Emission Reduction Efforts in Jambi: Towards Nesting Approach

Substantive Report of REALU II- Indonesia

Atiek Widayati and Suyanto (editors)

World Agroforestry Centre –
ICRAF Southeast Asia Regional Program
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Cover photos
Atiek Widayati (left), Muhammad Sofiyuddin (right)

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Atiek Widayati

1.1 Introduction

1.1.1 REDD and land-based Nationally Appropriate Mitigation Action (NAMA)

Initiatives on climate change mitigation efforts have been developed over time through RED, REDD and REDD+. They have been discussed widely especially for the past six years since COP-13 in Bali in 2007. Debate hinged on challenges in developing incentive mechanisms due to the contentious definition of forest. Inclusion of other land uses and the identification of potential carbon sinks or CO_2 removal mechanisms were then reviewed. For accounting purposes, the Intergovernmental Panel on Climate Change (IPCC) guidelines (IPCC 2006) decided that accounting methods should include all sources of carbon pools (Agriculture, Forestry and Other Land Uses [AFOLU]) and emissions should be proportioned to the land-use sources from where they originated.

The Alternatives to Slash-and-Burn (ASB) Partnership for the Tropical Forest Margins seriously considered the inclusion of all sources of land-use based carbon pools and proposed the Reducing Emissions from All Land Uses (REALU) framework in this context. This framework consists of four pillars that reflect (1) the inclusion of emission reductions from deforestation and degradation (as in REDD), (2) emission reductions from peatlands, (3) enhancement of carbon sequestration and (4) emission reductions from agricultural activities (van Noordwijk et al 2009). The importance of recognizing indigenous people rights through 'free, prior and informed consent' (FPIC) was underscored as well as ensuring respect for national sovereignty within differentiated global responsibilities for assuring sustainable livelihoods and addressing climate resilience.

NAMA refers to a set of policies and actions that countries undertake as part of a commitment to reduce greenhouse gas emissions (GHGs). It is expected to be the main vehicle for mitigation actions for developing and combining attempts to facilitate activities such as low-emission enhancement. It was formally promulgated in Indonesia in 2010 in which emission reduction was targeted of as much as 26 percent below projections for 2020, with an additional 15 percent reduction subject to multilateral support. As part of the commitment, the land-based sector under Indonesia's NAMA includes REDD, emission reduction from peatlands and carbon sequestration in forestry and agriculture. Action plans to respond to the enactment are part of Presidential Regulation 61/2011 which established Indonesia's National Action Plan to Reduce Greenhouse Gas Emissions (RAN-GRK) under the coordination of the National Planning Board for Development (Bappenas).

1.1.2 *Nested emission reduction*

Nested emission reduction was introduced as a hybrid approach within the REDD scheme for accounting and for incentive mechanisms combining national- and sub-national-level projects (Angelsen et al 2008; Pedroni et al 2009). The arguments behind nesting lie in the search for the 'right scale' for the REDD mechanism (Angelsen et al 2008), where multiple projects might be involved at various sub-national scales as well as registration for credits through bilateral and multilateral channels at the national level. The scale is also reflected in capacities and governance systems that presumably vary across national and sub-national levels. If implementation is more promising at the sub-national level, there is potential for project implementation at sub-national and local levels which can be scaled up to the national level. This can then lead to extrapolating the successes for generating overall designs for national programs and to serve as guides for improving governance across all levels. For the REDD credit system, nesting will allow efforts to start as sub-national activities or projects and move up to the national accounting system while in some other instances it allows simultaneous credit mechanisms at the two levels (Angelsen 2008). As argued by Pedroni et al (2009), the nested approach will likely encourage developing countries to take national action faster than a top-down approach that risks losing time with a year-long readiness-building process.

A range of concepts under nesting within REDD+ have been widely discussed. However, the nesting approaches for all-land-uses through the NAMA mechanism and its sub-national derivatives have not been widely debated. For Indonesia, nesting approach under NAMA should take place in line with national and subnational governments' hierarchies. The approach has been exercised through ICRAF's involvement in the dynamics at national and sub-national levels. Both top-down and bottom-up approaches are implied in the processes and interactions. Conceptually, nested approach for Indonesia's context is proposed in which each level has specific roles with regard to negotiations and aggregation of plans and targets implying iterative processes (Figure 1.1.). REALU work in Indonesia contributes to the three levels through different roles and forms of engagement, which will be elaborated further in the following sections and chapters of this report.

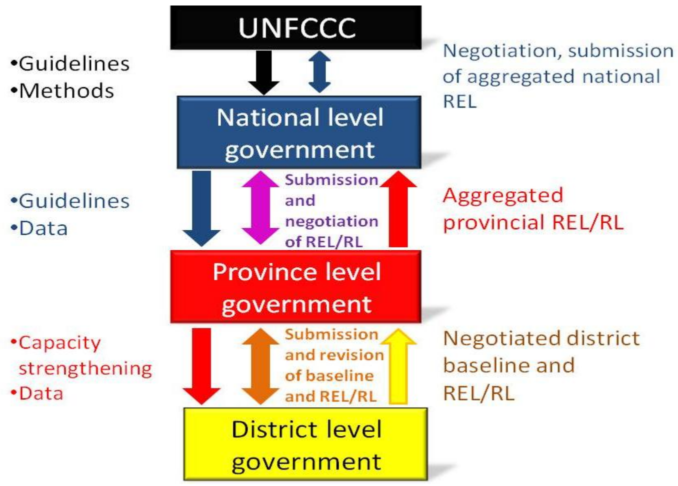


Figure 1.1 Nesting concept for all-land-use approaches proposed for Indonesia (Dewi, pers. comm.)

1.1.3 *National and sub-national engagements towards nested emission reduction*

In Indonesia, REDD discussions and processes have become a strong domain in the forestry sector, while the emerging NAMA with RAN-GRK was channeled through the national development planning sector. ICRAF Indonesia is involved in and contributes strongly to the various processes under RAN-GRK, mostly via capacity strengthening towards developing mitigation action plans. REALU Indonesia, together with other ICRAF projects and programs in Indonesia, has been actively supporting the various country-wide activities involving various government and non-government agencies. The Land Use Planning for Low Emission Development Strategies (LUWES) framework (Dewi et al 2011) and the software ABACUS SP (Harja et al 2012) were developed by the ICRAF Indonesia team and these tools have been adopted for calculating baselines and reference emission levels (RELs) and for simulating ex-ante mitigation scenarios.

At the provincial level, action plans are formulated under Sub-national Action Plans to Reduce Greenhouse Gas Emissions (RAD-GRK). The progress of RAD-GRK throughout provinces is at various stages, but overall is still embryonic. One of the priority provinces in the national debate, Jambi, is an area where ICRAF has long been engaged. In Jambi, the REDD+ mechanism has been making progress in the past few years while RAD-GRK only started recently. ICRAF is currently engaged with provincial stakeholders in Jambi in the design and development of 'Provincial Strategy and Action Plan on Emissions Reduction' (SRAP) under the REDD+ mechanism. In light of moving forward under the land-based NAMA at the sub-national level, ICRAF also aims at linking emission reduction strategies developed by both forces, by assisting them in developing RELs in their respective documentations. The REALU project has played a major role in implementing these initiatives and engagements have started through contributions to technical meetings and discussions towards developing formal provincial documentation.

Demonstration activities towards reducing emissions from all land uses and all sectors are mostly conducted in the more local context, where engagements with stakeholders and actors are realistically addressed. For Indonesia, district (*kabupaten*) is the level below province where regional autonomy takes place and where programs and development activities are operational. REALU Indonesia selected one district in Jambi Province as its demonstration landscape where emission reduction efforts are to take place. To serve 'demonstration' purposes, the selection of a demonstration landscape for REALU is key, because it should consider potentials for emission reduction targets yet pose sufficient challenges to represent a degree of complexities of emission reduction efforts at the Indonesian sub-national level. The designed activities should also take into account the adoption of ongoing efforts/programs, the local biophysical and sociocultural settings while introducing innovative ideas that overall are expected to improve the processes for better landscape management as well as governance.

Tanjung Jabung Barat (Tanjabar) District is a REALU demonstration landscape where ICRAF through the REALU project has been engaged since 2010 in project implementation. Through the diagnostic approaches in various assessments at the district level, understanding on feasibility towards low emission development (LED) and emission reduction strategies was successful and further initiatives towards intervention in different sectors with multiple stakeholders have been implemented.

1.2 Demonstration landscape

1.2.1 Tanjung Jabung Barat District as REALU demonstration landscape

Tanjabar District is located on the east coast of Jambi Province, bordering Riau Province in the north. The geographic location is 7.35S–102.64E and 1.45S–103.58E (Figure 1.2) and encompasses approximately 500 000 ha or 5000 km^2.

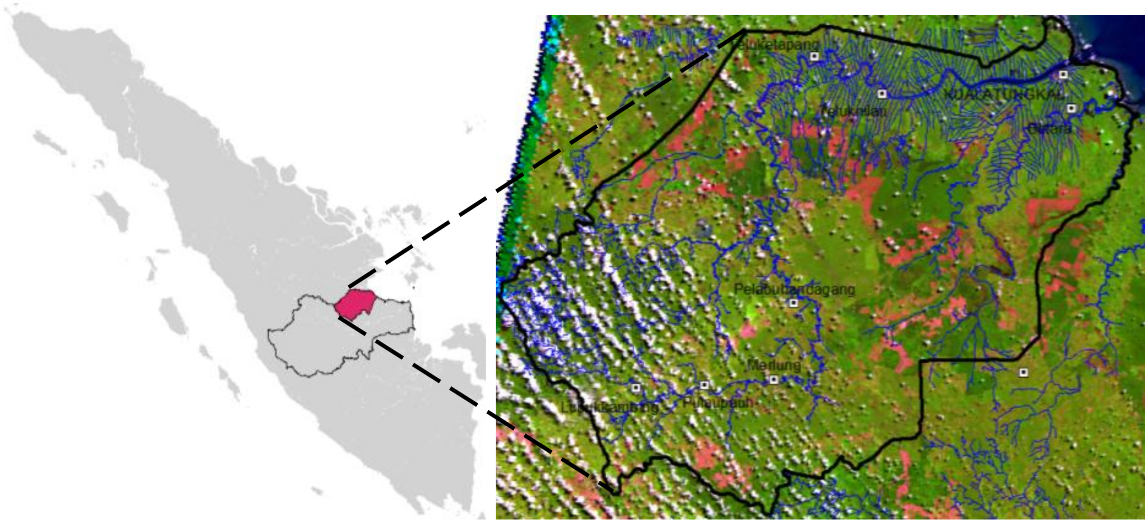


Figure 1.2 Location of Tanjabar District, Jambi Province, Sumatra, Indonesia

Approximately 40 percent of the district is peatland, falling roughly into three sub-districts (locally called *kecamatan*): Pengabuan, Betara and Bram Itam. The remaining 60 percent, in the southwest, is minerally-enriched land, dominated by podsolic, alluvial and grey hydromorphic soil. About 48 percent or 240 000 ha of the district is classified as 'forest area'. About 71 percent of this forest area is classified as production forest, 6.65 percent is protected peat forest and 3.66 percent is reserved for national parks. The proportion of 'non-forest area' in this district is very high; it is dominated by coconut agroforestry, rubber agroforestry, rubber monoculture and, most recently, oil palm plantation.

The district population is around 280 000 people, with a population density of 56 residents per square kilometre. Local people dominate the district's southwestern inland area, while migrants dominate the peat areas and coastal villages (in the northeast). Native residents' numbers have been increased through the influx of inland migrants from western or northern Sumatra who came to the region around 100 years ago. In lowland areas, early spontaneous migration came from South Kalimantan (ethnic Banjar people), South Sulawesi (Bugis people) and Java (Javanese), who arrived between 1930 and 1950. In both inland and lowland areas, transmigration from Java began around 1980 and continued up until 2000.

1.2.2 Summary of REALU feasibility and project design[1]

Diagnostic steps are needed prior to building scenarios, designing implementation activities and developing further engagements with the relevant actors on emission reduction action plans. For the REALU demonstration landscape in Indonesia, feasibility studies and design towards emission reduction efforts were completed in the first year of project implementation (Widayati et al 2011).

The objectives of the work were:

- To understand livelihoods and responses to landscape dynamics related to CO_2 emissions, land rights and forestry policies.
- To develop scenarios for LED based on consultation with local stakeholders.
- To assess the trade-off with, and impacts on, livelihoods implied through land-use changes both from historical changes as well as from the simulated changes as part of an LED scenario.
- To identify areas and find evidence that supports project intervention that is based on major drivers of land-use changes and emissions, which reflect REALU principles and are in line with or additional to ongoing local efforts.

Diagnostic steps to achieve the understanding on the backgrounds of emissions applied the REDD/REALU Site Feasibility Appraisal (RESFA) framework. The sampling scheme was designed to ensure representativeness of the district typology by taking into account the two important properties for land-use development in Tanjabar: major soil types (peatland and mineral soils) and types of community (local and migrants). Beyond the diagnostic appraisal, attempts were made to simulate future land-use dynamics including trade-off assessment under different scenarios conducted in the FALLOW modeling tool (van Noordwijk 2002). Based on the simulation results, RELs and emission reduction strategies were established. The policy instruments and institutional settings for REDD/REALU were reviewed in order to obtain comprehensive vision of the enabling conditions.

The discussions towards the intervention designs for REALU in Tanjabar were initiated with the establishment of RELs resulting from FALLOW simulation. The emission reduction strategy that reflects approaches and values proposed by REALU employs the simulated results of the REALU scenario, which reflects both reasonable emission reduction as well as low amounts of foregone economic opportunities relative to 'business as usual' (BAU) by 2020 (Mulia et al 2013). By considering the contribution of reduced emissions through avoided emissions and carbon enhancement, enabling institutional and policy baselines as well as local efforts, two potential intervention sites were proposed, each with strengths and challenges to be addressed: KPHLG (Peat Protection Forest) in the vicinity of peat forest remnants and KPHP (Production Forest Management Unit) Open Access areas in the western part of the district (Widayati et al 2011).

At the district level, emission reduction strategies should be part of development planning and participation of district multistakeholders should be ensured in developing the strategies. The LUWES framework established by ICRAF Indonesia is a framework that integrates the processes

[1] Conducted in 2010-2011 and has been reported in: Widayati A, Suyanto, van Noordwijk M(eds). 2011 Towards Reduced Emissions in a High-stake District- RELAU Project Design for Tanjung Jabung Barat (Tanjabar), Jambi, Indonesia, REALU Report

of identifying emission sources, calculating historical emissions, predicting future emissions by considering historical emissions and local development plans, setting up RELs and mitigation action plans, and determining an implementation strategy (Dewi et al 2011). LUWES was applied for Tanjabar to develop RELs, scenarios and mitigation action plans that involve multistakeholders in the district (Ekadinata and Agung 2011). One of the scenarios for emission reduction based on LUWES application in Tanjabar focused on the mitigation action plan in the KPHLG area. It spelled out cumulative aboveground CO_2 emission reduced to be 1.48 Mg CO_2/ha/year, or 27 percent reduction relative to BAU (Ekadinata and Agung 2011). This scenario provides high emission reduction target by still considering the realistic design of action plans. Local stakeholders involved indicated relevant activities under this action plan, which include three key activities: promote the concept of conservation/protected areas and their purpose to communities around the KPHLG, establish relevant local institutions to support the KPHLG, promote the value of *Dyera* species among local communities and explore its access to national and international markets (see Chapter 6 of this report).

Hutan Lindung Gambut (HLG) or peat protection forest is based on the Jambi Governor Decree (on 'peta padu serasi TGHK and RTRW' No. 108/1997) and the Decree of the Jambi Forest Agency No. 425.3/2350/Dinhutbun/2004 on 11 May 2004. The total peat protection area is approximately 16 065 ha. Some parts of HLG have been used by the local community as log transportation paths. Data from the district forest agency show that around 4624 ha have been occupied by local farmers for farming. Ditches and canals are built manually and semi-mechanically to regulate water flow and for transportation.

1.2.3 Demonstration landscapes as part of the nesting approach

As part of engagements in climate change mitigation efforts nationally, REALU Indonesia, together with other relevant programs and projects conducted by ICRAF Indonesia, participates in various discussions and processes in the development of national REDD strategies as well as capacity strengthening for emission accounting methods. At the same time, engagements at the sub-national level are implemented through demonstration activities to provide a foundation for emission reduction purposes in the demonstration landscape of Tanjabar District. At the sub-national demonstration landscape level, mini-nesting approaches are also applied, with engagements and activities taking place both at the district level as well as for 'focused intervention areas'. The conceptual framework of the entire set of engagements and activities in the demonstration landscape is presented in Figure 1.3.

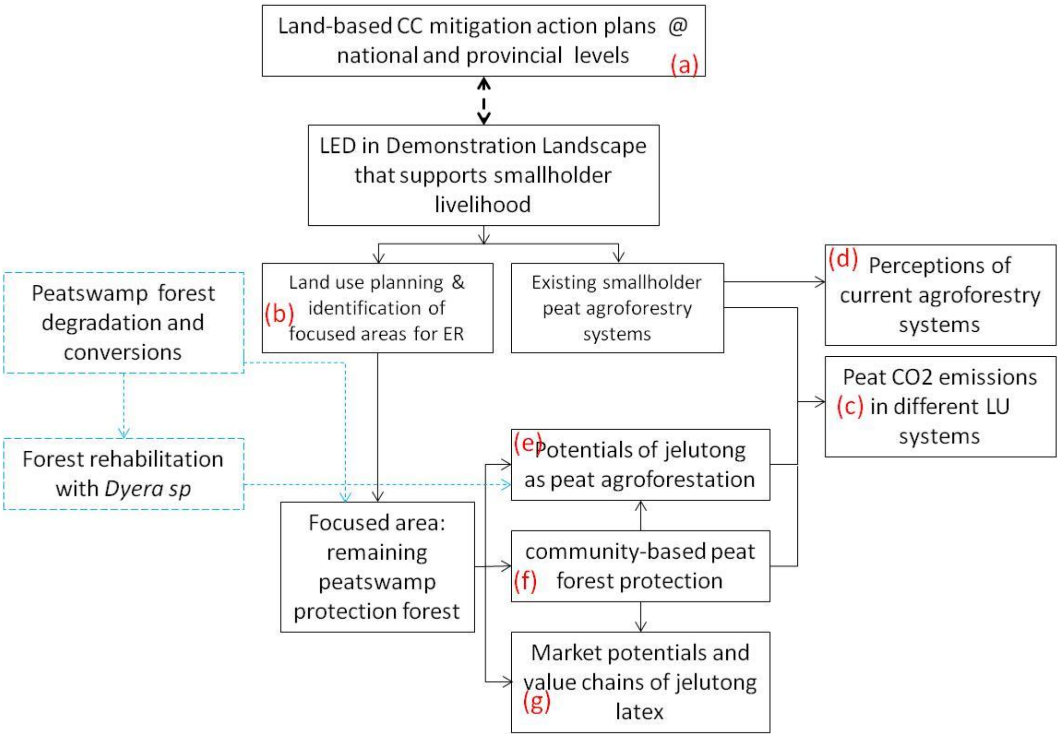


Figure 1.3 The conceptual framework for different work components in Tanjabar demonstration landscape
(Note: Letters in brackets refer to components listed in the framework in Table 1.1)

Implementation at the district level is carried out through dialogue with the District Spatial Planning Office (Badan Perencanaan Daerah- BAPEDA) for LED planning while the sub-district focused intervention area refers to the remaining remnants of peat swamp forest in which engagements with local actors have been initiated towards establishment of community-based peat protection forest. Juxtaposing these two processes, other pertinent activities are also designed to support emission reduction efforts. Smallholder mixed farming and agroforestry systems of various cash crops occupy a substantial area of the district both in the peatland area and the mineral soils area - approximately 120 000 ha in 2010. Industrial crop plantations have intensified with oil palm and acacia flourishing in the most recent decades. Perceptions of local farmers towards the current agroforestry systems have been assessed to observe the likelihood of maintaining these local commodities in the future as opposed to converting their lands to monoculture plantations. This has included assessment of endemic species of jelutong, the latex of which has good commercial value. Jelutong was once harvested widely by local farmers as a non-timber forest product (NTFP) from the peat swamp forest now referred to as Hutan Lindung Gambut (HLG) and recently has been promoted as part of the peat swamp forest rehabilitation thrust. Jelutong's market potential was also analysed as well as other enabling conditions for the jelutong replanting program. The other relevant assessments for Tanjabar's peatland area addressed understanding of belowground peat emissions due to conversions to agricultural crops. Elaboration on these subjects discussed in this report is provided in Table 1.1.

1.3 Report Outline

The report is structured to correspond with each of the sub-topics in Figure 1.3 and Table 1.1 and their interlinkages. Discussions at the national level, including REDD readiness for Indonesia are elaborated in **Chapter 2**, followed by observations on provincial-level dynamics, in this case Jambi Province in **Chapter 3**. Engagements at the district level towards LED planning are described in **Chapter 4**. Analyses on transaction costs for REDD mechanisms are found in **Chapter 5**. Efforts towards community forestry scheme in HLG area are also reported (**Chapter 6**) followed by perceptions on the potentials of jelutong and other smallholder agroforestry commodities (**Chapter 7**) and market potentials for jelutong (*Dyera polyphylla*) (**Chapter 8**). Initial findings and ongoing work on the estimation of peat emissions are reported in **Chapter 9**. **Chapter 10** synthesizes REALU II activities and how they can link to the next phase of REALU work .

