price

Table 3: Input record

A record of all inputs (chemical fertiliser, organic fertiliser, pesticide etc.) applied to the farm.

Farmer's name:

Plot name: **Treatment:**

Input: (**F**) fertiliser / (**H**) herbicide / (**I**) insecticide / (**M**) fungicide / (**P**) organic matter / (**O**) other - please specify
* Please specify the undiluted amount applied to the plot only

Date	Input	Product used	Crop / pest targeted	Total amount* (L / kg)	Total price

Table 4: Labour record

A record of all labour applied to the farm. Please enter the number of hours worked by the group, this will later be converted to the total number of person hours.

Farmer's name:

Plot name: **Treatment:**

Activity: (**F**) fertilising / (**W**) weeding / (**H**) harvesting / (**L**) land clearing / (**O**) other - please specify

Date	Focal crop	Activity	Hours worked	No. of people	Notes

Table 5: Revenue

A record of all revenue earned will be recorded from the treatment plots.

Farmer's name:

Plot name: **Treatment:**

Crop: the crop species
Product: (**C**) cup rubber; (**S**) sheet rubber; (**F**) fruit; (**L**) leaves; (**T**) timber (**O**) other, please specify in notes

Date	Crop	Product	Yield (kg)	Sale price (kg^{-1})	Buyer	Notes

Table 6: Rubber latex production

Assess the rubber output from each of the tagged trees.

Surveyor: **Farmer's name:**

Monitoring date:

Plot name: **Treatment:**

Tapping time start: **Tapping time end:**

Days since last tapped:

Tree tag #	Fresh latex (g)	Dry latex quantity (g)

Table 7: Rubber growth

Surveyor:

Monitoring date:

Plot name: **Treatment:**   **Transect:**

Height: only recorded for trees <4 m tall

Status: (**A**) alive / (**AB**) alive but below 1 cm DBH (e.g. resprout) / (**D**) dead / (**L**) leaning / (**F**) Fallen / (**N**) no leaves / (**B**) damaged / (**NA**) unknown or missing

Disease: (**1**) <5% / (**2**) 5-20% / (**3**) 20-40% / (**4**) 40-60% / (**5**) >60%

Tree tag #	DBH (cm)	Height (m)	Status	Panel Disease	Foliar Disease	Comments

Table 8: Intercrop growth

Surveyor:

Monitoring date:

Plot name: **Treatment:**   **Transect:**

DBH: Where it is not possible to measure DBH at 1.3 m, record the height of measurement
Height: only recorded for trees <4 m tall; * Only the tallest stem height is measured.
Status: (**A**) alive / (**AB**) alive but below 1 cm DBH (e.g. resprout) / (**D**) dead / (**L**) leaning / (**F**) Fallen / (**N**) no leaves / (**B**) damaged / (**NA**) unknown or missing

Tree tag #	DBH (cm)	POM (cm)	Height (m)	Status	Comments

Table 9: Grass-like cash crop growth

Surveyor:

Monitoring date:

Plot name: **Treatment:**   **Transect:**

DBH: Measured as close to the ground as possible. Requires pulling the leaves closely together
Status: (**A**) alive / (**D**) dead / (**N**) no leaves / (**B**) damaged / (**NA**) unknown or missing

Tree tag #	Length leaf 1 (cm)	Length leaf 2 (cm)	Length leaf 3 (cm)	Basal diameter (cm)	Status	Comments

Table 10: Soil macro-invertebrates

Surveyor:

Monitoring date:

Plot name: **Treatment:**

Table 11: Erosion

Surveyor:
Monitoring date:
Plot name: **Treatment:**

Table 12: Infiltration

Surveyor:

Monitoring date:

Plot name: **Treatment:**

Start minute	End minute	Start level (cm)	End level (cm)
0	5		
5	10		
10	15		
15	20		
20	25		
25	30		
30	40		
40	50		
50	60		
60	70		
70	80		
80	90		
90	110		
110	130		
130	150		

Notes

Table 13: Tea bag decomposition

Surveyor:
Monitoring date:
Plot name: **Treatment:**

Date digging in	Date digging out	Plot name	Treat ment	Bag ID	Red start (g)	Red end (g)	Green start (g)	Green end (g)	Comments (holes, string lost etc.)

Table 14: Rubber decomposition

Surveyor:

Monitoring date:

Plot name: **Treatment:**

Start date	End date	Branch ID	Start (g)	End (g)	Comments (broken, missing etc.)

Checklist for submission

	Check
Is the report less than 10MB? If so, please email to <u>Darwin-Projects@ltsi.co.uk</u> putting the project number in the Subject line.	Yes
Is your report more than 10MB? If so, please discuss with <u>Darwin-Projects@ltsi.co.uk</u> about the best way to deliver the report, putting the project number in the Subject line.	No
Have you included means of verification? You need not submit every project document, but the main outputs and a selection of the others would strengthen the report.	Yes
Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number.	No
Have you involved your partners in preparation of the report and named the main contributors	Yes
Have you completed the Project Expenditure table fully?	Yes
Do not include claim forms or other communications with this report.	