Table 1.1 Objectives of various components of REALU project in Indonesia

Central hypotheses	Leading questions	Specific Objectives
(a)	Within REDD/REDD+/REALU arena at the national level, how is the dynamics? What is the state of readiness ? what are the costs implied in the emission reduction efforts?	
(a) Climate change mitigation processes addressing emission reduction in Indonesia have been progressing at the national level. The REALU project contributes to backstopping them through dialogue. Recently, initiatives at the sub-national level are starting (provincial level) through both the REDD+ pathway (SRAP) and the land-based sector of GHG reduction action plan (RAD-GRK). Backstopping activities at the provincial level is relevant and was emphasized in REALU II year 3 and it is important to eventually link-up with interventions for emission reduction taking place at the district level (demonstration landscape).	To proceed with the 'nested' approach in emission reduction strategies, what is the platform at the provincial level to govern emission reductions in Jambi Province as well as to link the national-level discussions and the mitigation actions at the district level?	Specific objectives: 1. To engage with the provincial REDD task force through participation in its agenda and in the write-up process of the provincial REDD+ strategy and action plan (*SRAP)* 2. To backstop and assist in establishing the nesting approach between national and sub-national land-based mitigation actions (NAMA & LAMA) through legitimate institutions and frameworks, i.e. RAD-GRK by: a. strengthening the provincial baseline and REL based on available maps and other relevant information b. connecting provincial- and district-level discussions in establishing baselines and REL, e.g. through support to provincial RAD in disseminating the discussions to districts. 3. To backstop dialogues between provincial RAD-GRK and the provincial REDD task force towards achieving synergies for the development of mitigation action plans by: a. reviewing the documents on RAD-GRK and SRAP b. discussions and consultations with both parties (RAD and SRAP) on linking their mutual baselines, REL and strategies
(b) For LED at the district level, after a series of capacity-strengthening exercises, iterations of	In moving forward with LED at the district level, what are the entry points/channels for negotiation?	1. To facilitate the revision of emission reduction scenarios for Tanjabar and Merangin districts based on the results of public consultations and to proceed with expressing the scenarios into their

technical assistance and joint efforts with local district offices in developing mitigation action plans, strategic approaches are needed to ensure that LED will be taken into account as a technical reference for district documentation.	What can be the minimum/ realistic targets to ensure the inclusion of LED in district spatial planning?	mitigation action plans 2. To align the technical documentation of district LED scenarios into formal district development planning frameworks by closely engaging with district administration/authorities in the LED formulation
(c) Land-use dynamics in Tanjabar peatland are dominated by both large-scale operators and smallholder farmers. Land management on peatland for farming inevitably includes construction of drainage canals which affect the peat and trigger belowground CO_2 emissions. Drainage canals in large-scale plantations are normally wide and deep with large spacing between major canals, while canals in smallholder farming are shallow and small, with smaller spacing in between.	Can management practices be associated with different rates of belowground CO_2 emissions? Do CO_2 emissions differ between conversions to smallholder farms and those to large-scale plantations? With limited data and resources what proxies that can be applied for such estimates? And eventually what are the estimated amounts of CO_2 emissions at the landscape level, *vis-à-vis* different land uses and scales?	1. To estimate emission rates per year for several major land cover types based on the peat subsidence approach 2.To improve peat emission rates obtained from stock differences by applying more accurate canal distances mapped by VHR imaging 3. To compare emission rates obtained from the subsidence method to those obtained from the stock difference approach 4. To explore the scaling-up approaches for the entire peatland area of Tanjabar: a. by finding relationships between information from VHR images and those from medium resolution images (Landsat) b. by distinguishing the spatial characteristics of canal drainage systems from each land cover type and applying the emission rate value to the particular land cover type to be scaled-up at the landscape level through the recent land cover map
(d) & **(e)** Existing farming systems in Tanjabar peatland include various smallholder agroforestry systems of, among others, coconut, coffee, betelnut. Rehabilitation of encroached areas in the remaining HLG also bears potential to be developed into agroforestry/mixed systems. Jelutong was one important NTFP tree in the past; it may hold potential to be part of a peat agroforest system in local farmlands. Perceptions on both existing mixed systems and the potential of jelutong as part of local	What are the perceptions of local farmers on the existing agroforestry systems? What is the potential for jelutong planting as part of the peat agroforestry system to be emission friendly? What types of mixed farming system are perceived to have potential for jelutong?	Specific objectives: 1. Related to HLG and jelutong planting a. to collect information on permitted tree and crop species in HLG referring to each zone, on NTFP policies for protection forest and on the future of the rehabilitation programme b. To obtain farmers' perceptions on the performance of current jelutong planting and their expectations in the future 2. Agroforestry potential in peatland areas a. To obtain farmers' perceptions on current mixed

farming systems are important for assessing future smallholder farming systems on peatland as opposed to the development of monoculture plantations of oil palm and acacia		farming/agroforestry systems and their preferences in this context in peatland areas (tree+cash crops+food crops, etc) b. To obtain farmers' preferences on tree species as part of mixed/agroforestry systems on their lands
(f) Sustaining the peat ecosystem is considered central to emission reduction activities in Tanjabar. Backstopping for the ongoing rehabilitation/restoration efforts are needed to combat the continuing degradation in the remaining peat swamp forest area. Despite the complex tenure issues due to land markets in the area on top of demographic characteristics, conditional land tenure is worth exploring and community-based peat forest co-management through HKm licences is considered the most feasible option. Assessments of realistic targets should be conducted and activities for achieving these licences should be well identified.	Within the target of reaching community forestry (HKm)/licences, what are the set of activities to be implemented involving farmers and the relevant authorities ?	Specific objectives: 1. Exposure and familiarization of local farmers on community-based forest management for protection forest through: a. socializing the relevant aspects of HLG, KPHLG, HKM, etc and interaction with forestry authorities b. lessons learned from established HKM groups 2. Continued facilitation for processes to propose for HKM permits with specific targets of formation of farmers' groups 3. Assessment and recommendations on enabling conditions for the HKM-aftermath for the benefit of HKM farmers, especially with regard to policies on forest management in HLG
(g) In the past jelutong was a favoured peat NTFP commercially attractive to local people and currently it is the 'champion' commodity to rehabilitate the peat swamp forest and has potential as a peat agroforestry commodity. Promotion of jelutong planting needs to be incorporated with information on and links to markets and other value chain actors	What recommendations can be given to both local authorities and farmers on market potential? What recommendations can be given to forestry authorities concerning market barriers?	Specific objectives: 3. Continued assessments fof market access and value chains of jelutong for providing recommendation to the local partner (DisHut) and KPHLG institutions a. To explore market access and potential links between supply and demand sides b. To assess NTFP policies related to management in other HLG areas and to those present as barriers for marketing NTFPs/agroforestry products c. To assess the effects of further postharvest processing at village/district levels on the value chain and policies

2 Emission reduction efforts in Indonesia: processes and readiness at national level

Suyanto, Putra Agung, Feri Johana

2.1 Background

Indonesia has made an international commitment to unilaterally reduce greenhouse gas (GHG) emissions by as much as 26 percent below projections for 2020 independently with an additional 15 percent reduction planned via multilateral support. The independent commitment of 26 percent is at the core of Presidential Regulation 61/2011 on Indonesia's National Action Plan to Reduce Greenhouse Gas Emissions (RAN-GRK). The National Planning Board for Development (Bappenas) is to coordinate with all provincial governments in developing their Subnational Action Plans to Reduce Greenhouse Gas Emissions (RAD-GRK). More than 80 percent of the emission reduction target comes from the land-based sector (agriculture and forestry). Another 15 percent is implemented through multilateral mechanisms such REDD/REDD+.

2.2 Indonesia's engagement in and readiness for REDD/REDD+

2.2.1 *REDD/REDD+ in Indonesia: historical perspectives*[2]

Indonesia addresses policies on REDD+ through several negotiations at international forums; adoption is carried out after discussions both in-country and at the regional (Asia–Pacific) level. Policies are developed and promulgated following analysis of regulations, working group results and the terms of new agreements, in addition to demonstration activities supported through bilateral cooperation or multilateral collaboration.

The plan to allow all countries to participate in the reduction of GHG emissions emerged at the Montreal Summit on Climate Change in 2005. At the 11th session of the United Nations Framework Convention on Climate Change (UNFCCC), deforestation was raised as an issue to be addressed under the agenda of 'Reducing Emissions from Deforestation in Developing Countries'. Most parties have responded positively and this has raised the significant issue of how national circumstances can be accommodated in a fair and equitable manner in the context of addressing forestry issues under the climate change convention.

Following up on the Montreal decision, Indonesia hosted communication, coordination and consultation events on REDD-related issues. The Indonesia Forest Climate Alliance (IFCA) was formed to complement preparations for COP-13 in Bali in 2007. IFCA conducted a study that resulted in a framework for reducing emissions from deforestation and forest degradation. The framework serves as the basis to formulate forest policies, establish pilot projects and develop appropriate methodologies through research-related initiatives. The published version—

[2] Primarily based on Maryani R, Agung P and Suyanto S. 2012. *REDD+ in Indonesia: a historical perspective*. Working paper 154. 20 p, ICRAF

Consolidation report: reducing emissions from deforestation and forest degradation in Indonesia—was issued by the Ministry of Forestry in 2008.

COP-13 adopted two decisions, namely the 'Bali Action Plan' as Decision 1/CP13 Para 1 (b) (iii) and 'Reducing Emissions from Deforestation in Developing Countries: Approaches to Stimulate Action' as Decision 2/CP13.

In Decision 1 the concept of REDD+ was identified in the following statement as: "Policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries".

Together with Decision 2, COP-13 raised five issues which were contentious for many countries: (i) scope—what should be included in the definition of REDD; (ii) measurement, reporting and verification (MRV); (iii) rights of indigenous people (IP); (iv) financing options; and (v) institutional arrangements—whether REDD activities were to be considered at national or project levels.

Regarding scope, parties debated whether this pertained to conservation and sustainable management of forests, enhancement of carbon stocks in developing countries and whether it applied to forestry per se or all land use and land-use change and forestry (LULUCF). Biodiversity and social benefits were two other key scope issues. For IP rights there was a suggestion to include indigenous people and local communities as stakeholders, and the extent of their rights would include participation, land tenure and distribution of funds. In terms of financing, dialogue revolved around whether REDD should be financed through governments via capacity building support, via a fund established under the COP umbrella or via market funding such as allowance auctions, carbon credit markets and so forth. In the context of institutional arrangements, there was concern about whether REDD should fall under Nationally Appropriate Mitigation Action (NAMA), but with the limitation of not being eligible to receive funding from market mechanisms. *Vis-à-vis* MRV delegates pondered how to address issues related to setting baselines for emission reference levels, addressing leakage and permanence, as well as additionality.

To follow up on the COP-13 decision, Indonesia introduced a phase-based approach and developed the REDD Readiness Strategy. Three phases were set for the period extending from 2007 to 2012. In Phase 1 (2007–2008) the current status of the national scientific base and REDD policy were analysed. The President formed a National Council on Climate Change or *Dewan Nasional Perubahan Iklim* (DNPI). Among its tasks, the Council was expected to create consensus around opportunities and challenges related to climate change. It had a mandate to assist the country in building a cohesive national position in the international negotiations under the Bali Action Plan.

Phase 2 (2009–2012) has been the testing period for strengthening the scientific base and policy support for REDD implementation. In this phase, the government issued regulations in connection with REDD, signed agreements with several parties and established various pilot projects. In addition, the government also established working groups and task forces to facilitate the phase of REDD implementation after 2012, subject to the outcomes of the COP meeting in Durban, South Africa in 2011.

2.2.2 *REDD readiness and good forest governance*[3]

Land use and the forestry sector are the main targets for the REDD approach, with the latter taking the leading position. Efforts to reduce emissions thus primarily relate to readiness levels, the levels of institutional commitment and infrastructure status in the forestry sector. Arcidiacono-Bársony et al (2011) reported that emission reduction efforts under REDD stemmed from addressing the driving forces of deforestation and degradation and three key issues were identified : tenure arrangements, the structure of forest governance and the effective participation of stakeholders, particularly IPs and local communities; the latter, as stakeholders directly affected by REDD, was presumably identified owing to the closeness and locality of their livelihoods and other strategies and rights affected by the presence of forest. As a result, most of the work carried out by researchers focuses on REDD+ impact at the local level, especially effects on communities' rights (Galudra et al 2011). Nonetheless, forestry policies in Indonesia are primarily formulated at the national level and are channelled to sub-national (provincial and district) levels via various pathways and arrangements. Consequently it is crucial to assess REDD readiness from the broader perspectives of forest governance in unison with widely discussed local issues.

The six domains of REDD readiness consist of planning and coordination, policy and legal institutional frameworks, demonstration/pilot projects, MRV and auditing, financing and benefit-sharing mechanisms (Minang and van Noordwijk 2013). These domains are linked to the four principles of good forest governance and how REDD+ readiness can help to reform current forest governance, especially in the context of two major issues: forest tenure and land-use planning (Figure 2.1).

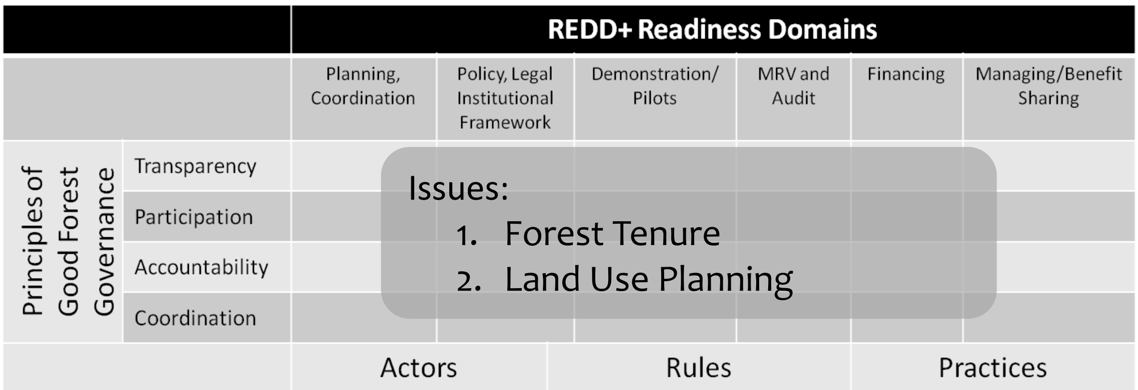


Figure 2.1 REDD+ readiness domains (Source: Agung et al, under review)

As concluded by Agung et al (under review), the government has been engaged in a wide range of efforts aimed at readiness to implement REDD schemes and progress has advanced relatively well, despite the variations across the six domains. Two domains are considered to have made better progress than the other four, namely demonstration and pilot projects and policies, and

[3] Primarily based on Agung P, Galudra G, Suyanto S. (under review) Reform or reversal: The Impact of REDD+ readiness to forest governance in Indonesia. Submitted to Climate Policy.

legal and institutional frameworks. At least 40 demonstration activities are underway in different parts of Indonesia and are attached to various local and international organizations (Figure 2.2).

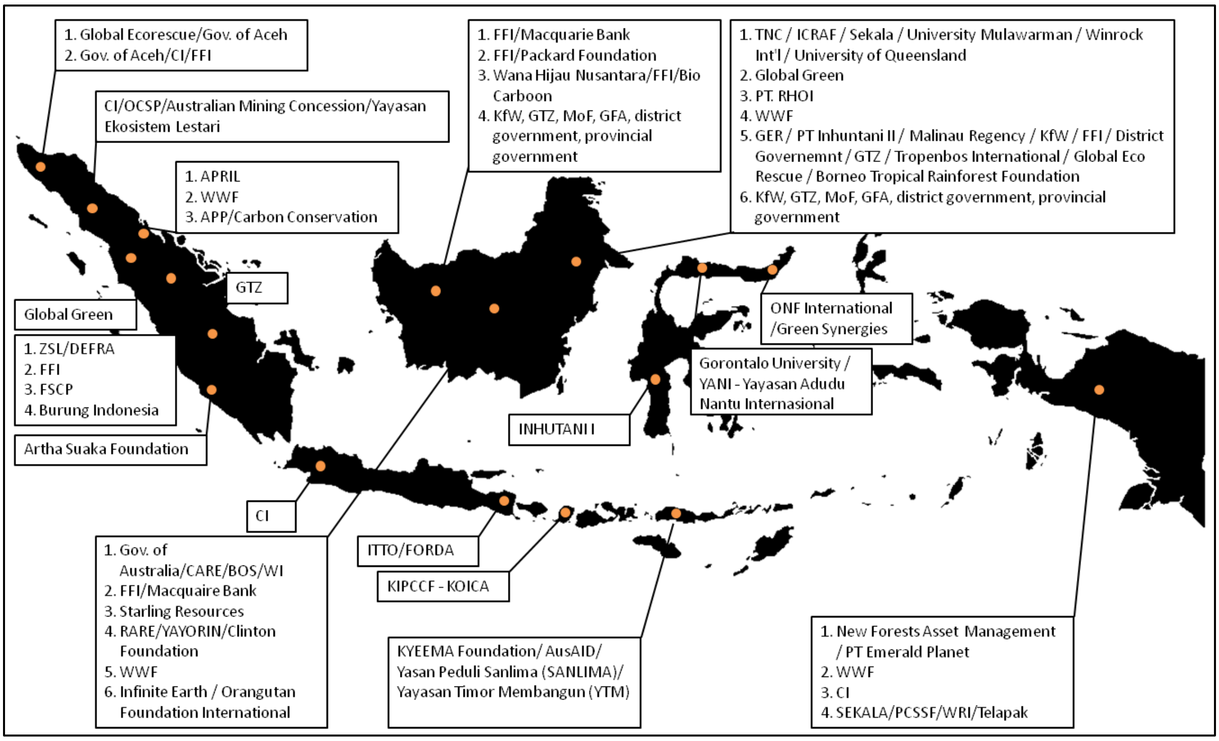


Figure 2.2 REDD+ readiness project site distribution (Source: CIFOR and Ministry of Forestry)

It was also concluded that the REDD+ readiness phase has good potential to reform forest governance in Indonesia, although contributions and the assistance of various bilateral and multilateral cooperative schemes for Indonesia are expected to continue to play a role to ensure success.

Tenure is important for REDD+ implementation to determine who can claim ownership and the ecosystem services provided by forest and other potential benefits from REDD+ schemes. Through the readiness phases, REDD+ instruments are being used to improve forest governance. Developing the REDD+ social safeguard during the readiness phase provides an opportunity to strengthen IP and local community engagement in forest resource management.

The nexus of REDD+ and spatial planning evidences a promising direction through which several regulations and existing spatial planning instruments can serve as effective monitoring tools for development processes, which include REDD+ implementation. Mitigation efforts in Indonesia now also include NAMA, channelled through 'Plans for Reducing Greenhouse Gases' at national and sub-national levels (RAN/RAD GRK). Synergies between REDD+ and RAN/RAD GRK are expected to be the efficient means for reducing emissions from all land uses that extend beyond forests and peatlands. In addition, integration of the two systems will contribute positively to the allocation decisions over forest areas and to forest planning instruments as well.

The readiness phase provides an opportunity for sub-national governments to develop their own planning on emission reduction efforts as contributions to the national pledge through Provincial Strategy and Planning on REDD+ Implementation (*Strategi dan Rencana Aksi Propinsi* or SRAP) as a *Stranas REDD+* derivative. Some challenges towards achieving good governance reform are recognized and these relate to the processes and structure of forest governance and how policies are implemented as instruments of governance according to state, private and civil society organization stakeholders.

2.2.3 Indonesia's National Action Plan to Reduce Greenhouse Gas Emissions (RAN-GRK)

The National Action Plan for Greenhouse Gas Emission Reduction (RAN-GRK) is a concrete step taken by the government to reduce GHG emissions. It materialized after the president's speech at the G-20 meeting in Pittsburgh, USA on 25 September 2009. RAN-GRK was legalized through the issuance of Presidential Regulation No. 61/2011 on the National Action Plan for Greenhouse Gas Emission Reduction (RAN-GRK), which is a working document that contains measures to reduce greenhouse gas emissions in Indonesia. The President's Regulation was followed by the issuance of Presidential Regulation No. 71 of 2011 on the Implementation of Inventory of National Greenhouse Gas (GHG).

RAN-GRK was developed to achieve national and sectoral targets, guidelines and priority actions for climate change mitigation. RAN-GRK consists of core activities and supportive activities to reduce GHG emissions and clear targets on reduction efforts for each sector. Key sectors in RAN-GRK are forestry and peatland, agriculture, energy and transport, industry and waste management.

The development and establishment of reference emission levels (RELs) is vital for emission reduction efforts. Determination of RELs results from discussion with stakeholders and is supported by in-depth analysis that takes into account the history of past emissions and future considerations in an equitable manner. Stakeholders must agree to a specific REL that describes the conditions that will ensue and transparently indicate how emission reduction targets will be implemented nationally.

RAN-GRK has mandated sub-national governments (provincial level) to develop a Province Action Plan for Reducing Greenhouse Gas Emissions (RAD-GRK). The substance of RAN-GRK is the basis for every province in developing RAD-GRK and the document itself is determined by the Governor Regulation. RAD-GRK preparation is expected to be a bottom-up process that describes how steps will be taken for every province to reduce GHGs, in the context of provincial capacities, resources and development plans. In addition, each provincial government needs to calculate the GHGs, emissions reduction targets, and how to reduce emissions from different sectors. However, the provincial government still has to ensure that the reduction of GHGs in the region still contributes to reduction targets at the national level.

2.3 What`s next?

The next step in emission reduction efforts is to design a performance-based monitoring, evaluation and reporting (MER) system at the national level. This is very important in evaluating the impact of the action plan, and performance, in terms of estimating the volume of emission reductions compared to the reference emission level. The system needs to be transparent, internationally accepted and standardized for independent bodies to conduct verification. An MRV system has yet to be designed for Indonesia. Guidelines for monitoring are indicated in COP decisions (2/CP13 and 4/CP15) that require the use of a combination of remote sensing and ground-based forest carbon inventory approaches for estimating forest-related GHG emissions by sources and removal by sinks, forest carbon stocks and forest area changes. Guidelines and modalities for reporting and verification are still to be developed and agreed on by the UNFCCC's Conference of Parties. However, as RAN-GRK is a national program, there is a strong argument that the standard for MRV could be national instead of international. There is a significant challenge in developing a simple MER system for RAN-GRK (a national standard) that still complies internationally.

At this juncture, the RAN-GRK secretariat is preparing to develop an MER system for the RAN/RAD-GRK land-based sector. ICRAF through different projects, including the Reducing Emissions from All Land Uses (REALU) project, is actively helping the RAN-GRK secretariat in designing and testing an MER system. Human capacity for implementing MER both at national and local levels is still weak, so an intensive series of training courses is required to address this deficiency.

3 Provincial commitment for climate-nested governance: governing forest and carbon through REDD+ and NAMA in Jambi

Gamma Galudra, Ratna Akiefnawati, Putra Agung

3.1 Introduction

There are opportunities for reducing greenhouse gas (GHG) emissions across all sectors of the economy and over a wide geographic area, but emissions from forest and peatland conversion predominate, incurring considerable public debate. With the advent of REDD+, the introduction of an Indonesian action plan for emissions' reduction under the remit of the Nationally Appropriate Mitigation Action (NAMA), and the potential for increased financial flows into carbon-rich landscapes, the question of how to relate national commitment to local context and effective implementation is more important than ever.

For effective implementation, nested governance becomes important with regard to relating national commitment to sub-national context. Nested governance occurs through decision-making processes at national, provincial and district levels. Nevertheless, such decision-making processes at multiple levels will also need to relate to each other across scales, such as between NAMA and REDD+. Through Presidential Regulation No. 61 and 71, 2012, the Government of Indonesia (GoI) has pushed local governments, either at provincial or district levels, to plan emissions' reduction as part of national commitment under NAMA. The presidential decrees provide guidelines for local governments to develop such plans, which are known as RAD-GRK.

Conversely, the GoI has also published the National Strategy for REDD+ (Stranas REDD+). Like RAD-GRK, it needs to translate its implementation to the local level. Such commitment to reducing emissions through REDD+ has been incorporated in a Letter of Intent between Indonesia and Norway. Around 11 provinces have agreed to participate in REDD+ implementation and Jambi is one of them. This initiative at the provincial level is referred to as SRAP.

This chapter aims to explain the process of planning emissions' reduction via the REDD+ and NAMA thrusts. Both intend to reduce emissions for climate change mitigation and many scientists and activists are hoping that they could change existing forest governance in Indonesia; however if they are not integrated properly, confusion in implementation and conflicts will result. Two analyses are presented: 1) the implementation strategies of the programs and 2) gaps between them as well as their methods of implementation.

The assessment targets the sub-national level in Jambi Province and enables better understanding of various actors' strategies involved in shaping and negotiating REDD+ and NAMA; further, it identifies what they are seeking to achieve. Comparison is made by discussing (1) the objectives and action plans to reduce emissions, based on analysis of deforestation drivers; (2) agreed mechanisms, including provincial accounting of emissions and incentives; and (3) transparent regulations, such as regular monitoring and sanctions of failure.

3.2 Nested climate governance: strengths and limitations

Nested governance implies achieving multilevel, multi-actor governance. It is based on the extent to which actors participate in shaping rules about forest use, and to what extent each form of governance reflects different interests. The first approach involves nested institutions (Ostrom 1990, 1995). The concept of nested institutions is sometimes visualized as a Russian 'matryoshka' doll, where each local set of rules and incentives fits within rules and objectives set at larger scales (regional, national and international) (Angelsen et al 2008). Ideally, the nested approach will be established so that the same rules apply to everyone. However, this approach will depend on how clearly rules are defined—for example, clear objectives (to reduce deforestation and forest degradation), agreed mechanisms (to provide incentives via carbon credits) and transparent regulations (such as regular monitoring, and sanctions for failure).

A risk of using the nested approach is that this system is used for managing resources at different scales under one general set of rules. It does not always acknowledge local perceptions of forests or local political processes or reflect the complexity of local rule-making (Forsyth 2009). There is a perception that nested governance will only lead to a top-down approach, setting a certain rule at the national to lower level. Climate change mitigation requires not only new technologies and financial incentives but also the critical prerequisite of appropriate governance. This means it requires nested governance including decision-making processes at multiple scales and across scales, including the coexistence of various forms of governance such as community-based natural resource management (CBNRM). Therefore, the recognition of forest people's rights could lead to this appropriate form of governance (Sikor et al 2010). To ensure that nested governance is a bottom-up approach involving multiple actors, Pedroni et al (2009) propose that an emission reduction system should also be built on sub-national accounting of emissions. This includes project-level accounting as well as conservation by private companies or communities.

3.3 What lies beneath: the political process behind NAMA and REDD+ in Indonesia

The GoI has issued a policy regarding global climate change agreement through a commitment to reduce emissions by 26 percent in the context of the construction 'business as usual' scenario (BAU) by 2020 via independent funding sources, without sacrificing other development sectors, or by 41 percent if international funding is obtained.

Achieving the long-term goals of the REDD+ Strategy involves building a platform for sustaining the five main pillars of the national program strategy, namely: (1) institutions and processes, (2) legal and regulatory frameworks, (4) strategic programs, (5) modifying paradigms and work culture, and (5) synergy among all parties.

At the sub-national level in Jambi Province, the fifth pillar of the program in the REDD National Strategy involves elaborating more detailed reference and operational guidelines in the Provincial Strategy and Action for the implementation of REDD+ according to the region's characteristics and problems related to deforestation and degradation forest in Jambi Province. Based on Presidential Regulation No. 61/2011, the province is required to prepare RAD-GRK but it is important to ensure consistency between RAD-GRK and SRAP for REDD+ implementation.

Implementation of the REDD+ National Strategy is being executed in accordance with the developmental stages of readiness and guided by the National Action Plan Document for REDD+ and Business Plan Document for the National REDD + Strategy Document. The third document refers to the preparation of a Strategy Document and Action Plan for Jambi Province (SRAP REDD+). SRAP REDD+ Jambi will be the main foundation and strengthen the implementation of RAD-GRK in Jambi Province, conceived and established by Jambi Governor Regulation No. 36 of 2012 as well as REDD+ SRAP Jambi Province Governor Decree No. 352/KEP.GUB/SETDA.EKBANG & SDA-4.2/2013.

3.4 About Jambi: deforestation, emission and opportunities for emission reductions

Jambi's land area covers 53 435 km^2 and it is home to 3 092 million people. Economic growth in 2010 reached 7.31 percent. The province has nine districts and two cities. Jambi is committed to the development of low CO2 emissions and thus contributes to higher national-level initiatives in this respect. Jambi is one of the 11 provinces in the SRAP REDD+ pilot study in Indonesia. Support and commitment by the provincial government related to climate change mitigation efforts involve preparation and adoption of RAD-GRK, the creation of a regional commissioner for REDD+, preparation of development strategies regarding low carbon emissions as well as backstopping international research institutions, government and non-governmental organizations and local governments in preparation for SRAP REDD+.

Forested area in Jambi encompasses ± 2 179 440.00 hectares or 42.73 percent of the total land area. In 2010, forest area with forest cover amounted to 29 percent or 1.401 million hectares, the remainder being forest land without forest cover (Ministry of Forestry 2011). Primary and secondary forest total 285 000 hectares and 1.0063 million hectares respectively and approximately 540 100 hectares are located in natural reserve areas and conservation areas (Ministry of Forestry 2011). Forest conservation in Jambi Province has strategic significance for both Indonesia and the world, owing to extensive natural forest in the four national parks: the National Park of Kerinci Seblat (TNKS), which has been designated as a World Heritage Site; the National Park of Berbak, which is a Ramsar Convention wetland site with peat–swamp forest landscapes that are relatively intact and the largest in Southeast Asia; the National Park of Bukit Duabelas; and the National Park of Bukit Tigapuluh. Thus Jambi Province has a very important role in addressing the carbon cycle and serving as a global biodiversity reservoir.

Similar to other provinces in Indonesia, Jambi Province faces pressure from land use, land-use change and forest (LULUCF) issues that contribute to global warming. The rate of deforestation and degradation in Jambi Province within and outside the forest area reached 76 522 hectares and 9431 hectares per year respectively in the period 2006–2009 (Ministry of Forestry 2011). Drivers of deforestation and forest degradation are usually defined as overexploitation and conversion of natural forests and peatlands into production forests (industrial timber, oil palm plantations), infrastructure development and mineral and coal mining; other significant factors are illegal logging, forest fires and encroachment of protected forest area.

Economic development in Jambi still depends on the abundance of its natural resources, both renewable and non-renewable that are sourced through farming, forestry, agriculture, and mining. In 2010 the Gross Regional Domestic Product (GRDP) at constant prices based on oil and gas supplies amounted to more than IDR16 272 trillion, or if non-fossil fuel-based, around IDR14 662 trillion with a growth rate of 6.56 percent (BPS 2010). Forestry, agriculture and plantations have a major role in shaping the structure of Jambi's economy and are expected to expand. Economic growth in 2009–2011 was driven by these sectors.

The REDD+ SRAP for Jambi (2012) indicated that the province could reduce its GHG emissions by more than 55 mega tonnes of CO_2e, including 47.3 mega tonnes of CO_2e or 86 percent of peatland conservation and LULUCF to 2030, or an average of 1.58 mega tonnes of CO_2e per year. In this context, reduction of 48 percent or 26.4 mega tonnes of CO_2e can be pursued through the conservation of peatland and 38 percent or 20.9 mega tonnes of CO_2e via LULUCF. There are five major carbon reduction opportunities that represent more than 85 percent of the total emission reduction potential in Jambi:

- Preventing the burning of forests and peatlands (15.3 mega tonnes of CO_2e annual emissions by 2030);
- Reducing deforestation by introducing policies for land allocation and generating more effective and sustainable increases in agricultural productivity (14.5 mega tonnes of CO_2e annual emissions by 2030);
- Rehabilitating peatlands that are not used or degraded (10 mega tonnes of CO_2e);
- Managing forests sustainably (four mega tonnes of CO_2e annual emissions by 2030), and
- Reforestation (two mega tonnes of CO_2e annual emissions by 2030).

3.5 REDD+ and NAMA in Jambi

With regards to REDD+ strategies at the provincial level, the Jambi Provincial Government (JPG) has passed a new decree, Jambi Province Governor Decree No 386/Kep-Gub/Ekbang & SDA/2011 on the Local Commission of REDD+ in Jambi Province. This commission will develop a Strategy and Action Plan for REDD+ as a policy guideline for emissions' reduction from deforestation and degradation, carbon conservation, forest carbon enhancement and sustainable forest management. Unlike RAD-GRK, actors for developing REDD+ in the province are dominated by several members from NGOs and the academe. Moreover, the leading agency for developing this strategy is the Economic Development and Natural Resource Section of the Provincial Secretary.

Under the NAMA approach, JPG endorsed Governor Regulation No. 36/2012 (a provincial action plan on emissions' reduction) as support to national commitment on NAMA. The objective of this action plan (also termed as Locally Appropriate Mitigation Actions - LAMA) is for all provincial government offices to identify and adjust their programs to support NAMA. RAD-GRK is a guideline for provincial government offices with regard to planning, implementation, monitoring and evaluation *vis-à-vis* emission reduction action plans. This regulation is also mandated to district government offices for development of LAMA at the district level. RAD-GRK is spearheaded by the Provincial Environmental Offices (BLHD) and the Indonesian Regional Body for Planning and Development (BAPPEDA) while members come from the following government offices: Forestry Office, Crop-Estate Office, Mining Office, Agricultural Office and Land Administration Office. Besides reducing emissions from forests and peatlands, this document also targets lowering emissions from the agricultural, energy, transportation and human waste sectors. In the context of REALU, however, we only focus on forestry and peatlands as those two represent the land use based emission activities.

Both of these documents target reducing emissions from deforestation and degradation, but here we will examine and compare to what extent these two documents are being applied to the nested-climate governance mechanism. We source Forsyth (2009), Sikor et al (2010) and Pedroni et al (2009) for the relevant variables and Table 3.1 reviews and compares RAD-GRK and SRAP based on their frameworks.

Table 3.1 Comparison and review of RAD-GRK and SRAP based on the nested-governance framework

Framework	RAD-GRK	SRAP
	Objectives and action plans	
Objectives	The aim is to develop LAMA to support national emission reduction up to 26 percent by 2020 from the forest and peatland, agriculture, transportation, industry and human waste sectors.	The aim is to develop a provincial REDD+ strategy to support national emission reduction beyond 26 percent to 41 percent by 2020 from forest, peatland and agriculture sectors (related to forest conversion).
Drivers of deforestation	Categorize into two groups: government and community. In the government component, licences and permits for forest conversion for other land-use systems; community component: shifting cultivation and forest conversion. The document identifies the underlying causes of deforestation: conversion of forest to oil palm, forest plantations/concessions, illegal logging, forest fire, migrants, land conflicts and the loss of traditional values.	Using fishbone analysis, the document divides the causes of deforestation into planned and unplanned activities. For example, forest plantation, forest occupation by migrants and conflicts, failed forest rehabilitation, forest fire, forest conversion to oil palm plantation, transmigration and coal mining. Interestingly, most of the forest conversion stems from the implementation of provincial spatial and development planning. The document also identifies where deforestation occurred at least at the district level.
Action plans	The document has identified 20 mitigation action plans that will curb drivers of deforestation. In summary: facilitate and develop three forest management units, restructuring of forest industry, forest gazettement, forest rehabilitation, CBFM development, forest fire prevention, law enforcement, forest protection patrols and forest plantation. Each of these action plans has emission reduction targets and is nested in current government programs. However, there is no indication how these action plans will be distributed to the district level and where they will be put, for example, the development of CBFM. This will lead to uncertainty on how monitoring (of meeting emission targets) in the action plans will be accomplished. No involvement of private companies to support the provincial emission reduction action plans is	The document has identified five mitigation action plans that will curb drivers of deforestation. In summary: forest and peatland fire prevention, effective allocation permits, rehabilitate degraded peatland, sustainable forest management and forest rehabilitation. Each of these action plans has an emission reduction target and some are being nested in the REDD pilot project. A number of these plans are more site-specific at the district level. No involvement of private companies to support the provincial emission reduction action plans is mentioned in this document.

	mentioned in this document.	
	Agreed mechanism	
Provincial accounting of emissions	The data used for calculation come from DNPI (2010) who calculated historical forest and land-use change from 2000 to 2005 and linear historical projection until 2030. The action plans also put some figure on how much these actions will actually reduce emissions. Unfortunately, no provincial emission calculation was used.	The data used for calculation come from DNPI (2010) who calculated historical forest and land-use change from 2000 to 2005 and linear historical projection until 2030. The action plans also put some figure on how much these actions will actually reduce emissions. Unfortunately, no provincial emission calculation was used. Several REDD pilot projects have developed emission baselines but it is uncertain how they will be also nested into the provincial emission calculation and emission target reduction.
Financial incentives	The action plans also place some budget expenditure for implementation. Nevertheless, there is no clear indication where the funding will come from, either from the national state budget or provincial state budget.	There is no clear indication of how these actions will be financed.
	Transparent regulations	
Rights and governance	CBFM is being recognized as part of the programs including how much they will contribute to emission reduction, but it is still uncertain how many will be developed. Involvement of communities is being prioritized but there is no clear guidance on how their roles will be linked with the program.	CBFM is mentioned but the document does not mention its contribution to emission reduction targets. The importance of these actions being integrated into spatial and development planning is mentioned but it is uncertain how these actions are being nested into government planning. Several regulations are identified to support this objective.
Regular monitoring	No clear indication of how these action plans will be monitored, a clear monitoring design, and institutions in charge. No timeframe when these action plans will start and end.	The document discusses developing monitoring design including deforestation, land cover change, emission factors, terrestrial and spatial databases and safeguards. It also develops the timeframe for emission reduction action plans to 2030.

Sanctions for failure	As there is no monitoring scheme, there are also no sanctions if these actions fail to meet their targets as well as no further remedial actions	No sanctions if these actions fail to meet their targets as well as no further remedial actions.

3.6 What lies ahead: bridging the gap toward nested climate governance

Both RAD-GRK and SRAP have the same purposes and can work complementarily. RAD-GRK aims to support national emission reduction to 26 percent while SRAP is intended to support national emission reduction beyond 26 percent to 41 percent. The emission reduction action plans from RAD-GRK are well nested in government programs, probably through state budgets, while some REDD+ pilot projects are being nested in SRAP, with likely financing from multilateral/bilateral relations. The two action plans also acknowledge the importance of provincial spatial and development planning to support the plans for emissions' reduction.

Nevertheless, they have some limitations which are summarized as follows:

- They have not calculated provincial emission baselines and targets for emissions' reduction. Although they discuss the potential of each action plan to contribute to emissions' reduction, there is no certain figure on how far Jambi Province will able to reduce emissions by 2020 and how this province will contribute to national emissions' reduction, either through NAMA or REDD+.
- Both action plans recognize the importance of provincial spatial and development planning in emission reduction efforts, but there is no plan on how to integrate these action plans for provincial spatial and development planning.
- There are no sanctions if targets are not met. To ensure that stakeholders follow the targets, sanctions for failure should be developed. Private companies are being neglected and their potential roles are not being elaborated. Failure to recognize them may lead to failure of these programs as the private sector is the biggest contributor to CO_2 emissions.

4 Low emission development initiatives in Tanjung Jabung Barat District

Feri Johana, Putra Agung

4.1 Introduction

Initiatives at the national level to commit to greenhouse gas (GHG) emission reduction are evidenced by the release of Presidential Regulation no. 61/2011 in the National Action Plan for Greenhouse Gas Emission Reduction (RAN–GRK). RAN–GRK will not be successful if there are no derivative activities undertaken at the operational level. Such efforts have been channeled through the development of RAD–GRK in the provincial level in conjunction with RAN–GRK that aims to disaggregate activities and emission reduction targets to the sub-national level (See Chapter Three).

As to the implementation at the district level, there is currently no standard guidance on how RAD–GRK in the provincial level is channeled and disaggregated in the district level. However, considering the regional autonomy, it has been realized that districts will be more involved in the process for the next few years for the implementation phase. REALU initiatives in this context, has encouraged local governments and all stakeholders to be aware and to prepare for the implementation of RAD–GRK via appropriate methods, policies, institutions and regulations and integrate them into a 'low emission development' (LED) planning.

To address those problems, REALU project facilitated Tanjung Jabung Barat (Tanjabar) District stakeholders to develop LED planning and action plans and help them prepare to develop RAD GRK in due time. Tanjung Jabung Barat (Tanjabar) District has one of Jambi's highest rates of CO2 emissions that are associated with land-use changes. During 2000–2005, the average annual aboveground emissions of CO_2e in the district reached 18 tonnes per hectare, and 15 tonnes per hectare during 2005–2010. The main source of emissions was the conversion of previously logged forest to oil palm plantations (Widayati et al 2012). Forests in Tanjabar cover 48 percent of the district's total area. Approximately 71 percent of the forest area is categorized by the government as Production Forest. The national development policy to establish industrial timber plantations (locally called HTI), resulting in wide expanses of HTI in the district, has influenced the level of emissions in the district significantly.

4.2 Overall methods

The design and construction of planning steps for emission reduction strategies in this exercise used the framework strategy of Land Use Planning for Low Development (LUWES) (Dewi et al 2011), which contains a systematic set of steps to integrate the processes of identifying emission sources, calculating historical emissions, predicting future emissions by considering historical emissions and local development plans, setting up a reference emission level (REL) and mitigation action plans, and determining an implementation strategy.

LUWES integrates scientific concepts that can be used in forecasting/calculating emissions' rates and making RELs the principal instrument for integrative, inclusive and informed use in the implementation process. Stakeholders reconcile and discuss the process in developing an analysis unit (zone), define the zone and draw up mitigation actions; this is a major prerequisite for the process and should be done properly, accommodating stakeholders' interest.

4.3 Integrating the land-based development plan and spatial plan

An early stage in the preparation of the initiative is to identify mitigation actions based on land development plans, spatial planning and the implementation of several development activities. This analysis is important to understand the conditions of regional development and the extent to which aspects of the development of low emissions are already included in the existing development plan.

In facilitating this process, developing zones as planning units is considered the appropriate way to integrate all existing planning documents into a single template. In each planning unit any land-use change process is recorded as well as factors affecting the activity and preparation in developing appropriate mitigation actions. The zone is developed based on spatial-based integration of various planning documents such as the District Spatial Plan (RTRW), Long-term Regional Development Plan (RPJP)/Medium-term Regional Development Plan (RPJMD) and maps of forestry land status, land-use permits and biophysical elements (e.g peat). The zones in Tanjabar are shown in Figure 4.1.

Steps taken in developing the zones in Tanjabar involve:

- Consultation with stakeholders who are involved in land-use development activities.
- Integrating the activities of land-based sector development with district spatial planning.
- Confirming that the information, data and facts are accurate, up to date, and as much as possible include the various parties associated with the development, future development plans and other relevant information such as conflicts over land and natural resources.
- Addressing the assumption that represents the actual direction of development that will be implemented.

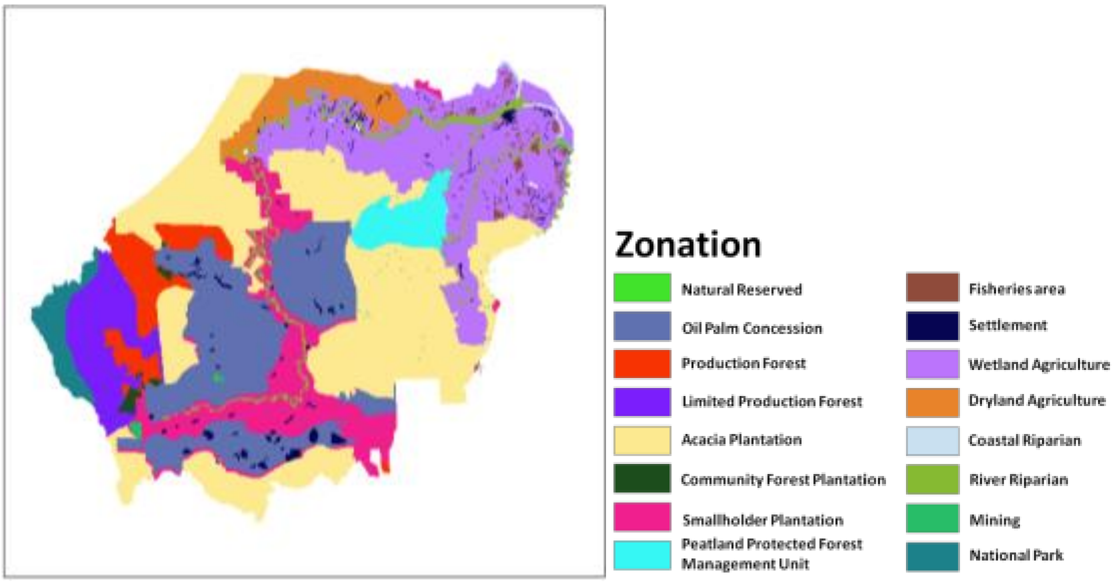


Figure 4.1 Zonation agreed by stakeholders in Tanjabar District resulting in the 'Zone Map'

From discussions with local government agencies in Tanjabar, we were able to obtain development documents, such as maps of mining concession areas, oil palm plantations, HTI concessions and agricultural commodities. These maps were then combined with the RTRW to derive a 'Zone Map'. Initially there were 16 zones resulting from map overlay and after further dissecting them with peat maps, 27 zones were produced representing the land-based development plan and spatial plan in Tanjabar District.

4.4 Estimating historical and future GHG emissions

Two time series (2005 and 2010) land cover/use maps were employed in assessing historical emission rates in Tanjabar District. The rate of land-use change from the two data sets was used to calculate the rate of change in land use for the foreseeable future until 2020.

To obtain information on land-use changes and emission sources in Tanjabar, time series data were analysed and further calculations were conducted within REDD Abacus SP (Harja et al 2012). Table 1 shows major changes in land uses as a source of emissions in the seven zones. Land-use changes are characterized by land clearing for economic activities such as timber harvesting, palm oil development, rubber cultivation and logging.

Table 4.1 Type of land-use change as the biggest emission source in Tanjabar

Zone	Land use in 2005	Land use in 2010
Wetland agriculture on peat	Coconut/ betelnut agroforestry	Coconut/ betelnut agroforestry
	Coffee agroforestry	Coffee agroforestry
		Coconut/betelnut agroforestry
Acacia plantation	Logged-over forest – high density	Acacia plantation
		Oil palm monoculture
		Rubber monoculture
		Oil palm monoculture
		Acacia plantation
	Logged-over swamp forest	Acacia plantation
Acacia plantation on peat	Undisturbed swamp forest	Shrubland
	Logged-over swamp forest	Shrubland
		Acacia plantation
		Coconut/betelnut agroforestry
	Shrubland	Shrubland
Oil palm concession	Rubber agroforestry	Oil palm monoculture
	Logged-over forest – high density	Oil palm monoculture
	Logged-over forest – low density	Oil palm monoculture
Peatland Protected Forest Management Unit on peat	Undisturbed swamp forest	Logged-over swamp forest
Dryland agriculture on peat	Coffee agroforestry	Coffee agroforestry
Production forest	Logged-over forest – high density	Rubber monoculture

Figure 4.2 shows the share of emissions per year respectively based on 27 zones in Tanjabar. Zones with the five highest emission shares consist of acacia plantation, acacia plantation on peat, wetland agriculture on peat, oil palm concession and smallholder plantations.

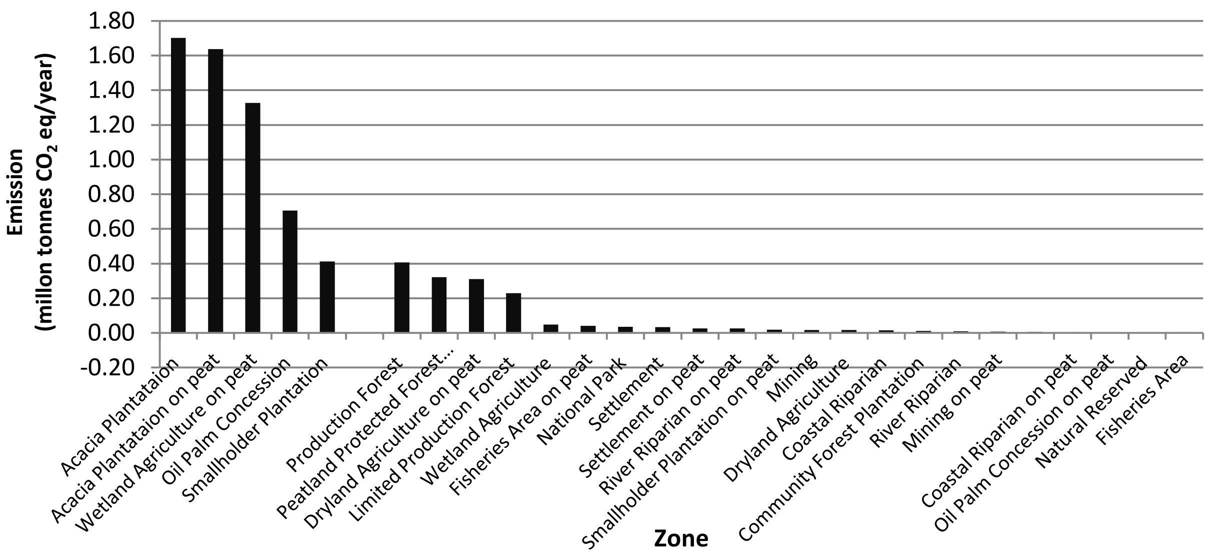


Figure 4.2 Amount of historical emission share in each zone in Tanjabar

A total of 45.36 percent of historical emissions came from acacia plantation zones (on two different landforms); peat wetland agriculture, oil palm concessions and smallholder plantations accounted for 18.02, 9.58 and 5.61 percent respectively. The total emissions from the five zones accounted for 78.57 percent of the total emissions in Tanjabar.

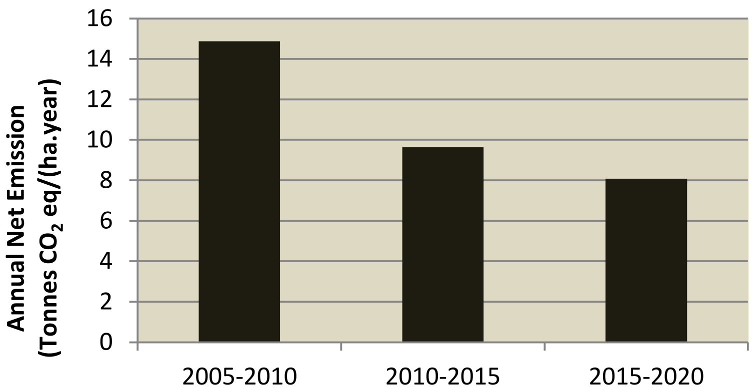


Figure 4.3 Rate of annual historical emission and projection for 2010–2015 and 2015–2020

According to records, the annual emission rate in Tanjabar for 2005–2010 was approximately 14.8 tonnes CO_2e per hectare per year. Since the rate of future emissions has been projected based on the rate of land-use change during historical periods, we calculated the annual emission rate for 2010–2015 to be 9.6 tonnes CO_2e per hectare per year and about 8 tonnes CO_2e per hectare per year for the period 2015–2020.

4.5 Setting up Reference Emission Levels (RELs)

Setting up RELS is important for implementing low emission development. RELs are used as a reference for any emission reduction actions (the degree of the mitigation action on emission reduction compared to the baseline).

RELs adopt ‘historical’, ‘adjusted-historical’ and ‘forward-looking’ approaches. Stakeholders in Tanjabar select RELs based on ‘projected historical’ principles. This is because Tanjabar District has a long history of land-based development activities; thus for projecting future conditions it is more appropriate to study conditions that have occurred in the past.

Developing RELs has involved both technical aspects and policy considerations. The principle of equity must be considered by the district, which has had many land-based activities associated with high emission rates in the past; thus it is advisable to use a ‘historical baseline’ approach. This will avoid the use of ‘forward-looking’ baselines for controlling land use that can add greater emission rates in the future.

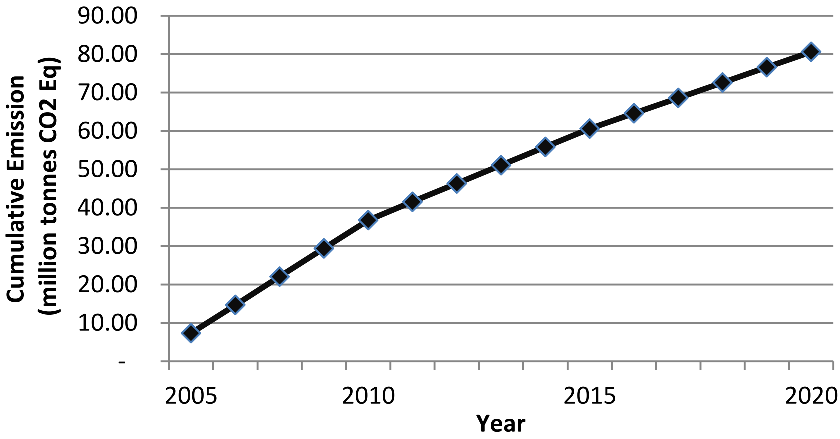


Figure 4.4 Tanjabar's RELs based on historical projections

Cumulative CO_2 emissions from the land sector in Tanjabar by 2020 are estimated to reach 80.6 million tonnes CO_2e. Figure 4.4 shows the RELs developed using historical projections.

4.6 Developing appropriate local mitigation action

For developing scenarios to reduce emissions, discussions have been held with Tanjabar government agencies. Various options were discussed carefully because activities in development areas provide significant contributions to the economic well-being of the district's population. Low emission development scenarios need to consider the consequences of reduction activities not only for the environment but also for the economic prosperity of the district. The scenarios developed are listed in Table 4.2.

Implementing reduction activities in areas allocated for acacia plantations (Right of Use Title/IUPHHK-HA) was projected to give the largest reduction, mainly through avoiding conversion of primary forest to acacia, maintaining existing smallholders' tree-based systems and expediting planting of acacia in shrubby fallow and grassland areas within the concession zones. Thus emissions could be minimized or even avoided and might even result in carbon sequestration. This scenario could reduce emissions by 7.1 million tonnes CO_2e or 8.84 percent from REL.

Another significant scenario was improving the management of KPHLG (PPFMU) areas by planting jelutong *(Dyera polyphylla)* and enforcing the protection of peatswamp ecosystems. This scenario could reduce emissions by 1.7 million tonnes CO_2e or 2.12 percent from REL. Based on the agreed scenarios for the low emissions' development strategy, emissions in Tanjabar District could be 13.98 percent lower than the REL. Nett emission and emission reduction rates are shown in Figure 4.5.

Table 4.2 Scenarios and planned activities for mitigation actions

Zone	Scenarios	Planned activities
Acacia Plantations (S1-AP)	(1) Avoid conversion of primary forest to acacia (2) Maintain existing smallholders' tree-based systems (3) Expedite planting acacia in bush fallow and grassland areas within the concession zone.	Persuade concession holders to maintain primary forest by promoting HTI and High Conservation Value Forest spatial regulation. Implement results of agreement between the Tanjabar government, community and concession holders on forest boundaries. Implement a moratorium on use of wood from natural forests for pulp and paper industries.
Oil Palm Concession (S2-OPC)	Prohibit conversion of forest to oil palm (± 8759 ha)	Persuade concession holders not to convert high-density forests and primary forests to oil palm systems.
Peat Protection Forest Management Unit (S3-PPFMU)	1) Maintain existing forest area 2) Establish systems with jelutong (*Dyera polyphylla*) in rehabilitated oil palm areas.	Promote the concept of conservation/protected areas and their purpose to communities around the KPHLG. Request more forest police from the Ministry of Forestry. Establish relevant local institutions to support KPHLG. Promote the value of jelutong among the local community and explore access to its national and international markets.
Production Forest (S4-PF)	1) Maintain primary forest area 2) Establish rubber systems in non-forested areas	Promote the concept of conservation/protected areas and their purpose among communities around the KPHP (Production Forest – Management Unit). Provide rubber seedlings to establish rubber systems in the area.
Limited Production Forest (S5-LPF)	1) Maintain primary forest area 2) Establish rubber systems in non-forested areas	Promote the concept of conservation/protected areas and their purpose among communities around the KPHP. Provide rubber seedlings to establish rubber systems in the area.
Wetland Agriculture on Peat (S6-WA_OP)	Preserve existing forest	Issue recommendations and prioritize agricultural activities in non-forested land.

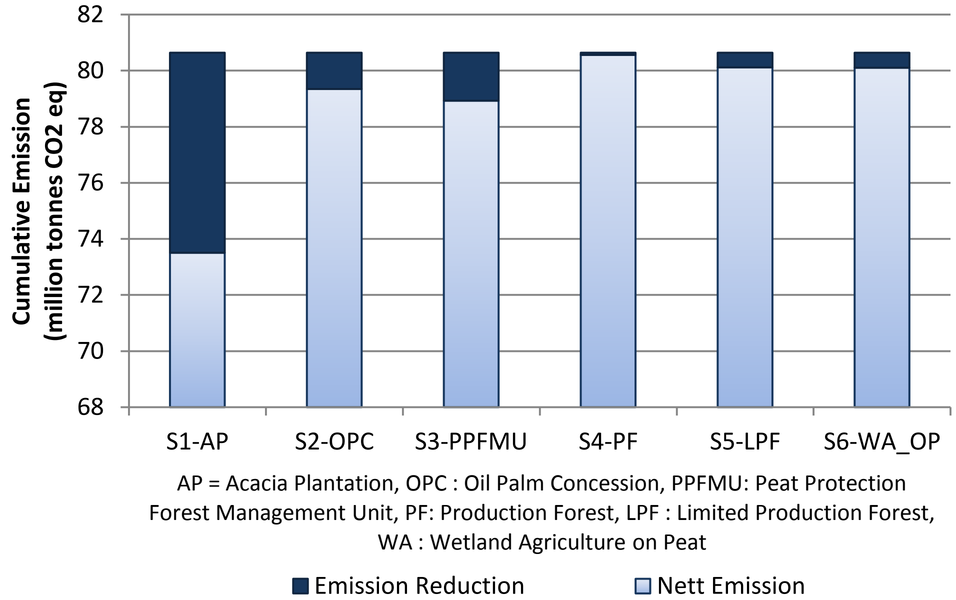


Figure 4.5 Scenarios and their impacts on reducing cumulative emissions, 2005–2020

4.7 Discussion and conclusion

Emission reduction activities in Tanjabar should focus on the three land allocation zones that contribute to 78.57 percent of total emissions of CO_2e mentioned earlier (80.6 million tonnes CO_2e). Low emission development can take place in the district if all stakeholders are committed to their tasks and undertake their responsibilities. For example, reducing emissions in the oil palm sector requires commitment from concession holders to optimize the use of abandoned and degraded land rather than clearing land with high carbon stock (aka forest). Similarly, reducing emissions in the HTI zone implies the commitment of pulp and paper industries to use raw materials from their planted trees and reduce (or even forego) the use of wood (mixed tropical hardwood) from natural forests.

Several challenges have been recognized in implementing low emission development in the field. For example, there is high potential to make use of abandoned lands (with low carbon stock) which formally can be accessed by the concession holder through Agrarian Offices. However, in reality, land claims by local communities create difficulties for concession holders to proceed with such approach.

Similarly, to reduce emissions from the PPFMU (KPHLG) zone, local government and local communities must work together to restore and maintain the protection function of HLG. Conversion of oil palm to jelutong systems could increase carbon stocks. However, commodity conversion needs careful consideration because it has impacts on farmers' income. Currently, oil palm provides a significant contribution to farmers' incomes. Promotion of jelutong should be accompanied with relevant guidance and recommendations, for example on farm management, harvest methods and market potentials.

To provide communities around the PPFMU with clear legal status and tenurial access in order to effectively manage the land, the local government should consider to support community based forest management (e.g. Hutan Kemasyarakat/HKm) or other forms of cooperation that could strengthen the collaboration between local government and local communities.

Furthermore, implementation of low emission development in Tanjabar in the next years will require detailed identification of necessary conditions in the implementation stage. It would be beneficial to test the accuracy of the forecasting/calculations done earlier in the context of the possible implementation of low emission development in other areas.

In the context of REALU, the low emission development concept seems very appropriate but cannot stand alone because the development planning system in Indonesia is highly conventional and regulated. The Law of the Republic of Indonesia Act No. 25 of 2004 related to the National Development Planning System and Act No. 26 of 2007 on Spatial Planning stipulate the need for methods to integrate low emission development into conventional regional planning.

The initiative to develop an action plan for reducing emissions at the local level is an idea that needs more analysis since there is no clarity at any level regarding the division of roles and commitment in emission reduction efforts. In addition, besides the need for standardization according to the Intergovernmental Panel on Climate Change's Guideline, the process of developing mitigation action should also include all stakeholders who are committed to low emission development.

Climate change and low emission development need understanding and new skills in efforts to make inventories, develop action plans and implement monitoring, evaluation and verification. Achievements in Tanjabar are at early stages of the overall long-term process. The regional characteristics of Tanjabar are also a challenge to low emission development application as the region's economic development is still dependent on land-based activities; thus there is a need to synergize implementation of low emission development and economic development activities.

5 Review of transaction and implementation costs for emission reduction efforts in Indonesia

Arif Rahmanulloh, Caecilia Yulita Novia, Suyanto

5.1 Introduction

Reducing Emissions from Deforestation and Degradation, and beyond (REDD+) is an international policy and finance mechanism to pay for avoiding deforestation and enhancing tree planting; it results in emissions' reduction and offers carbon credits in return. However, payments come at a cost for seller countries. Experts have identified the cost components as (1) opportunity costs, (2) implementation costs and (3) transaction costs (IUCN 2009; World Bank Institute 2011; Pagiola and Bosquet 2009). The mechanism is being tested at demonstration sitesand studies have revealed that REDD+ costs are rising. Most studies, however, are still focusing on opportunity costs, feeding more discourse on feasibility and identification of targeted areas (Harris et al 2008). Studies on transaction and implementation costs are rare. Those that have been conducted aim to provide REDD+ implementation cost units, allowing stakeholders to design REDD+ projects more effectively. Recent studies have confirmed that transaction costs can significantly impede implementation of environmental policies. Transaction costs are normally blamed for the slow growth of land use, land-use change and forestry (LULUCF) projects (Cacho et al 2013).

This report assesses the nature and size of transaction and implementation costs in forestry-related projects in Indonesia. The report is expected to provide a cost estimate for the implementation of REDD+ or similar land-based carbon projects. In Indonesia, there are more than 70 REDD+ related projects (Mardiastuti 2012).

The report starts with definition of terms used, especially for transaction & implementation (T&I) costs. Later, we bring the context of Indonesia to REDD+ implementation. Costs for REDD+ are approached by collecting cost information on land- and forestry-related projects in Indonesia.

Table 5.1 Cost categories of REDD+

Cost categories	Definition
Opportunity costs	Equal to foregone benefits that occurred owing to avoidance of deforestation/deforestation (for logging, agricultural activities etc).
Transaction costs	Arise from the needs for information before and while making an economic exchange (game rules and refereeing).
Implementation costs	All costs directly linked with the actions to reduce deforestation or degradation, or enhancing carbon stocks.

Source: World Bank Institute (2011)

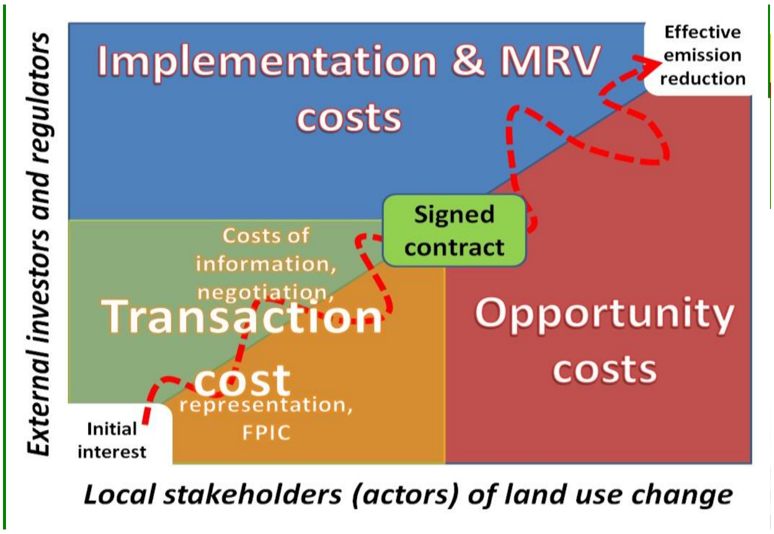


Figure 5.1 Cost categories for REDD+

Figure 5.1 shows the cost categories of the emission reduction mechanism. It also portrays the pathway from initial interest to effective emission reduction through the signed contract linking local stakeholders and external investors and regulations.

5.2 Scope of transaction costs

The 'transaction cost' term, found in new institutional economics discussions, has also crossed into various studies on environmental policy. It encompasses issues ranging from 'exchanging ownership titles' to 'cost arranging of a contract ex ante and monitoring and enforcing that contract ex post" (Demsetsz 1968; Matthews 1986). A recent study indicates that transaction cost is "the cost of a resource used to define, establish, maintain and transfer property rights" (McCann et al 2005).

In terms of REDD+ projects, most of the transaction costs are incurred in the preparation phase and borne by buyers, sellers, donor agencies and external institutions such market as regulators (Pagiola and Bosquet 2009). Activities categorized as transaction costs range from project searching and information gathering, learning about materials and production, negotiating and concluding contracts and monitoring and enforcing contracts over time (Bromley 1991; Stavins 1995; Kasper 1998). Some components such as approval costs and insurance are also considered under transaction cost (Dudek and Wiener 1998). The World Bank Institute (2011) uses the following terms to identify transaction cost: program development, agreement negotiation, emission reduction certification (measuring, reporting, verification [MRV]), stabilization and preventing deforestation from moving to other countries (stopping leakage).

The activities mentioned below are considered as elements of transaction cost:

- Searching and negotiation: Costs ranging from identifying and finding interested projects and project partners to the transaction and consultations to reach an agreement. This cost covers the services that address providing information, promotion and brokerage and the delay experienced by stakeholders in finding a right partner. It is raised for both buyers and sellers.

- Feasibility study: The development of monitoring techniques and verification protocols; methods for baseline and project scenario measurements; feasibility studies to ensure positive social and environmental benefits result from the project.
- Approval costs: Cost of checking and certifying carbon sequestration by an accredited agency (ex post); cost of validating claims by an accredited agency.
- Enforcement and insurance: Cost of enforcing compliance if monitoring detects a breach of agreed terms of contract. Insurance cost relates to project failure due to fire, the seller fails to provide emission mitigation or the investor fails to pay.
- Free, prior and informed consent (FPIC) activities: Socialization of the REDD program and institutional strengthening.

World Bank Institute (2011) considers Monitoring, Reporting & Verification (MRV) activities to fall under transaction cost as they do not contribute to emission reduction. These costs are to ensure that participants are fulfilling their obligations and for measuring actual greenhouse gas (GHG) abatement achieved by the project in real time.

5.3 Scope of implementation cost

The implementation costs of REDD+ components cover action to reduce deforestation, forest degradation and improving carbon stocks. Also, promoting alternative sustainable livelihoods, preventing illegal logging, sustainable forest management, preventing forest fire and replanting of degraded lands.

- Promoting alternative sustainable livelihoods: This aims to enhance people's livelihoods in surrounding REDD+ areas through training, providing alternative sources of income as well as increasing the productivity of their land. Significant training costs are the number of participants and the type of training. The REDD Secretariat Central Kalimantan conducted training on rubber cultivation, fisheries, rattan webbing and integrated farming in 2012 (Satgas REDD+ 2013).
- Preventing illegal logging: The prevention of illegal logging can be accomplished through: enhancement of people's livelihoods as well as improvement of forest management and monitoring activities. It also involves patrolling and controlling the area of the REDD+ program. The size of the REDD+ area is a major cost factor. The wider the area, the more resources are needed.
- Forest fire mitigation: This targets public outreach through fire prevention models, training, hotspot identification, installing warning signs, as well as patrolling and providing facilities and tools for monitoring and fire prevention.
- Replanting of degraded lands: This activity aims to enhance carbon stocks in targeted areas. Identifying degraded land is required to estimate the resources needed for planting activities. The planting cost consists of planning and planting materials as well.
- Sustainable Forest Management (SFM): To manage forests sustainably, the Food and Agriculture Organization of the United Nations (FAO) underscores the maintenance of biological diversity, productivity, regeneration capacity, vitality and the resource's potential to fulfill important functions at various levels, without damaging other

ecosystems. This type of cost is approached through the cost of timber harvesting under the reduced impact logging (RIL) system (Holmes et al 2002).

5.4 Estimating transaction and implementation costs of REDD+ in Indonesia

REDD+ has not been implemented yet. Transaction cost and implementation cost can be predicted using the cost component of previous or existing programs on avoiding deforestation and replanting programs as well as carbon projects with different mechanisms such as the Clean Development Mechanism (CDM) and voluntary carbon market.

5.4.1 Transaction costs of land and forestry projects in Indonesia

Ginoga and Lugina (2007) found that the transaction costs of CDM-type projects in two locations were different. In West Nusa Tenggara, the transaction cost for 150 ha was USD 95 779 (39.2 percent of total cost) or USD 639 per hectare. In West Java, the cost for 17.5 ha was USD 51 021 (59.7 percent of the total project) or USD 2915 per hectare. Ginoga and Lugina (2007) indicated that both projects had the same cost of certification at IDR400 million (USD 42 105) regardless of different project area. The projects were initiated by the Ministry of Forestry in collaboration with the Japan International Forestry Promotion and Cooperation Center (JIFPRO) and involved farmer groups as field implementers. The agreement allowed project implementation through the establishment of a private forest (Subarudi et al 2004).

Arifin (2006) analysed the transaction cost of payments for ecosystem services (PES) in Sumberjaya Lampung. The transaction cost of this mechanism was relatively high (USD 55 per household). The total cost comprises the cost of searching for information, organizing the group and enforcing rules and regulations (Arifin 2006). Approximately 6400 farmers received Hutan Kamasyarakatan (HKm) or community forestry management permits for a total area of approximately 13 000 ha (Suyanto et al 2007). Using the average landholding size of HKm farmers in Sumberjaya of about 2.03 ha per household, we can estimate the transaction cost of the PES mechanism by assuming that all HKm licensed-lands employed agroforestry (with coffee). Thus the transaction cost was USD 27 per hectare.

A case of facilitating HKm permits was published by Partnership for Government Reform (PGR) (2011). The cost included capacity building activities, mapping, work plan development and all approaches to propose the HKm permit to the Ministry of Forestry. In total this was estimated to cost USD 53 per hectare.

Another transaction cost figure in Indonesia was estimated by Ginoga et al (2009, cited in Yuniati et al 2011). The estimation (REDD preparation cost and project developer) was USD 0.014 per tonne of CO_2 and USD 1.3 US$ per tonne of CO_2, respectively.

Table 2 summarizes the transaction costs as described above. The costs translated into USD per tonne of Co_2 using the carbon stock data for agroforestry (20 tonnes of C per hectare) in Lampung (van Noordwijk 2002) and 22.3 tonnes of C per hectare in West Java (Ginoga et al 2004).

Table 5.2 Estimated transaction costs of various forestry projects in Indonesia

Project	Source	Carbon stock	Emissions**	Transaction cost		
		tC/ha	*tCO_2-e*	*IDR/ha*	*USD/ha*	*USD/tC 0_2-e*
HKm	PGR (2011)	20.0	73.4	500 000	52.6	0.7
HKm Lampung	Arifin (2006)	20.0	73.4	257 231	27.1	0.4
CDM-type Cianjur	Ginoga and Lugina (2007)	22.3	81.9	27 697 143	2915.5	35.6
CDM-type Cianjur*	Ginoga and Lugina (2007)	22.3	81.9	4 840 000	509.5	6.2
CDM-type NTB	Ginoga and Lugina (2007)	22.3	81.9	6 066 000	638.5	7.8
REDD DA	Ginoga and Lugina (2009)	n.a	n.a	n.a	n.a	1.3

** Without certification cost (IDR400 million); ** assuming the carbon stock of previous land was zero tC/ha*

5.4.2 *Estimating REDD+ implementation cost components*

5.4.2.1 *Forest fire mitigation*

Forest fire mitigation is promoted via training, hotspot identification, installing warning signs, patrolling as well as providing facilities and tools for monitoring and fire prevention. The Central Kalimantan REDD+ Secretariat reported provision of firefighting equipment for 15 villages in five districts in October 2012 (Satgas REDD+ 2013). The firefighting equipment is worth USD 5612 for each village.

The cost of forest fire mitigation also comes from the provincial development budget. This usually covers training, human resources and equipment. In 2002, the Central Kalimantan budget for forest fire management was USD 63 158. Five years later (2007) the same budget had increased to USD 484 211. The media also reported that the Riau budget for forest fire mitigation was USD 52 632 in 2009 and it also increased to USD 368 421 in 2010. The South Sumatra budget was USD 73 684 in 2009 and in West Kalimantan it was USD 105 263 in 2008.

In terms of implementation, a BPK document published in 2008 reported on the forest fire mitigation program in Riau Province conducted by several provincial forestry agencies; in the first six months of 2007 their activities cost as much as USD 18 172. In the same period, the Riau conservation agency (BBKSDA) also used about USD 86 735 for forest fire mitigation such as patrolling activities (USD 17 979), administration (USD 63 716) and preparedness activities or 'apel siaga' (USD 5040). The working area for the BBKSDA is about 1 562 470 ha and comprises protected forest, peat soil area and preservation area.

5.4.2.2 *Replanting*

Subarudi et al (2004) reported the cost for 17.5 ha in a CDM-type project (labour and planting/maintenance for the first year) that was divided into 10 and 7.5 ha sites. Planting/maintenance cost USD 2563 and USD 2788, respectively. The total labour cost for planting was USD 1798 and USD 1114 respectively. In the same project Subarudi et al (2004) noted that farmer training in the project (for both sites) amounted to USD 1846.

Government replanting activities are tracked by the National Rehabilitation Movement (Gerhan) for the whole country. In 2003, the government allocated USD 85 million to rehabilitate 295 455 ha of degraded land. In 2004 and 2005, the government rehabilitated 464 470 and 447 246 ha of degraded lands with budgets of USD 186 million and USD 176 million respectively.

In terms of establishment cost, the regulation Hutan Tanaman Rakyat (HTR), 2009 governs the standard. Forestry Minister Decree No. P.64/Menhut-II/2009 also controls establishment cost for planning, infrastructure, maintenance, planting, protection, taxes and social responsibilities—these range from USD 942 to USD 1302 per hectare.

According to the strategy and action plan for REDD+ in East Kalimantan, with regard to replanting, the cost for rehabilitating one hectare of degraded land was USD 368 (Pemprov Kaltim 2012).

5.4.2.3 Promoting sustainable livelihoods

The promotion of sustainable livelihoods can be done in various ways. However, in this report we scope it into training and providing startup materials for livelihood options as indicated hereunder.

- Subaradi et al (2004) reported that the cost of training was USD 138 for each hectare and covered about 54 farmers (USD 3.00 per participant). This number did not include equipment and tools for livelihood enhancement.
- A private consultant for providing training on handicraft skills was much more expensive. Each training event involved up to 30 participants at about USD 140 per participant (Fauzi 2013).

The cost for providing start-up material varies and is based on type and scale of livelihood activities. For example, a small-scale catfish farm requires from USD 104 to 304. Such investment can be managed by a farmer group of five to 10 members. Oyster mushroom farming (*jamur tiram*) that can be started with supplies costing USD 212 to 733.

5.4.2.4 Preventing illegal logging

Preventing illegal logging is a multilevel activity occurring at both national and local levels. In terms of the implementation of emission reduction mechanisms, prevention is effected at the local level through capacity building of local residents and patrolling activities.

The estimated cost for illegal logging prevention is USD 138 per hectare for farmer training activities and land patrolling. Patrolling activities were supported by the Government of Jambi in 2012, which allocated USD 105 per day to cover 2 100 000 ha of forest (Kompas 2012).

5.4.2.5 Sustainable Forest Management

SFM under the REDD+ mechanism is employed by timber concessions according to FAO guidelines such as RIL. Darusman and Baharuni (2004) reported that the cost of practising SFM was in the range of USD 3.00 to 5.00 for each cubic metre of timber extracted.

Table 5.3 Indicative cost for implementation of emission reduction mechanisms

Component	Activities	Indicative cost
Forest fire mitigation	Training	USD 3–140 per participant
	Patrolling	USD 17 979 (six-month period)
	Equipment	USD 5612 for each village
Replanting	Planting	USD 256–1302 per ha
Promoting sustainable livelihood	Training	USD 3–140 per participant
	Start-up material	USD 104–733 per small start-up package
Preventing illegal logging	Training	USD 138 per ha
	Patrolling	USD 105 per day
SFM	Timber concession	USD 3–5 cubic metre

5.4.3 Strategies to reduce transaction and implementation costs

To reduce T&i costs influencing factors must be identified. Each country and site has unique biophysical, institutional and socio-economic characteristics that determine the scope of activities.

IUCN (2009) noted two factors that influence REDD costs: (1) Type of driver of deforestation and (2) carbon content.

The search and negotiation process is expensive in Indonesia. Cacho et al (2013) found that seeking verification and approval for projects in remote areas was costly as expert consultants needed to be recruited in this context.

Cacho et al (2013) provide strategies to reduce transaction costs that involve increasing project size by fostering collective action among suppliers, reducing contracting costs by utilizing existing management structure and reducing information costs through public provision of data, templates and guidelines. The role of intermediaries during the negotiation process and a multistakeholder strategy can reduce the cost as well (Arifin 2006).

5.5 Concluding remarks

More information on the T&I costs of REDD+ is needed to backstop the program's economic feasibility. This study is an initial step for analysing them based on a literature review. The analysis need to be extended by analysing more case studies and collecting more primary information.

6 Incentive mechanisms for peat forest protection: formalization of community forestry mechanism

Putra Agung, Jasnari

6.1 Introduction

Sustaining peat ecosystem is central for emission reduction activities in Tanjabar, owing to large peatland area including the remaining peatswamp forest. Efforts have been made through the enforcement of Peat Protection Forest status (*Hutan Lindung Gambut - HLG*) which covers approximately 16 000 ha. HLG area was formerly with the status of limited production forest and was awarded timber concessions until the early of 1990s. In 1999, the area status was changed to Peat Protection Forest through the issuance of the Forestry Minister Decree No. 421/Kpts-II/1999. This decree intended to restore the functions of peat swamp forest, which had been exploited for timber extraction. At the end of the concession era an encroachment boom began and communities started to claim the forest area and converted it for different agricultural commodities before the land was finally planted with oil palm, which currently covers around 4000 ha (Agung et al 2011).

Responding to the perception of state forest as an open access area, the central government launched the Forest Management Unit or FMU (*Kesatuan Pengelolaan Hutan*-KPH) concept. KPH allocates state forest area into management areas in accordance with the basic functions and purposes of the forests and is expected to address the fundamental problems of forest governance experienced over the years and conduct forest management at the site level. The Peat Protection Forest Management Unit (PPFMU), or locally called KPHLG, was established in the remaining peat swamp forest of Tanjabar (See Figure 6.1.). Encroachment by communities triggered the creation of a forest replanting program by the Forestry Agency which intercropped 'jelutong' (*Dyera polyphylla)* with oil palm, the predominant crop planted by farmers.

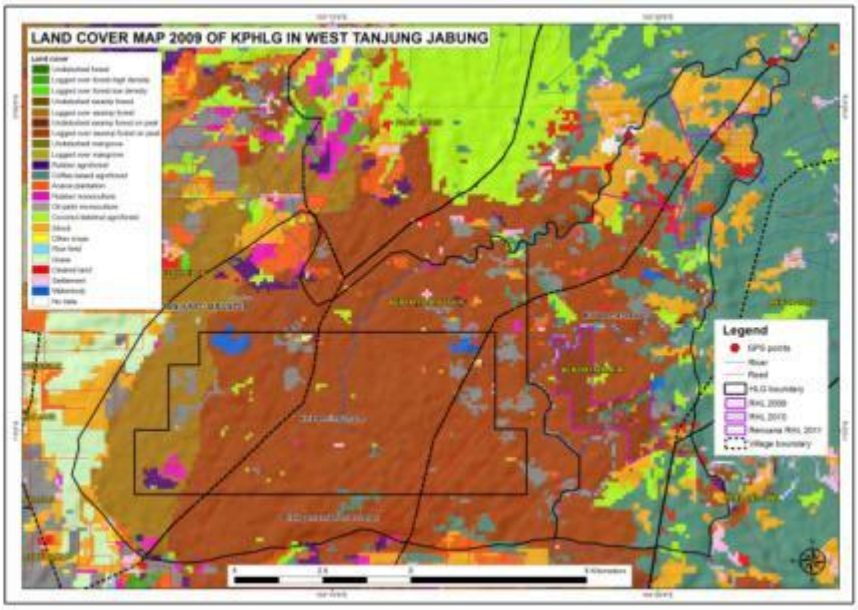


Figure 6.1 KPHLG area and the distribution of jelutong plantations

During 2005–2009, the average annual emission of CO_2e in the district reached 9.66 tonnes per hectare (Ekadinata and Agung 2011). The main source of emissions was the conversion of previously logged forest to oil palm plantations and rubber. The national development policy to establish industrial timber plantations (Hutan Tanaman Industri/HTI) has greatly influenced the level of emissions in the district. Forest area in Tanjabar covers 240,000 ha or 48 percent of the district's total area and approximately 71 percent is classified as Production Forest.

Land Use Planning for Low Development (LUWES) analysis conducted in Tanjabar (Ekadinata and Agung 2011) found that peat protection forest (HLG) generated about 1.9 tonnes of CO_2e per hectare per year. Emissions from HLG mainly stemmed from conversion of peat swamp forest to oil palm plantations by communities. Using the spatially explicit model simulation of FALLOW (van Noordwijk 2002) a plausible scenario representing the Reducing Emissions from All Land Uses (REALU) approach was also simulated for Tanjabar and the result showed HLG to be the focus area for emission reduction activities (Widayati et al 2011; Mulia et al 2013). Activities designed as part of emission reduction efforts need to consider consequences on economic prosperity of the district and local people. Agroforestry and maintaining current-tree based systems, including planting of jelutong, are important components in this respect.

6.2 Methods

6.2.1 Towards community forests in peat protection areas

Prior to determination of the appropriate mechanism to accommodate the need for recognition of their farmlands within the protection forest area, several assessments were conducted to obtain baseline information. This baseline information is needed before programs are developed in the target area. Different mechanisms of community forest in Indonesia were also reviewed followed by feasibility analyses of application in HLG Tanjabar.

Data was obtained from several sources using a range of methodologies: informal interviews with farmers and members of customary landowning groups and elders who were personally involved in or knowledgeable about village/land history, sale of claimed land and forest to outsiders; also migration and community history case studies and informal interviews with local people and migrants who cultivate and lay claim to state forest land. Informal interviews with local governments were also conducted, involving members of the Forestry Agency and District Spatial Planning Agency.

Other qualitative methods were used for the assessments such as focus group discussion for an initial overview as well as in-depth interviews with external stakeholders and key informants.

In order to apply forest management policy in the KPHLG area local communities need to have holistic comprehension of the KPHLG area that they already occupy. Otherwise different perceptions among local people will impact on the change of the area status from limited production forest to peat protection forest and there will be indistinct boundaries for the KPHLG area. Negotiation and mediation should be carried out by the Forestry Agency to restore the area's functionality as peat protection forest and mitigate any community negativity about planting jelutong.

Different forms of community-based forest management were studied and feasibility for application in HLG context was conducted. And as part of the initial process towards developing activities towards proposing community forestry in the target area, we also addressed socialization of forestry issues with the participation of communities and the Forestry Agency.

In addition to that, to increase community awareness on the need for the establishment of a local institution to help with legitimization of forest management, we invited local community and farmer representatives as well as Forestry Agency officers to visit Sumberjaya in Lampung Province. In Sumberjaya, HKm community forestry licences have been awarded for approximately ten years using a coffee-based system within protection forest. The process was facilitated by ICRAF and the Rewarding Upland Poor for Environmental Services (RUPES) program .

6.3 Findings

6.3.1 Community perceptions of the KPHLG area

The KPHLG area consists of four administrative villages: Bram Itam Kanan, Bram Itam Kiri, Teluk Nilau and Serdang Jaya. Almost 80 percent of the area is in the territory of Bram Itam Kanan and Bram Itam Kiri villages where jelutong plantation took place from 2009 to 2011. Community perceptions of the KPHLG area in Bram Itam Kanan and Bram Itam Kiri are elaborated in Table 6.1.

Table 6.1. Local community perceptions of the KPHLG area

	Villages	
	Bram Itam Kanan	**Bram Itam Kiri**
Forest zone status as peat protection forest	Most farmers recognize the status of the area as peat protection forest.	Most farmers do not recognize the area's status, and some indicated that the zone is not a peat area.
Forest boundary	Recognize the boundary since forest gazettement conducted in 2004.	Aware of the forest gazettement process but do not recognize the boundary.
Jelutong plantation initiative as an effort to restore peat protection forest functions	Recognize the initiative and allow the Forestry Agency to plant jelutong on the fringes of their oil palm plantations (in 2009 around 500 ha were planted with jelutong).	Do not recognize the initiative and do not allow the Forestry Agency to plant jelutong on the fringes of their oil palm plantations (in 2010 425 ha of jelutong plantations failed to expand in this area).
Land/forest tenure security	The community recognizes that they can only manage the land rather than enforcing it as individual property.	The community still hopes that they can change the land status into individual property.

6.3.2 Local community institutions

In general there are formal and non-formal community institutions. A formal institution is an institution that is authorized and approved by the government, for example village heads and subordinates. A non-formal institution is formed on the basis of need and consensus, which are not binding, and is not governed by any formal rules and regulations. Assessment of Bram Itan Kanan village revealed that there were no formal or non-formal institutions. This was attributable to:

- Unclear and obscure resident status of the local community living in the KPHLG area.
- Weak intervention by existing formal institutions to promote the concept of local community institutions (such as the establishment of farmer institutions).
- Non-binding social status. This KPHLG area is encroached by migrants who vary in ethnicity.
- The pattern of migration and relations with the region of origin are strong.
- Tenure insecurity.

6.3.3 Land tenure

The local community started to claim the KPHLG area in the early 1980s. By the 1990s, the area was impacted by the arrival of Bugis, Banjar and Jawa migrants and other ethnic groups, resulting in increased demand for land, especially for farming. Eventually this led to the establishment of an informal land market involving local communities and migrants. Recognition of ownership rights or control of arable land is derived from sale and purchase of land in a document that confirms ownership. During the early days of the arrival of migrants to this area, the process of selling and purchase over claimed land passes in the form of letters and land certificate (*Surat*

Keterangan tanah-SKT) issued by the village headmaster. Starting from 2007, however, this issuance has been revoked by District Forestry Office.

The relationship between migration and deforestation in KPHLG area continues to receive significant attention. The migrants play an important role not only in developing local tenure arrangements, but also in procuring them on a legal basis to claim state forest land. Migrants are attracted to forest frontiers if they perceive that they can obtain at least some security of tenure with an opportunity to make a living.

Lands were encroached by locals and migrants and claims were made by both locals and migrants as well. Land commoditization in the KPHLG area started in 1970 and boomed from 1990 to the early 2000s. The process was very simple, migrants asked the 'pesirah' (chief of territory), or the village headmen about a parcel of forest for clearing and cultivation. This then extended into creating new tenure arrangements within the area. Banjar ethnics for example, with their familiarity and skills in farming peat zones, introduced canalization to drain peat forest as a part of land preparation. The Bugis and Javanese introduced and practised land share tenancy as a means to access land resources.

6.3.4 Community-managed forest formalization

6.3.4.1 Possible mechanism under community-managed forest

There are two options of community-managed forest schemes considered for the KPHLG area: 1) community forestry/HKm and 2) Hutan Desa/village forest.

Community forestry is the utilization of state forest that is primarily intended to empower local people who are not burdened by land rights. The working area is a tract of forest that can be managed by a group or coalition of local communities in a sustainable manner. Forest zones that can be managed under this scheme are protection forest and production forest zones.

Village forest is state forest managed by the village institution and utilized for the welfare of the village. The village forest working area covers the protected forest and also production forest not affected by forest management or permits; the proposed location has to be approved by the village administration.

Community forestry facilitates land tenure/land property rights over claimed forest land. It offers the communities tenure bundles associated with access, withdrawal, management and exclusion rights. But like any other community-based forest management mechanism in Indonesia communities cannot sell, bequeath, transfer or inherit the land.

After dialogue with farmers and Forestry Agency officers, it was proposed that the socialization and facilitation process would be conducted in Bram Itam Kanan village, which also participates in the jelutong planting/rehabilitation program.

6.3.4.2 Identification of the target area

Starting in 2009, the Forestry Office of Tanjabar started forest rehabilitation activities in peat forest areas by introducing a replacement species for oil palm. Jelutong was selected. There have been three planting programs since 2009: 1) Planting by the Forestry Agency in Bram Itam Kanan village of 500 ha, 2) replanting in Mekar Jaya in 2010 with 425 ha and 3) replanting by BPDAS in 2011 with 415 ha in Bram Itam Kiri.

Despite claims of replanting success (70 percent survival rate of the jelutong trees planted), in some areas the program was considered a failure due to very low tree survival. Reasons for failure were attributed to: 1) land conflict in the peat protection area where farmers had already managed and planted land, 2) poor survival of jelutong when intercropped with oil palm, 3) no market and value chains established for the latex, 4) lack of clarity on benefit sharing between farmers and the Forestry Agency and 5) lack of information and extension programs on farm management for farmers.

The first target area is within the area of rehabilitation program initiated in 2009, located under the administration of Bram Itan Kanan village. The rehabilitation area comprises 500 ha and contains 500 households and the canals are Parit (canal) Selebes, Parit Patiro, Parit Bekawan, Parit Bone and Parit Jawa Bugis (See Figure 6.2).

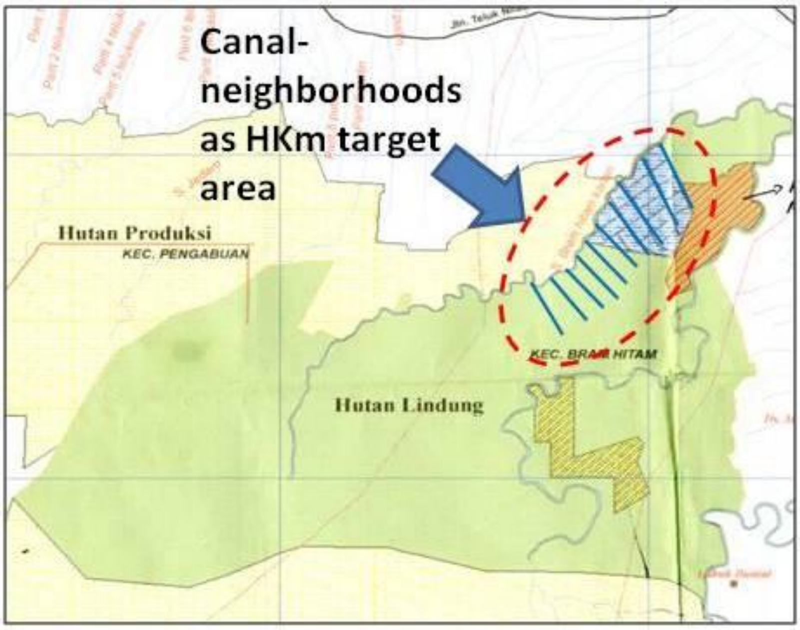


Figure 6.2 The canal neighborhoods as target area for HKm

Recently many other communities outside the main canal areas have shown interest in joining the scheme, as a result, several other neighbourhood canals are joining the initiative and as many as 100 households are involved in this second group covering an area of 300 ha. Most of the lands are newly cleared areas planted with oil palm or annual crops. The neighbourhood canals are Parit Haji Melong, Parit Sulawesi, Parit Selamat, Parit Sejahtera and Parit Famili (Figure 6.2).

6.3.4.3 Increased community awareness

Agreement reached during conflict resolution in 2009 became the basis for recognition of protection forest by the villagers. Intensive socialization conducted through REALU aimed to provide understanding of the peat protection forest on land managed by them.

More recently, farmers in HLG areas have obtained better perspectives of the importance of forest rehabilitation to revive forest functions by replanting forest tree species that also provide economic benefits. Farmers are willing to increase the diversity of their farmland by planting timber and fruit trees in their oil palm gardens. The seeds are provided by the farmers themselves and the Forestry Agency.

The farmers realize the importance of establishing farmer groups for acquisition of HKm licences. The groups also allow farmers to discuss and coordinate planning for forest land management. Since the land belongs to state, they realize that legal ownership is not an option but they could opt for management rights within the community forestry scheme.

6.3.5 Facilitating the establishment of HKm

6.3.5.1 Formation of farmer groups

After visiting the community forest in Lampung, farmers in Bram Itam made significant progress towards local institution formation. Based on the location of their dwellings, the following farmer groups were formed representing their neighbourhoods: Patiro Jaya, Bekawan Raya, Bone Makkasame, Jawa Bugis and Pada Idi Sido Makmur.

For coordination purposes, one large farmer group was formed as a common platform for all the farmer groups—the Makmur Jaya Farmer Group.

6.4 Discussions

The formalization of community-managed forest facilitated by the REALU initiative gave positive impetus especially for community awareness of peat protection forest. It also synergized the relationship between communities encroaching on KPHLG areas and the Forestry Agency. The challenge now is if local government, especially the Forestry Agency, will stick to the agenda to strengthen community-managed forest, among other issues.

Whether the KPHLG can serve as an umbrella to facilitate the HKm process remains unclear in terms of institutional arrangements. Endorsement to the KPHLG institution from local authority is still not finalised even though the area itself is already declared as an FMU by the Ministry of Forestry regulations. Several factors are yet to be resolved, mainly: 1) distribution of human resources since the KPHLG believes it will acquire some local district government staff; and 2) identifying the budget to finance KPHLG is still a major issue.

Meanwhile, in practice, the KPHLG also faces another challenge: illegal logging activities. Community-managed forest (collaborative management) under the facilitation and supervision of KPHLG institutions will be the potentially optimum solution to restore peat protection forest and to enhance local community livelihoods and welfare.

6.5 The way forward

After local community institutions are established, the next step is to map community claim areas within the KPHLG including at least nine canals. Participatory mapping activities will take place to map all the area claimed by the local community of Sungai Bram Itam Kanan which has been proposed for an HKm permit. The process itself will involve the local community, local-level government institutions and the Ministry of Forestry. Once participatory mapping has been finalized, the next step is developing a target 'working area', which is a highly technical process.

Another issue that needs to be taken into consideration is how to measure the progress of HKm once the permit has been issued. In the HKm regulation it is clearly stipulated that the area permitted as HKm should be monitored and evaluated periodically. Monitoring activities, held at regular or irregular intervals, should be agreed upon by the parties involved in the implementation of HKm activities. Evaluation should be an integrated assessment used to obtain feedback and must not be in repressive mode. Monitoring and evaluation in HKm should be participatory in nature and should involve all stakeholders involved, so as to understand the progress, improvement, achievement and constraints in expediting the HKm work plan that has been developed.

There is a need to develop certain criteria and indicators to address the monitoring and evaluation of HKm. The three major criteria and indicators are for: (1) institutional arrangement; (2) conservation, in this case the restoration of peat protection forest functions; (3) the socio-economic and ecological impact of HKm activities (Cahyaningsih et al 2006)

7 Perceptions on agroforestry systems and jelutong (*Dyera polyphylla*) for peatland farming

Janudianto, Muhammad Sofiyuddin, Jasnari, Atiek Widayati

7.1 Introduction

The incentive mechanism for sustaining peat ecosystem in Tanjabar is by giving conditional land tenure to communities with community forestry scheme (HKM). The conditionality under this scheme is the revival of forest functions by replanting forest tree species that also provide economic benefits. One of the endemic peatswamp forest species which has been promoted as the forest rehabilitation species in Tanjabar HLG is Jelutong (*Dyera sp*).

Jelutong (*Dyera* sp.) is a commercial tree species that is highly valued for its latex and wood. It is indigenous to rainforests throughout Malaysia, Kalimantan and Sumatra. Now it is difficult to find owing to deforestation, including the peat swamp forests in the islands of Sumatra and Kalimantan. Many reforestration programs have included jelutong for promotion in Indonesia, however literature on the species is not widely available.

The changing functions of forests and vast exploitation of timber in the province of Jambi, particularly within Tanjung Jabung Barat (Tanjabar) peat swamp forest have considerably diminished jelutong resources in the region. Owing to the demand for jelutong latex and wood in the last few years, rehabilitation projects have focused on restoring this species for commercial purposes in peatlands, providing potential income for farmers settling in peat areas.

Jelutong tree planting employs monoculture and agroforestry. Khususiyah et al (2010) studied the livelihoods of local and migrant communities in Tanjabar and found that the most common farming systems for local livelihood strategies consist of rubber agroforestry, oil palm, coconut agroforestry, coffee agroforestry and swidden (slash-and-burn)-paddy.

Implementation of the low emission development project, Reducing Emissions from All Land Uses (REALU),includes jelutong cultivation as a land-use scenario to study the balance between emission reduction and livelihood improvement.

This chapter has three objectives: 1) to present a brief overview of the past and current presence of jelutong as a peat swamp-based trade commodity; 2) to study potential peatland tree-based agroforestry systems that are suitable for peatland forest restoration in Tanjabar; 3) to identify the opportunities and potential of jelutong as a native (peat swamp) forest species as part of peat agroforestry systems.

7.2 Methods

7.2.1 Rapid Appraisal of Agroforestry Practices, Systems and Technology (RAFT)

Agroforestry is an umbrella term for a wide range of practices and situations in which trees are allowed to grow or are grown on farms and in agriculturally-used landscapes. Specific terms for specific forms of agroforestry are needed before we can understand the strengths and weaknesses of the use of woody perennials as providers of goods and services, and appreciate the opportunities for and threats to their further enhancement.

The study adopts the RAFT approach and household surveys on local perceptions on collecting and verifying data from Tanjabar District. The RAFT framework provides guidelines for the description and analysis of the ways trees are used and the way that they benefit rural livelihoods. Supporting data were also collected from Tanjabar as one of jelutong development areas in Jambi Province.

The RAFT framework assesses agroforestry practices, systems and technology appropriate for local use that are open to global comparisons—tree management and 'domestication'; local ecological knowledge and strength appraisal; weaknesses, opportunities and threats jointly with the main stakeholders to plan for applied research and development support.

7.2.2 Literature review and key informant interviews on jelutong

Anecdotally, jelutong has been commercially valuable in the past, although currently not many farmers in the peatland areas of Tanjabar voluntarily plant jelutong. Promotion of jelutong, however, has taken place in the Hutan Lindung Gambut (HLG) or peat protection forest area, which is part of a formal peat swamp forest restoration program. Considering its ecological and economic value, on top of the historical perspectives of this commodity, it is relevant to obtain as much information as possible on this re-emerging species. Literature review on jelutong was conducted covering historical perspectives, distribution and trade. In order to obtain the latest information on jelutong cultivation as well as markets in Indonesia, site visits and key informant interviews were conducted in two provinces in Central Kalimantan (Kotawaringin Barat and Kotawaringin Timur districts) and in Jambi (Tanjung Jabung Barat [Tanjabar] and Tanjung Jabung Timur districts) as they are best known for jelutong production. Interviews were held with officers from district forestry offices, district plantation offices, jelutong plantation companies and jelutong nursery farmers. Statistical data were also collected especially from the Central Statistics Bureau.

7.2.3 Household surveys on local perceptions

This survey was employed to collect the perceptions on and values that people attribute to tree-based farming systems in the peatland area under study, i.e. how people rate peatland fertility as well as its suitability for supporting farming systems and potential agroforestry systems in the area. The latter part of the interview specifically emphasized farmers' perceptions on jelutong, both its cultivation potential as part of peatland agroforestry systems as well as its market and commercial value.

Interviews were held in three villages in the peatland areas of Tanjabar: Bram Itam Kanan, Mekar Jaya and Teluk Nilau. Further categorization was also applied to respondents, mostly to those from Bram Itam Kanan: HLG farmers and non-HLG farmers.

7.3 Results and discussion

7.3.1 Local perceptions on peatland and farming systems in Tanjabar

Interviews with farmers in the three villages were successfully conducted with 54 farmers, 23 of them being HLG farmers and 31 being non-HLG farmers.

During the interviews, several tree species were mentioned by respondents that supported their livelihoods. e.g. areca nut, coffee, coconut, oil palm and jelutong, which mostly conformed with the findings of Khususiyah et al (2011).

Mulyoutami et al (2011) and Khususiyah et al (2011) indicated that most farmers in Tanjabar peatland are migrants from different parts of Sumatra and Indonesia. Farming and land management techniques have been developed over decades and passed on to the next generation. Overall, their perceptions of land suitability of the peat (or former peat) area were positive; 60 percent of the farmers responded that farming in peatland area is moderately beneficial to their livelihoods and 20 percent stated that peatland was very beneficial for their livelihoods (Figure 1).

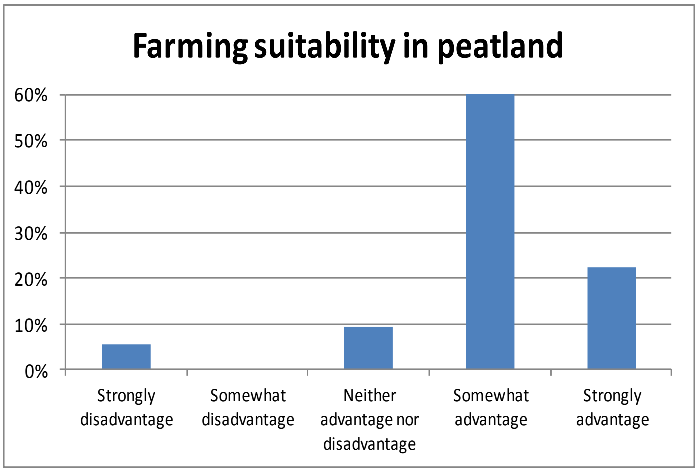


Figure 7.1. Suitability and benefits of peatland for farming

When asked about the values or benefits of mixed farming systems and monoculture systems, farmers considered that both systems provided reasonable benefits for their livelihoods (50–60 percent) (Figure 7.2). Only 21 percent perceive that mixed systems were highly beneficial and only 8 percent had the same opinion about monoculture.

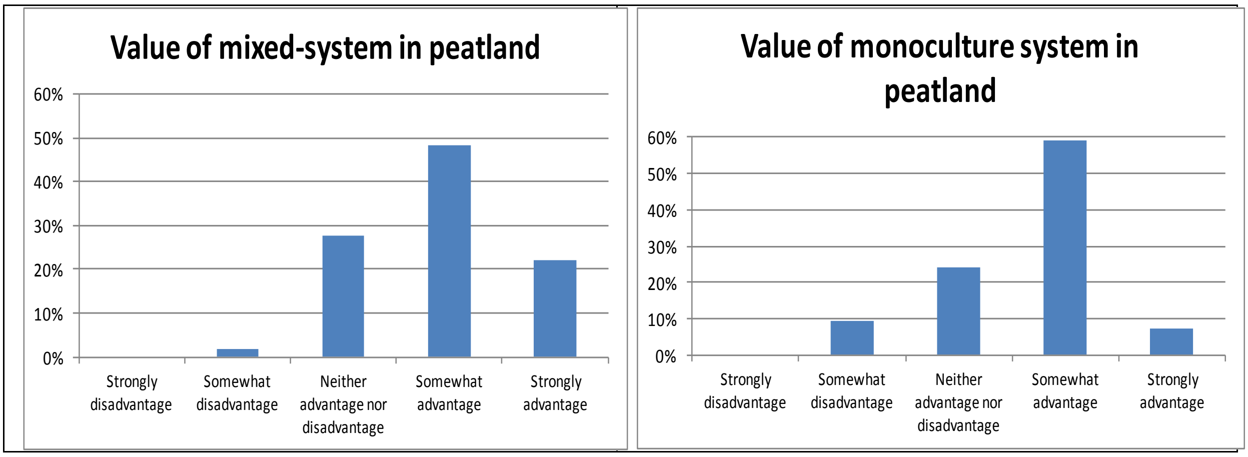


Figure 7.2. Perceptions on the benefits of mixed farming and monoculture systems

When asked which system they preferred, out of 54 respondents, 65 percent preferred mixed-farming systems as opposed to 35 percent who opted for monoculture (Figure 7.3). Most of the mixed-farming systems were: coconut–coffee, coffee–betelnut and coffee–coconut–betelnut. A small number of farmers owned mixed farms of oil palm–betelnut–jelutong. The monoculture systems in question mostly used oil palm.

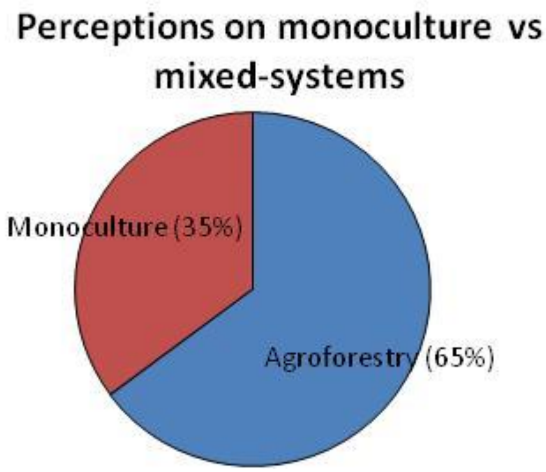


Figure 7.3. Farmers' preferences of mixed farming systems versus monoculture systems

The reasons behind greater preference for mixed farming were mainly attributable to product diversity in light of possible price fluctuations and also regarding labour for managing farms and for harvesting. Those who opted for monoculture, especially oil palm, generally liked the good price for oil palm and easy marketing.

7.3.2 Overview of jelutong in Indonesia and Jambi

7.3.2.1 Historical perspectives of jelutong in Indonesia

Jelutong species belongs to the genus *Apocinaceae* with two classifications—*Dyera costulata* Hook and *Dyera lowii* Hook (Burkill 1935). According to Williams (1963) *D. costulata* grows well on dry land or in unflooded lowland rainforest, while *D. lowii* is limited to peat swamp forest or flooded areas. This tree is native to Indonesia, Singapore, Malaysia and the Philippines. In Indonesia, jelutong is found in Sumatra and Borneo, including Jambi, Riau, North Sumatra, West Kalimantan, Central Kalimantan and South Kalimantan provinces (Martawijaya et al 1981).

Jelutong is known by many local names such as ‘melabuai’, ‘nyalutung’ and ‘pidoron’ in Sumatra and ‘pantung’ and ‘pulut’ in Kalimantan. The main products from jelutong are latex and timber. Jelutong latex is used by industries for the manufacture of chewing gum, cable coating and cellophane. Jelutong timber is used for plywood, furniture parts, drawing boards, picture frames and for making pencils (Lemmens et al 1995).

Prior to the development of rubber (*Hevea* sp.) plantations in the early 20th century, the world rubber industry obtained raw materials from wild rubber and jelutong trees (Brown 1919). According to Burkill (1935), after 1922, the development of the chewing gum industry caused a highly significant increase in demand for jelutong latex, which peaked between 1910 and the 1930s with decline setting in during the 1960s (Sellato 2002). The decline was attributable to overexploitation of the resource, in addition to competition with the development of other latex-producing crops (Williams 1963).

During the 1990s, Indonesia was considered to be the main source of jelutong latex, followed by Malaysia (Coppen 1995), with the most important importers being the United States, Japan and Europe. Jelutong timber began to be exploited during the logging concession era in Indonesia. From 1980 to 1990, Malaysia was the most important supplier of jelutong timber and Japan was the major importer (Lemmens et al 1995).

7.3.2.2 Jelutong in Jambi

According to Jambi’s indigenous residents there are three types of jelutong which are distinguished by the colours of their bark and leaves—white, red and black jelutong. More recently, jelutong production has fluctuated. Based on data from the Central Statistics Bureau, jelutong latex production in Jambi has only been recorded up to 2007. Currently it is difficult to find jelutong stands in natural settings. They can only be found in protected forest areas where exploitation is prohibited, thus there has been no jelutong production in Jambi in the since around 2009-2010.

Since the late 1970s, exploitation of jelutong timber in Jambi forest has been carried out through concessions to various logging companies. Between 1980 and 1990 jelutong was one of the primary sources of livelihood in Jambi. Farmers would harvest jelutong latexfrom naturally-growing trees in the forest. After the mass logging period was over, jelutong extraction activities drastically decreased. By the 1990s jelutong trees were hard to find. Jelutong domestication in Jambi began in 1989 via PT Dyera Hutan Lestari, an industrial forest concession company. The concessionaire was established to address the needs of pencil manufacturers. Within the last decade, rubber has developed into the most preferred estate crop in Jambi. However, most farmers who had profited from jelutong sap began to compare it with rubber and became interested in cultivating jelutong on their land and gradually jelutong nurseries emerged in communities. Large-scale jelutong plantation also encouraged jelutong nursery development in surrounding villages. The limited availability of seeds and seedlings along with their high demand influenced villages to produce jelutong seedlings. Currently some districts in Jambi are planting jelutong to rehabilitate peatlands. Jelutong as an indigenous plant species is believed to be ecologically and economically viable.

7.3.3 *Jelutong cultivation typologies*

In general, jelutong is used as the main crop with other potential plants as intercrops and currently there are three types of jelutong systems known as described below.

Natural jelutong system

Berbak National Park in Jambi Province is a natural reserve for peat swamp forest conservation and a natural habitat for jelutong. Based on information gathered from the community, farmers from villages in the conservation area extract jelutong sap from the forest. Jelutong trees are unevenly spread and according to farmers in Pematang Raman village in Muaro Jambi, the tree density for jelutong in the forest was six trees per hectare with an approximate total of around 300 trees in 55 ha of forest .

Mulyoutami et al (2010) showed that the productivity of natural jelutong trees in Lamandau River Wildlife Reserve (LRWR), Central Kalimantan Province was about 0.99 tonnes per hectare per year. Productive jelutong trees were about 10 to 15 years-old with approximately 30 cm diameter. Large diameter trees (about 90 cm) could also be found, with an estimated age of around 60 years.

Large-scale jelutong plantation

PT Dyera Hutan Lestari (PT DHL) operates an 8000 hectare plantation in Muaro Jambi and Tanjung Jabung Timur districts. The area is dominated by peat swamp to a depth of three metres. Rosera (2004) indicated that jelutong trees are planted using a row system of two to three metres with five-metre spacing. The rows extend from east to west with a seven-metre gap in between rows. Latterly the company has implemented a 100-metre row with five-by-five metre spacing. The first planting was carried out between 1991 and 1992 over an area of up to 913 ha in 1994 with average growth of more than 90 percent.

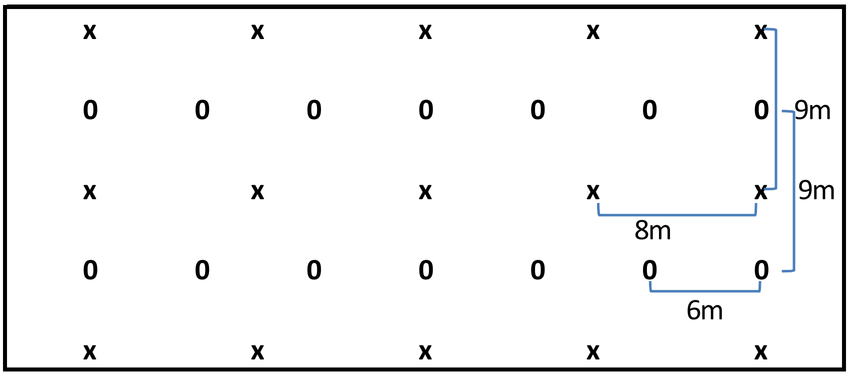
The constraints facing jelutong growers are mostly in collecting jelutong fruits as sources of seed, significant operational cost, lack of information on quality seeds and forest fire—considered to be the main threat faced by PT DHL. There were two major fires in 1997 and 2003, which caused great loss to the plantation. Currently, there are only 200 hectares of tree stands in the area (Bastomi and Lukman 2005). The stands function as sources of seed for Tanjabar District

Smallholders and jelutong

The increased popularity of jelutong in Jambi has encouraged several farmers to independently develop jelutong cultivation. In Tanjabar, the forestry agency supports communities living in the protected peat forest, which is government-owned land, to cultivate jelutong as an oil palm intercrop. In Tanjabar, the forestry agency supports jelutong cultivation on farmers' land. Both agencies provide jelutong seedlings for interested farmers and farmer groups at no cost.

From the study conducted in both districts, several villages were found to be jelutong farming centres, cultivating and producing seedlings for retail (Table 7.1). Farmers have experimented with a combination of mixed planting using jelutong and other high value crops. The combination pattern is mostly influenced by farmers' experience and seasonal trends. Thus it comes as no surprise that jelutong is combined with oil palm, rubber or other timber species.

A farmer in the peat swamp forest in Tanjabar planted jelutong with oil palm using 8 x 9 metre spacing or in the centre row of the oil palm trees. The same pattern was also applied by farmers in Sidomukti and Rantau Indah villages, Tanjung Jabung Timur. The farmers combined jelutong–rubber, jelutong–oil palm, jelutong–cacao and even jelutong–areca nut–oil palm. In the jelutong–oil palm combination, jelutong was planted in the centre row in vacant areas. Oil palm with 8 x 9 metre spacing was intercropped with jelutong using 6 x 9 metre spacing (Figure 7.4). Besides intercropping, farmers also used monoculture techniques with 6 x 6 metre spacing.



x oil palm (8 x 9m)

0 jelutong (6 x 9m)

Figure 7.4. Oil palm and jelutong spacing description for Tanjung Jabung Timur

Table 7.1. Jelutong cultivation and seedling production in Tanjabar and Tanjung Jabung Timur

District	Seedling centres	Cultivation centres
Tanjung Jabung Barat	• Senyerang village, Senyerang sub-district	• Bram Itam Kiri and Desa Bram Itam Kanan villages, Bram Itam sub-district • Teluk Nilau village, Pangabuan sub-district • Senyerang village, Senyerang sub-district

7.3.4 *Jelutong agroforestation, magnitude and distribution in Tanjabar*

Jelutong agroforestation in Tanjabar commenced during the rehabilitation of the protected peat forest conducted by the local forestry agency. The area planted with oil palm has been modified with jelutong as an intercrop. A buffer zone has been established to allow the community to plant annual crops under the jelutong stand as an alternative livelihood strategy. The provincial forestry agency is conducting a non-timber forest product (NTFP) development program, with jelutong as one commodity; Tanjabar, Tanjung Jabung Timur and Muara Jambi are priority districts.

As jelutong is an indigenous species suitable for peat swamp areas where other crops tend to be less productive, some information about jelutong seed handling and seedling production between the forestry agency and the community is being divulged, for example in training events for farmers on jelutong cultivation.

Constraints remain limited information on and access to seeds and cultivation techniques. Feral pigs also hinder the success of jelutong cultivation as well as competition from more profitable and promising commodities such as coffee and oil palm.

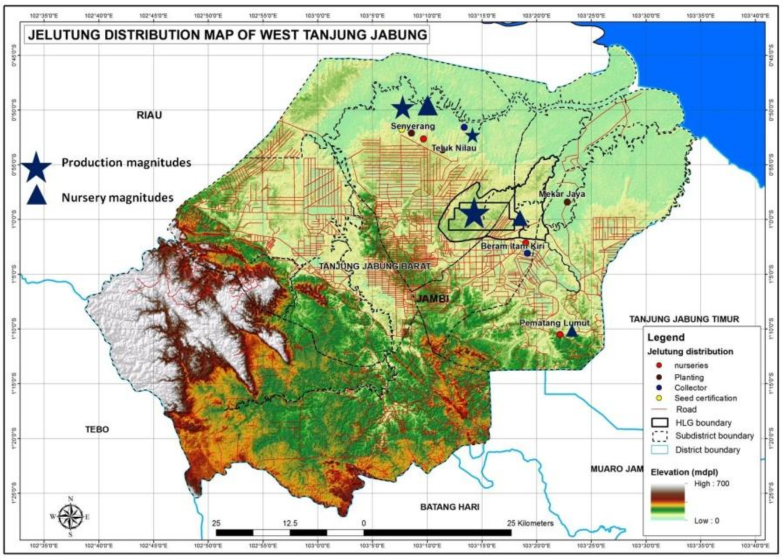


Figure 7.5. Jelutong development in Tanjabar

Figure 7.5 shows that the most significant jelutong production is in the peat swamp forest area. The first planting of about 500 ha of jelutong was conducted in 2009 in Bram Hitam Kanan by the local forestry agency. An estimated 1000 hectares of jelutong were planted within 2009 to 2010. Consequently, within less than 10 years the peat swamp forest area will be a prime jelutong production site in Jambi.

7.3.5 Perceptions on jelutong

Out of 54 farmer respondents, 96 percent were aware of jelutong while only 4 percent were not; 25 farmers had planted jelutong and 29 had not followed suit (Figure 7.6). Jelutong planters were mostly HLG farmers (23 farmers) while the remaining two planted jelutong voluntarily on their land.

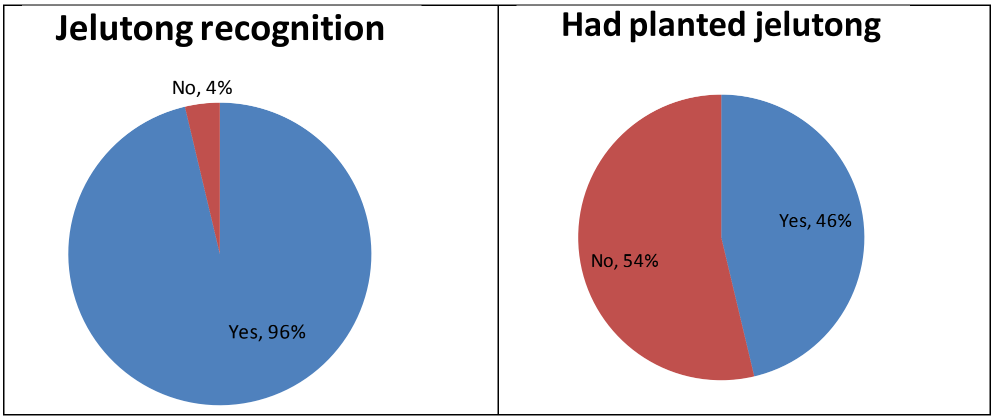


Figure 7.6. Farmer awareness of the jelutong species

7.3.5.1 Performance of jelutong

Figure 7 shows indicators for jelutong planting results, i.e. seedling growth and seedling survival rates. The farmers who have planted jelutong revealed that on the seedling performance, 60 percent mentioned that the seedlings grow moderately well and on the survival rate of the seedlings, 40 percent mentioned that the survival rate is between 50-75 percent (Figure 7.7).

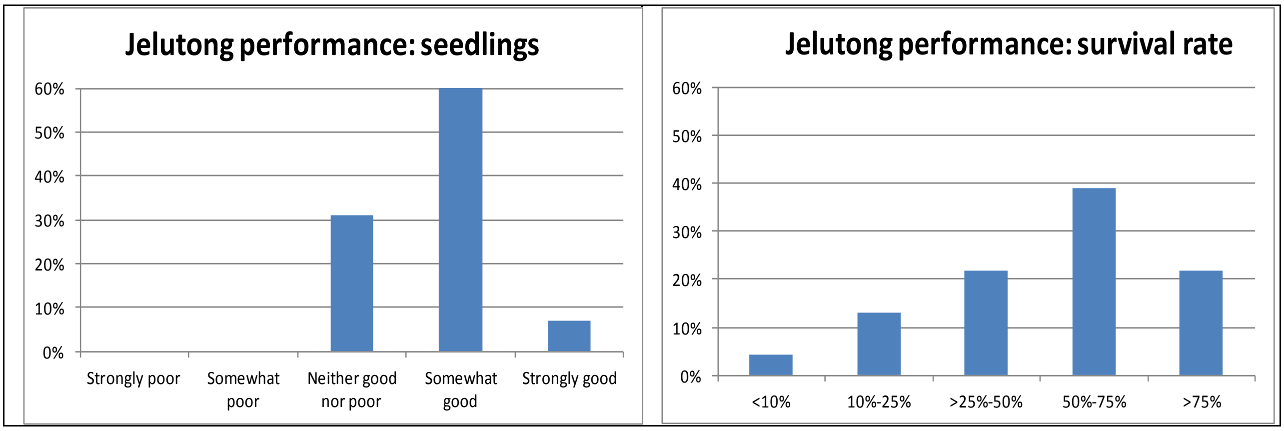


Figure 7.7. Two indicators of jelutong planting performance: seedling growth (left) and seedling survival rates (right)

7.3.5.2 Market information

There appears to be no market for jelutong in Tanjabar as most farmers (70 percent) responded that they were not aware of any such facility (Figure 7.8).

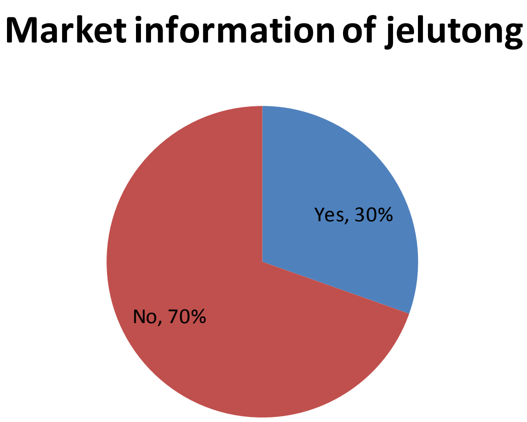


Figure 7.8. Current market Information on jelutong

Most farmers (60 percent) also mentioned that currently it would be extremely difficult to market jelutong latex, owing to no buyers in the area (Figure 7.9). However, with regard to the future, many farmers (60 percent) revealed that market access to jelutong latex looks promising. These positive perceptions are mostly on the basis of what they have heard about jelutong latex prices in the past and promotion of jelutong in the HLG area, which is attracting buyers and exporters.

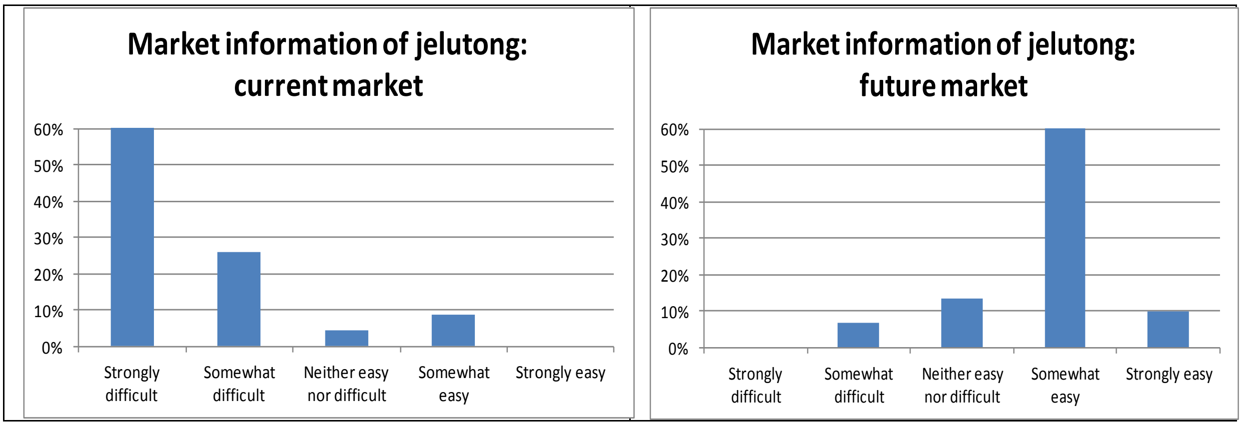


Figure 7.9. Perceptions of markets for jelutong at present (left) and in the future (right)

7.3.5.3 Willingness to plant jelutong

Overall, when asked about willingness to plant jelutong, many farmers (60 percent) showed moderate interest and 28 percent had strong interest in continuing to plant jelutong (Figure 7.10).

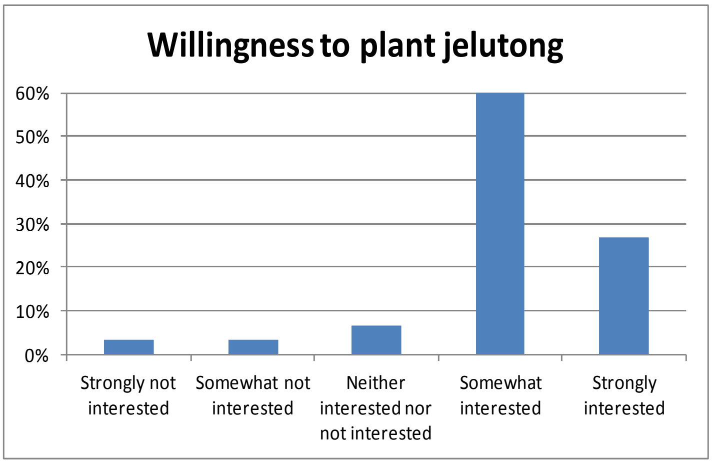


Figure 7.10. Farmers' willingness to plan jelutong

7.3.6 Land tenure and policy affecting jelutong

Obstacles such as access to land still impede agroforestation and adoption of jelutong cultivation by farmers. Limited landownership means farmers prefer other crops, for example, coffee, areca nut, rubber and coconut. Moreover, the overlaps between protected peat swamp forest areas and certified private lands generates unease in cultivation of jelutong. Police arrest of jelutong tappers and traders also creates apprehension among farmers.

7.3.7 Strengths, weaknesses, opportunities and threats (SWOT) assessments on jelutong in Tanjabar

Based on the current outputs reported in this chapter, overall analyses on the prospects for jelutong can be summarized using the SWOT approach (Table 7. 2).

Table 7.2. SWOT analysis for jelutong in Tanjabar

Internal factors	
Strength	Weakness
1. Jelutong is an indigenous species ideal for planting in peatland that is less productive for agriculture or plantations 2. Jelutong mother trees still exist in forests and community gardens around villages 3. Communities have experience in utilizing jelutong sap 4. Initiative for planting jelutong trees exists in communities, as a coffee and areca nut intercrop. 5. There is a farmer group with certified mother trees. 6. Several farmer groups have attended cultivation training.	1. Limited information and access to seeds and cultivation techniques. 2. Limited landownership 3. Wild pigs attacks 4. No successful production and marketing at the moment 5. The jelutong sap price is not as competitive as rubber 6. Coffee and oil palm give promising yields
External factors	
Opportunities	**Threats**
1. A development program for NTFPs, including jelutong, is being implemented by provincial forestry agencies prioritizing the districts of Tanjung Jabung Timur, Tanjabar and Muara Jambi 2. A rehabilitation effort is being implemented for protected forest areas by the district forestry agency via jelutong planting 3. Information sharing and exchange between plantation companies and farmers regarding jelutong seed treatment and cultivation 4. Farmers are permitted to plant annual crops under jelutong shade trees within the peat swamp forest area	1. Difficulty in finding jelutong to tap or as mother trees due to production and industrial plantation companies 2. Overlapping between protected peat swamp forest area and certified community-owned land causes concern about planting jelutong on private land 3. No regulations on jelutong trade as an NTFP 4. Arrests of jelutong tappers and traders

7.4 Recommendations: promotion and adoption process

1) Oil palm and areca nut are potentially profitable crops that can be grown together with jelutong on peatland in Tanjabar.
2) Active support from relevant agencies is required for capacity building among farmers for seed certification and in jelutong cultivation as well as technical marketing assistance.
3) A policy framework and analysis of implementation practicalities regarding jelutong management and marketing are required
4) Considering the existence of market actors and the high demand for jelutong products, it is crucial to develop a jelutong sap-processing industry at the provincial level.

8 Market access and value chain of jelutong latex

Aulia Perdana, Muhammad Sofiyuddin

8.1 Introduction

Jelutong *(Dyera sp)* is a latex-producing tree with high export value. It is used in the manufacture of commodities such as edible gum and cable insulators. Jelutong wood is also famous for its soft texture that is suitable for pencils, interior design and woodcarving. Originally found in natural forests, the number of jelutong stands has been depleted and only a small number of trees can be found in protected forests. This has caused a decrease in production of jelutong latex in the last decade.

In the past few years, jelutong has been the subject of public debate due to promotion by the Forestry Agency as a forest rehabilitation species as well as for commercial purposes. The rising demands for jelutong latex and timber reflect more opportunities for smallholder farmers living in peatland areas to enhance income sustainability, as jelutong productivity can last for 20 years and the timber can provide good cash returns when rejuvenation takes place. Jelutong planting was also included and assessed in the Reducing Emissions from All Land Uses (REALU) scenario in five land-use scenarios that employed the FALLOW model for assessing ecological and economic impact in Tanjung Jabung Barat.

It was revealed that the rehabilitation program has not yet indicated the marketing aspects of jelutong cultivation, which will affect adoption by communities and future endeavours. The success of promoting this tree species lies in the market aspects for that commodity. Therefore, information on and links to markets and other value chain actors should be incorporated along with the promotion of peat rehabilitation program. This chapter explores market access and barriers to marketing non-timber forest products (NTFPs) and agroforestry outputs; it also assesses NTFP market policies.

8.2 Methods

The study applied primary and secondary market information to identify actors in the market chain, marketing practices, market access and its issues and opportunities. Data collection was conducted from village to provincial levels to gain a comprehensive overview of the whole market system and its methodology. To analyse the jelutong latex market, rapid market appraisal (RMA) was undertaken; this is an iterative and interactive research process used to better understand complex market systems in a short period (Perdana et al 2013; ILO 2000; Ostertag et al 2007). RMA was used to identify and assess the problems and opportunities related to the jelutong latex market system, how the product flows from production to consumption and to understand how the commodity system is organized, operates and performs.

To identify existing actors involved in the jelutong latex trade, a snowball sampling method was used; this relies on referrals from initial subjects to generate additional ones. The direction of the snowballing approach was from tappers to exporters. In-depth interviews with key informants and focus group discussions were held to validate data collected.

Data collection was conducted in January and November 2012 in Jambi and Central Kalimantan provinces. In Jambi, the study initially addressed the districts of Tanjung Jabung Barat and Tanjung Jabung Timur, which contain peat swamps and are a natural habitat for jelutong species. The REALU project subsequently narrowed the study to Tanjung Jabung Barat as the district has an interesting focus on peat swamp forest rehabilitation. In comparison, Central Kalimantan was chosen to provide benchmark information on latex extraction and marketing practices. The researchers visited the latex marketplace and thus were able to describe the value chain. The acquired data identify valuable decision-making information for developing recommendations.

8.3 Jelutong latex overview

As having been reviewed in Chapter Seven, jelutong latex is comonly used by industries for making chewing gum, cable coating and cellophane (Lemmens et al 1995). Initially jelutong latex was produced and exported for the manufacture of low quality rubber materials. Jelutong latex started to become important when the manufacture of chewing gum commenced. The development of this industry generated a highly significant increase in demand for jelutong latex (Burkill 1935).

Historically Indonesia has been the most important supplier of this product, followed by Malaysia. During the 1990s, Indonesia was still considered to be the main source of jelutong (Coppen 1995). Three types of jelutong have been traded for a long time, namely jelutong Banjarmasin, jelutong Palembang and jelutong Pontianak (formerly known as 'Dead Borneo'); trade names are usually based on the exporting port (Vantomme et al 2002). The United States has traditionally been the major importer of jelutong. In the past, direct shipments of jelutong from Indonesia were made to the United States; nowadays almost all of them are shipped via Singapore rather than directly from source (Coppen 1995). Some jelutong is also exported directly to Japan and Europe (Italy is the main importer). Jelutong production in Indonesia has experienced fluctuations. The jelutong latex trade peaked between 1910 and the 1930s, and then began to decline in the 1960s. Decline in latex production is attributable to poor jelutong productivity caused by overexploitation for many years, in addition to competition with the development of other sources of latex-producing crops (Williams 1963).

Jelutong latex production in Jambi and Central Kalimantan peaked in the early 1990s and has declined since then (Figure 8.1). Data obtained from the Central Bureau of Statistics are unlikely to present the real picture owing to missing information on small-scale production. However they are sufficient to confirm that jelutong latex is still traded.

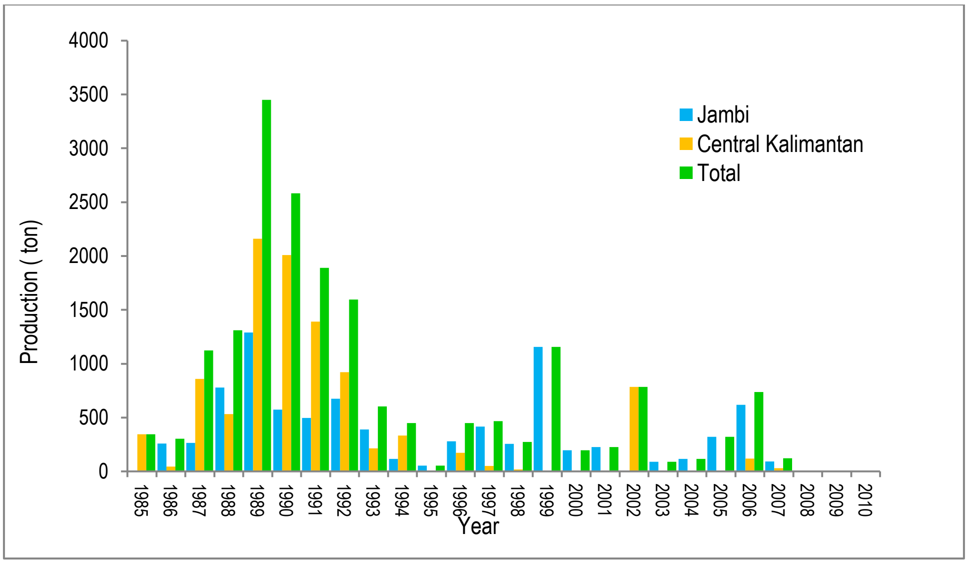


Figure 8.1 Jelutung latex production from 1985 to 2010 (Central Bureau of Statistics, 1985–2011)

Anecdotal information in Jambi Province demonstrates that up to 2007 people were still looking for and tapping jelutong trees. In Tanjung Jabung Barat and Tanjung Jabung Timur, tapping is done in production forest areas owned by companies or in protected forests. Tapping in these areas is considered illegal and many tappers have been prosecuted by the authorities resulting in negative impacts on the livelihoods of farmers who depend on this activity. In Central Kalimantan, on the contrary, to date many people have relied on tapping and trading latex in these regencies where the trees are abundant.

Jelutong agroforestry in Tanjung Jabung Barat commenced during rehabilitation of the Peat Protection Forest and was conducted by the Tanjung Jabung Barat Forestry Agency. Land planted with oil palm was rehabilitated with jelutong as an intercrop. The agency developed a buffer area and allowed the community to plant annual crops under jelutong stands as an alternative livelihood strategy. More broadly, the provincial forestry agency conducted an NTFP development program, with jelutong as one such product in Tanjung Jabung Barat, Tanjung Jabung Timur and Muara Jambi as priority districts.

8.4 Jelutong latex value chain

Data from key informants revealed that at its peak, jelutong latex development in Jambi Province followed a relatively simple flow. Tappers sold raw latex directly to large traders or through local collectors depending on ease of access. Most tappers in Tanjung Jabung Barat sold raw latex through local collectors owing to remoteness from the nearest town and substantial costs incurred in travelling. Provincial-level exporters would then receive latex from large traders and ship it to a processing company for export overseas. Figure 8.2 illustrates product flow in Jambi and Central Kalimantan.

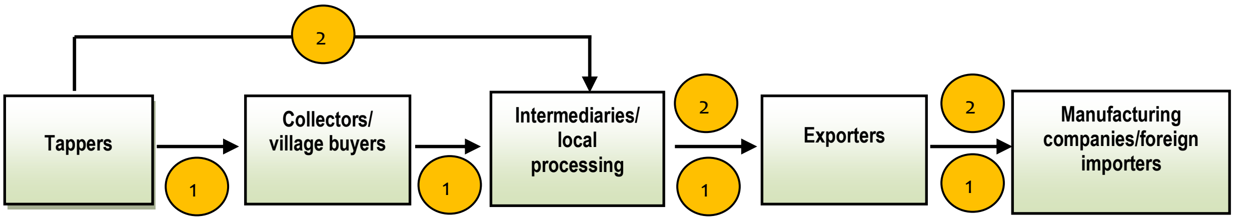


Figure 8.2 Jelutong latex value chains

A benchmarking study of the jelutong latex value chain in Central Kalimantan discovered that it followed the same flow. It also found during data collection that the jelutong latex trade was still thriving and involved a significant number of chain actors.

8.5 Value chain actors

The jelutong trade involves many actors and is influenced by government regulations on NTFP marketing and trade. Analysis in Central Kalimantan and Jambi showed similarities in market pathways. Some of the market pathway types are shown in Figure 8.2. Actors involved in jelutong market pathways include tappers, collectors in villages, intermediaries and export traders.

Tappers

Farmers tap naturally-growing jelutong in state forest land (production forest and protection forest) and forests surrounding their villages. Tapping is conducted individually or as group, consisting of two to five tappers. There is a tree tenure system in Jambi and Central Kalimantan. Each tapper or tapper group has seven to 14 tree lines, with 20 to 40 trees in each line. Based on observations, there are more jelutong trees in the protected forest area than in the production forest or in the neighbouring village forest.

At both study sites, tappers act as price takers. No negotiation is evident and collectors declare the price while receiving barrels filled with raw latex. Larger traders erect a sign with the day's price written on it and place it in front of the depot for everyone to see. Tappers are aware of the quality control procedure employed by the large traders. Colour, water content and cleanliness are among the indicators of quality set by most traders in the value chain. Lower quality will have a direct effect on price. In addition, trust is a crucial factor and serves as a primary basis of trade among all chain actors, especially between tappers and traders. If a tapper tries to cheat by placing stones or metal in the latex blocks, the whole group may be excluded from the system.

Intermediaries

Intermediaries in the jelutong latex value chain consist of collectors at the village level and district-level traders. Most village-level collectors are tappers themselves; some have direct access to traders and own vehicles to transport latex to town; others are just informants or distributors who resell the latex to traders. Nonetheless, collectors and traders play an important role along the value chain. First, they search the marketplace. Guided by their information network, they visit villages or tapper huts and explore upstream for product supply. They have to repeat this search process frequently due to changes in supply. Second, collectors perform various sorting functions by grading the quality of the latex of multiple producers for sale to processors. Third, traders serve to minimize and facilitate the number of contacts in the channel system.

In practice, collectors visit the tappers, assess the latex blocks or barrels and state the price by kilogram or for the individual barrel. Sometimes, local- and district-level traders wait for the tappers to pay them a visit. Traders assess the latex, check for impurities and name the price per kilogram. Some traders can boil clotted latex in a three-tonne barrel using boiled water. Boiled latex is then pressed into blocks of 10 x 20 x 15 cm cubes.

Processors and exporters

The next set of jelutong latex chain actors is representatives from the processors and exporters (private companies) who purchase raw latex from the local- and provincial-level traders and ship it mostly to Singapore and Japan. Processors and exporters are commonly strategic business partners; processors process blocks of latex into cubes with only 30 percent water content and the exporters ship the cubes in containers to other processing companies overseas. In Sumatra, there are three exporters in Jambi, three in Rengat, one in Pekanbaru and one in Palembang. Due to lack of supply, an exporter in Jambi moved to Central Kalimantan and started a new venture where the supply of jelutong latex is sufficient.

In Central Kalimantan during periods when the supply of jelutong latex is abundant, intermediaries process latex into cubes and processors make latex sheets (SIR20).

8.6 Governance and institutions involved

Exploitation and distribution of jelutong latex as an NTFP is regulated. The Indonesian Ministry of Forestry and Ministry of Trade are the regulating state agencies. In legislation No. 41/1999 regarding forestry and government regulation No. 6/2007 on forest governance and management planning, it is explained that the exploitation of NTFPs within state forest requires permits to use and/or to collect latex (Table 8.1).

Unlike state forests, based on Forestry Minister Decree No. 30/2012 on the management of forest products produced in private lands, exploitation and collection of NTFPs do not require permits. However, a transport or personal note is required, authorized by the village chief or village officials. For NTFP processing, an NTFP Primary Industrial Business Licence is required. The licences are offered to individuals, firms and cooperatives, and issued by the Ministry of Forestry based on a recommendation from the district government.

Table 8.1. Permits on the utilization of NTFPs

Forest status		State forest			Rights forest
Forest function	**Conservation**	**Production**		**Protection**	
		Hutan Alam (HA)	**Hutan Tanaman (HT)**		
Utilization	*	IUPHHBK-HA	IUPHHBK-HT	-	-
Collection	*	IPHHBK	IPHHBK	IPHHBK	-
Industry		IUIPHHBK			IUIPHHBK
Distribution/transportation	*	FA-HHBK	FA-HHBK	FA-HHBK	Transport permit, permit for own use

Note :

** Regulated under specific law*

HHBK= NTFP; *IUPHHBK* = NTFP utilization permit; *IPHHBK* = NTFP collection permit; *IUIPHHBK* = permit for NTFP primary industry

Within a state forest, procedures for NTFP distribution are regulated in detail in the Forestry Minister Decree No. 55/2006 on management of forest products derived from state forest. In NTFP distribution, permit holders require an NTFP freight invoice. In practice, before the invoice is issued, the company experiences a long official procedure involving district and provincial forestry agencies.

After harvesting and collecting NTFPs, permit holders are required to assess the weight, volume and number of harvested NTFPs. The assessment is then recorded and reported in an NTFP production report. The reporter will need to submit a legalization appeal to the official certifier of NTFP production at the provincial level with a copy sent to the head of the district agency. The certified report will act as the basis for calculation of forest resource provision payment. The provision payment is based on Trade Minister Decree No. 12/2012 for jelutong latex to the amount of IDR60 000 per kilogram. The certified report must be transcribed into an NTFP list and attached to the freight invoice during its issuance along with the receipt of the forest resource provision payment. Export documents are required for processing companies exporting latex as indicated by the Ministry of Trade.

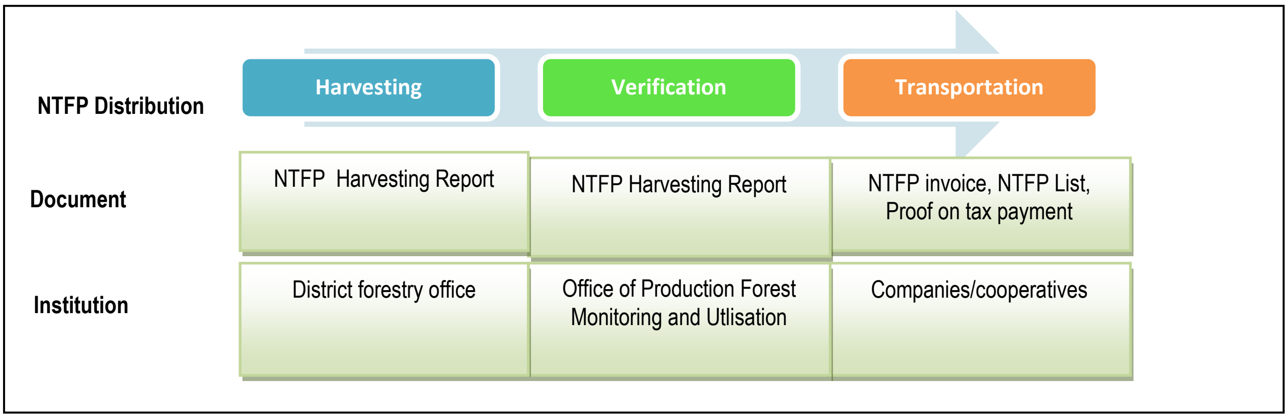


Figure 8.3 NTFP freight invoice issuance

Based on observations in Tanjung Jabung Barat and Tanjung Jabung Timur, the practice of these regulations is complicated and cumbersome. Business owners complained that the issuance of the regulation hampers the jelutong latex trade because the local government has no officials responsible for NTFP freight invoices or certified production report officers as inspectors and assessors of jelutong latex. This disparity forced the local government to put all NTFP utilization on hold. Numerous arrests occurred due to lack of information because of this hold-up as people still tap in the protected forest areas.

The local government of Central Kalimantan is more flexible in accommodating the issuance of the regulation. Business owners can directly coordinate with the monitoring and utilization of production forest agency to assist in developing the production report and freight invoice. Communities can easily obtain a permit to collect jelutong sap in the village area or a permit from the protected area managers if the community collects jelutong sap in the protected areas.

8.7 Conclusions and recommendations

Jelutong as a latex-producing tree—formerly a community source of livelihood in peat areas—is now more difficult to find. Establishment of extensive forestry and plantation companies means that jelutong trees can only be found in protected forest areas. The production of latex in Jambi and Central Kalimantan peaked in the 1990s but has been declining to date. However there is still a small jelutong latex trade.

Peatland rehabilitation programs conducted by the Ministry of Forestry introduced jelutong as an indigenous species that best fit ecological and economic circumstances in the area. However there are barriers and challenges that market actors must face to make jelutong an optional source of livelihood. Indonesia as a producing country can only produce semi-finished products. In future, with potential and self-initiated cultivation programs by the government or private entities, an advanced jelutong latex processing industry is a significant proposition to be taken into account.

The export trade value of jelutong latex is assessed as high, at more than USD 1 million annually. The local trade value is also considered high at more than IDR1 billion annually. The market itself has local, national and international scope, with at least three countries outside Indonesia as major target markets and community-based market chain involvement, such as cooperatives and farmer groups.

The potential for jelutong latex marketing in Jambi depends heavily on the application of NTFP regulations within the protected peat forest where farmers now live. Farmer groups are eager to produce jelutong latex as part of their livelihood portfolio, and value chain actors still exist to provide their services to customers. This situation can be modified to cater to farmers living within protected forests. This requires intensive coordination between district and provincial forestry agencies as well as trade and industrial agencies to disseminate related legislation to all stakeholders.

Progress can be made if farmers are facilitated to 1) have access to markets and information on the current status of the jelutong latex market in Indonesia; 2) obtain information on jelutong cultivation and latex processing; and 3) acquire financial support such as micro credit, which requires them to form collective groups or cooperatives.

9 Peat carbon emissions resulting from forest conversions

Ni'matul Khasanah, Subekti Rahayu, Dinna Tazkiana, Tonni Asmawan, Meine van Noordwijk, Atiek Widayati

9.1 Introduction

One of the fundamental elements in incentive mechanism for the maintenance or provision of ecosystem services is the presence of a cause-and-effect link between changes on the landscape and the services affected, preferably one that is open to observations, monitoring or measurement. With regards to conditional incentive mechanism to be developed in Tanjabar peatland area , it is therefore important to obtain reliable estimates on how the landscape changes affect emissions. This chapter reports the methods and findings on emissions due to peat oxidation in relation to drainage management of different types of land uses and land management.

Land conversion in peat areas is potentially a high source of carbon (C) emissions not only due to vegetation removal during land clearing, but also because of continuous emissions from peat oxidation when peatland is drained after land conversion. The deeper the groundwater level of a drainage canal, the higher the oxidation rate becomes. It can be minimized by maintaining the depth of the groundwater table to a maximum level. Maswar (2011) reported that overall emission levels for a large-scale oil palm plantation drained to maintain the maximum depth (shallowest from the surface) of the groundwater table to between 50 and 70 cm were between 34–45 t CO_2e per hectare per year. How varied values among land cover types; and if there is any difference between large-scale operations and smallholder farm management are interesting questions that need to be answered. How fertilizer affects decomposition and associated CO_2 release to the atmosphere is another interesting issue.

The specific objectives of this study were:

- To estimate peatland C emissions due to peat oxidation in relation to drainage management of (1) simple rubber agroforestry, (2) mixed coconut, (3) shaded coffee cultivation and (4) oil palm plantation by smallholder farms using the C stock difference approach (1–3) and the rate of subsidence approach (1–4).
- To estimate the effect of fertilizer application on the peat decomposition rates of three land cover types (simple rubber agroforestry, oil palm and logged-over forest) using rate of subsidence and microrelief approaches.

9.2 Methods

9.2.1 Carbon stock difference approach

The primary method for estimation of peat C emissions used in this study was observing the difference between C stocks of a certain land-use system/farming system and the C stock of forest when it was cleared and drained, assuming that farming systems were developed from forest conversion, hence the term 'stock difference'. The rate of C emitted is affected by the time lag after clearing, therefore it is important to know the time lag between clearing and the current age of planted crops. In relation to the maintained water table on the farm, distance from the main canal also affects the amount of belowground C stock remaining. Belowground C stock will become lower with closer proximity to the canal; conversely it will be higher with greater distance from the canal. The 'broken stick' relationship is normally used to describe this relationship as shown in figure 1. In conditions with no emissions, C stock will be on the C stock maximum line; as drainage builds, the C stock declines following the sloping line (figure 1). The total loss of C, or C emissions, can be estimated from the triangular area (identified with the arrow in Figure 9.1).

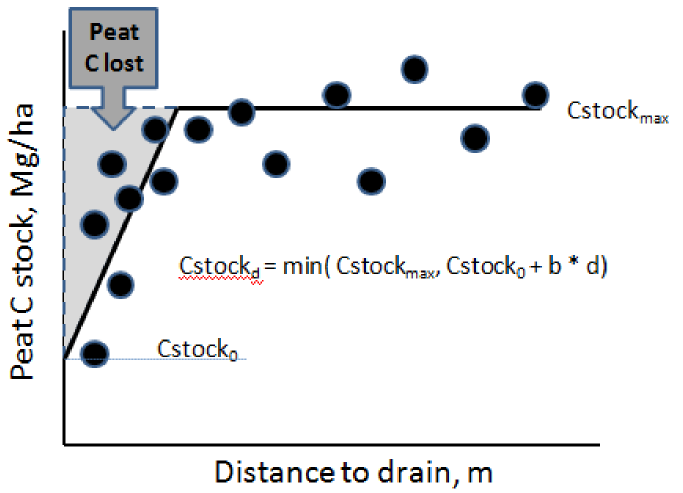


Figure 9.1 Cumulative peat C losses using the 'broken stick' relationship between peat profile C stock and distance to the drainage canal

Peat C loss is calculated as:

If 0.5d ≥ d_t

$$C_{lost} = \frac{d_t\ x\ (CStock_{max} - CStock_0)^2}{0.5\ x\ b\ x\ d^2\ x\ a} x\ 3.67$$

If 0.5d < d_t

$$C_{lost} = \frac{(CStock_{max} - CStock_0) - (0.25\ x\ b\ x\ d)}{a} x\ 3.67$$

$$CStock_0 = CStock_{max} - d\ x\ b$$

where: C_{lost} = peat C lost after land conversion, CO_2e tonnes per hectare per year; $CStock_{max}$ = initial C stock before conversion, tonnes per hectare; $Cstock_o$ = current C stock, tonnes per hectare; b = slope of the broken stick relationship; a = years after conversion; d_t = distance at $Cstock_{max}$, m; d = distance between canal, m; and 3.67 = conversion factor from C to CO_2.

9.2.2 *Rate of subsidence and microrelief approaches*

9.2.2.1 Peat emission based on subsidence rate

Peatland subsidence is an indication of the active decomposition process due to oxidation when peat is drained after land conversion. The annual rate of CO_2 loss of peatland can be estimated based on the subsidence rates of two different time measuring points at minimum intervals of measurement such as three to six months (GrØnlund et al 2008). To assess whether the C stock difference approach and broken stick regression analysis were accurate, we also measured the rate of CO_2 emission based on subsidence measurement in four land cover types (simple rubber agroforestry, mixed coconut, shaded coffee cultivation and oil palm plantation) under smallholder farm management.

Peat C loss was calculated as:

$$peat_{loss} = BD_{ini} x\, Z_{ini} - BD_{fin} x\, Z_{fin}$$ (GrØnlund et al 2008)

where: BD = bulk density (g/cm^3), Z = distance from marker to peat surface (cm), $peat_{loss}$ = g/cm^2.

The distance from marker to peat surface is corrected based on microrelief measurement using the Kriging approach.

Total emission CO_2 = $peat_{loss}$ x C_{org} x 3.67

Previous studies reported that variation in the rate of CO_2 emission due to decomposition based on subsidence measurement were around 38 percent (GrØnlund et al 2008), 40 percent (Couwenberg et al 2010) and 60 percent (Wosten et al 1997) from total subsidence.

9.2.2.2 Effect of fertilizer application on peat decomposition rates

While dominant theory relates the rate of peat decomposition and associated CO_2 release to the atmosphere primarily to drainage and water management, we have increasing evidence that the mineral nutrition (nitrogen, phosphorus) aspects that change with land use have a strong effect as well. Hence, we also conduct an experiment to test the local effects of increased nitrogen and phosphorus nutrition in the current water management regime over a range of different land uses. A similar calculation of peat C loss based on subsidence rate is also applied to assess peat C loss as a result of fertilizer application.

9.3 Data collection and analyses

9.3.1 *Carbon stock difference approach*

Three types of smallholder farmland found commonly in Tanjabar peatland areas are: (1) simple rubber agroforestry (40 years old), (2) mixed coconut (50 years old) and (3) shaded coffee cultivation (25 years old). Belowground C stock of these land cover types was estimated by measuring soil bulk density and analysing soil C content. This was accomplished by taking soil samples using a peat auger throughout the entire soil depth at four measurement points in transects perpendicular to the drains (5, 15, 25 and 45 m from the drainage canal). Each type of land cover had three replications. The sample was then analysed in a laboratory at the Indonesian Soil Research Institute (ISRI), Ministry of Agriculture. The soil C content was analysed via the loss-on-ignition (LOI) method. Depth of the groundwater table at each measurement point was also recorded as further information to observe the variation of C stock. The same approach was also done in disturbed forest as a reference level of C stock or initial condition before conversion. It was measured at three measurement points in transects perpendicular to the drains (50, 140, and 190 m from the drainage canal).

Two other types of land cover found in the peatland area are oil palm gardens and acacia plantations. No measurements were conducted in oil palm gardens because they are mostly newly planted gardens with one-year old palms and land characteristics that are very similar to disturbed forest. Owing to current land tenure situations in the area, measurement of acacia plantations was also not conducted.

For Tanjabar, three assumptions were used for the analyses:

- Disturbed forest was used as reference level or initial condition of total belowground C stock for all land-use systems. This is because forest conversions normally take place after forest logging or other disturbance and not directly from dense primary forest.
- We assumed that all land-use systems were located in the same peat dome (the same peat depth before conversion) with around 100 cm peat depth and with C stock of around 580 tonnes per hectare This was used as the reference C stock.
- We used 100 m as a reference for distance between canals. This assumption was arbitrarily applied due to limitations in the field to measure the true distance between major canals.

9.3.2 Rate of subsidence and microrelief approaches

9.3.2.1 Peat emission based on subsidence rate

Peat subsidence was monitored by installing metal rods at four measurement points (Figures 9.2 and 9.3) in transects perpendicular to the drains. A permanent mark (H_o) was made for initial point of measurement and peat subsidence (H_t) will be monitored every six months. Microrelief at eight cardinal points will also be mapped surrounding the central points (4 m and 10 m) for the subsidence measurements (Figure 9.4) at the same time as metal rod installation and every six months. Detail of parameters measured and monitored is presented in Table 9.1.

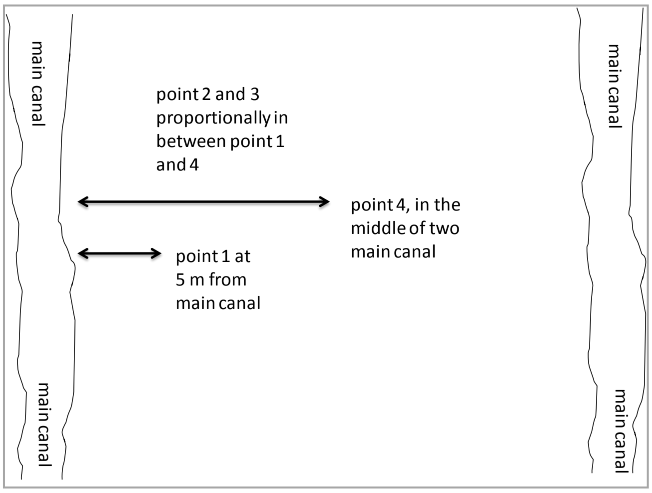


Figure 9.2 Points of measurement relative to canals

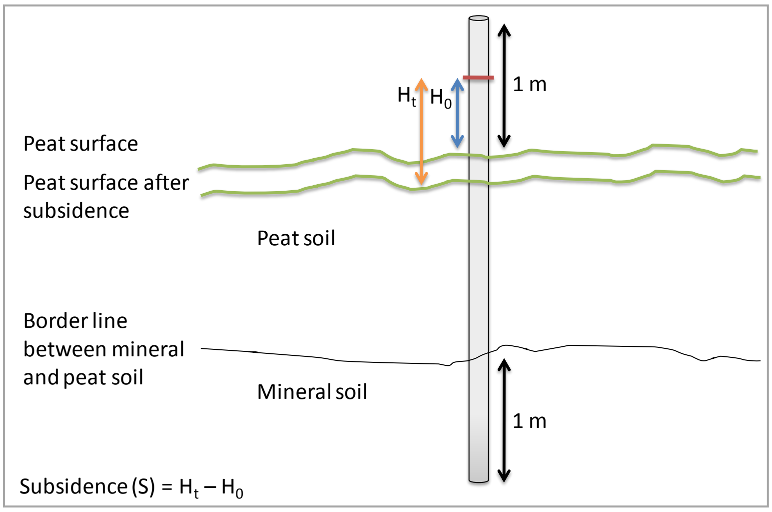


Figure 9.3 Measurement of peat subsidence

Table 9.1. Monitoring of peat subsidence per measurement point for three years

No.	Parameters	Interval
1	Water table	Installed in May 2013, will be monitored every month (manual reading per month)
2	Subsidence	Installed in November 2012, will be monitored every 6 months
3	Microrelief at 8 cardinal points at 4 m and 10 m	Every 6 months
4	Bulk density	Before metal rod installation and whenever cumulative subsidence exceeds 2 (or 5) cm

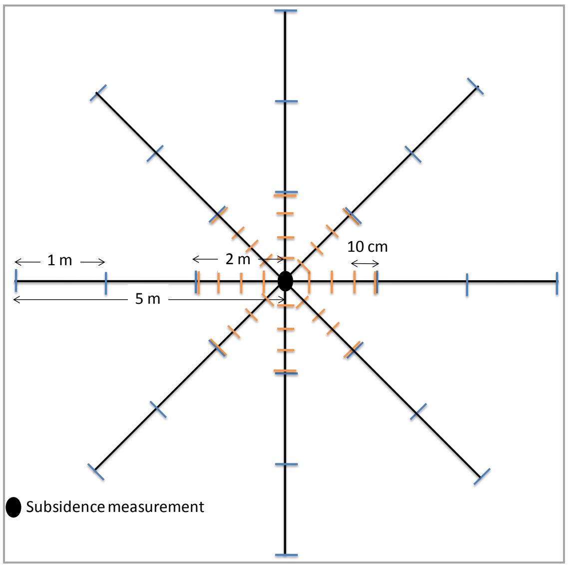


Figure 9.4 Measurement of microrelief

9.3.2.2 Effect of fertilizer application on peat decomposition rates

As the microrelief has been mapped in the area surrounding the central points for subsidence measurements, we can use a split-plot design and test two fertilizer levels against the control, with a plot size of about 1 m^2 (Figure 9.5).

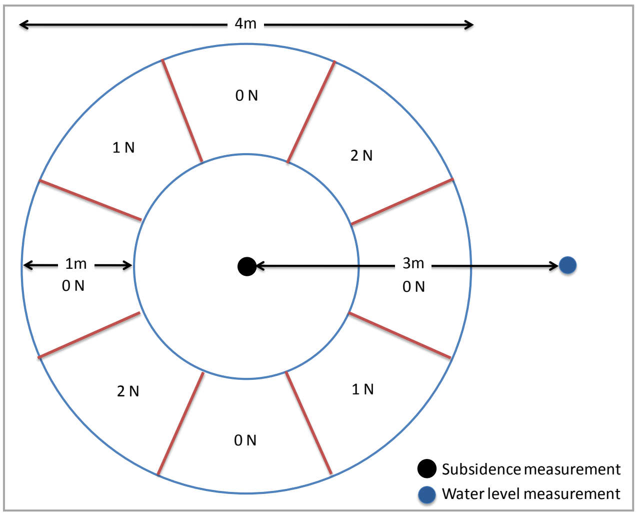


Figure 9.5 Design for fertilizer application (N + P) per measurement point

An experiment to estimate the effect of fertilizer application on peat decomposition rates will be done for one-year-old oil palm (three plots), logged-over forest (three plots) and 40-year-old rubber agroforestry (three plots). Each plot will have two measurement points in transects perpendicular to the drains (points 1 and 4 in figure 2) (two replications). Each replication has three different levels of fertilizer application (Figure 9.5 and Table 9.2) and this will be done every six months (Table 9.3). Four parameters will be monitored in each plot (Table 9.4).

Table 9.2. Doses of fertilizer application per measurement point

Treatment	Age of palm (year)	# of application	Urea	TSP	KCl	Urea	TSP	KCl
			(kg/tree/application)[1)]			(kg/m^2/application)		
0N	-	-	-	-	-	-	-	-
1N	1	2	0.625	0.625	0.75	0.28	0.28	0.33
	2	2	0.75	0.75	1.75	0.33	0.33	0.77
	3	2	0.75	0.75	2.5	0.33	0.33	1.10
2N	1	2	1.25	1.25	1.5	0.55	0.55	0.66
	2	2	1.5	1.5	3.5	0.66	0.66	1.54
	3	2	1.5	1.5	5	0.66	0.66	2.20

[1)] Assuming the rates are applied over 2.27 m^2 (1.7 m radius circle around the tree)
Source: Mutert et al (1999)

Table 9.3. Schedule for fertilizer application

Year	Application	Date
1	1st	May 2013
1	2nd	November 2013
2	1st	May 2014
2	2nd	November 2014
3	1st	May 2015
3	2nd	November 2015

Table 9.4. Monitoring per measurement point

No.	Parameters	Interval
1	Water table	Installed in May 2013, will be monitored every month (manual reading per month)
2	Subsidence	Installed in November 2012, will be monitored every 6 months
3	Micro relief at 8 cardinal points at 4 m and 10 m	Every 6 months
4	Bulk density	Before and after treatment, and whenever cumulative subsidence exceeds 2 (or 5) cm

9.4 Results and discussions

9.4.1 Measured plots

The four land cover types where measurements were conducted are illustrated in figure 9.6A–D. All the measured plots were owned by smallholder farmers with simple canals established. The distribution of measurement plots is shown in Figure 9.7.

Figure 9.6 The measured plots

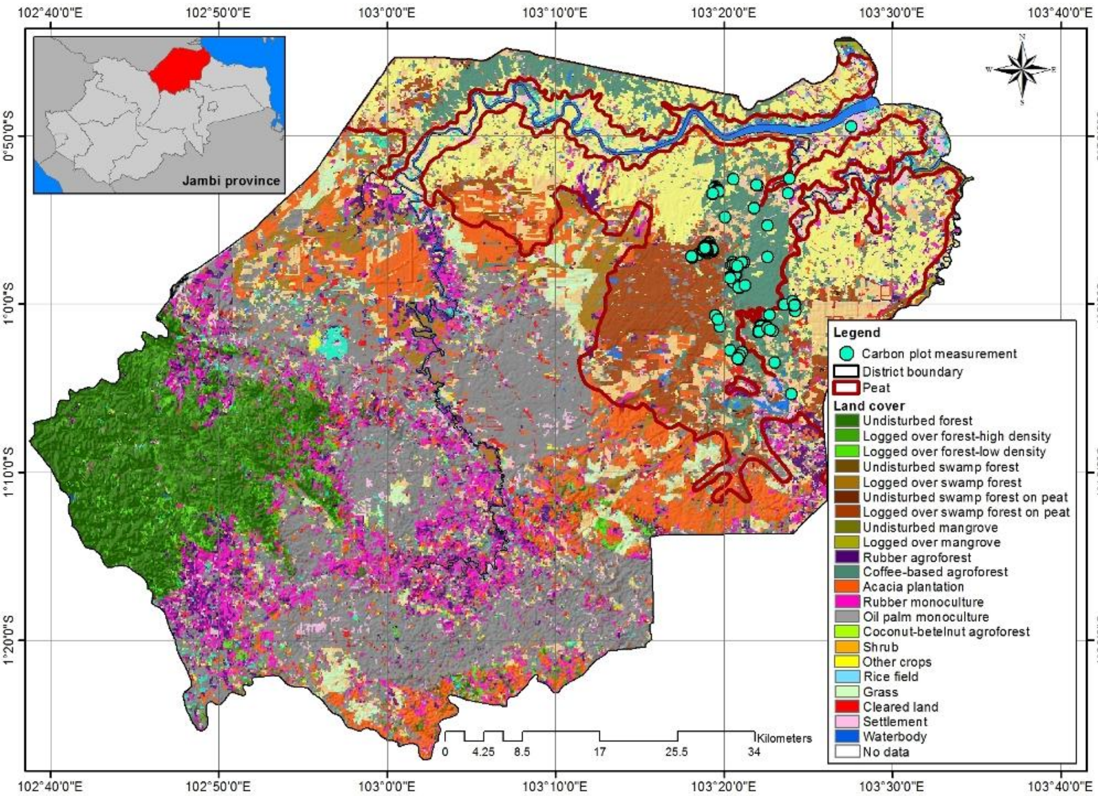


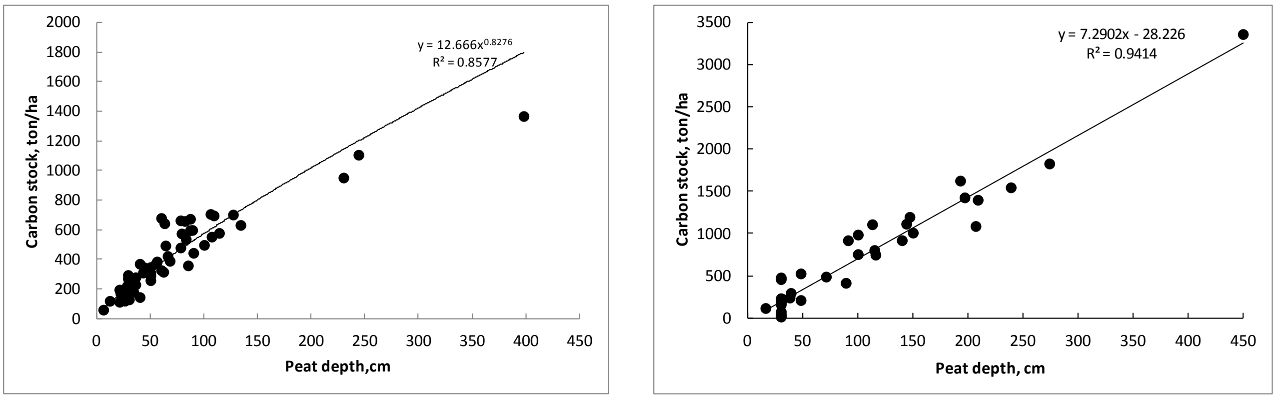
Figure 9.7 Distribution of plots

There were three additional sample plots measured earlier for reference plots, from which the data were incorporated for building the relationship between peat depths and C stocks. However, due to lack-of-distance-to-canal data, the three points could not be used for peat emission estimations.

9.4.2 Relationship between total belowground carbon stock and peat depth

Total belowground C stock increased in deeper peat conditions following the power regression Y = $12.666X^{0.8276}$ (Figure 9.8A).

Similar analyses were conducted in Lamandau, Central Kalimantan (Figure 9.8B) which has a different trend compared to Tanjabar. This can be explained through the different peatland conditions; in Lamandau land conversion was not followed by canal building as done in Tanjabar. Belowground C stock increased with linear regression to peat depth and had a lower intercept. This difference can be explained by land conversion from forest to other systems that involved establishing canal or drainage systems that potentially affected the peat decomposition process and resulted in higher bulk density of peat due to changing peat maturity.

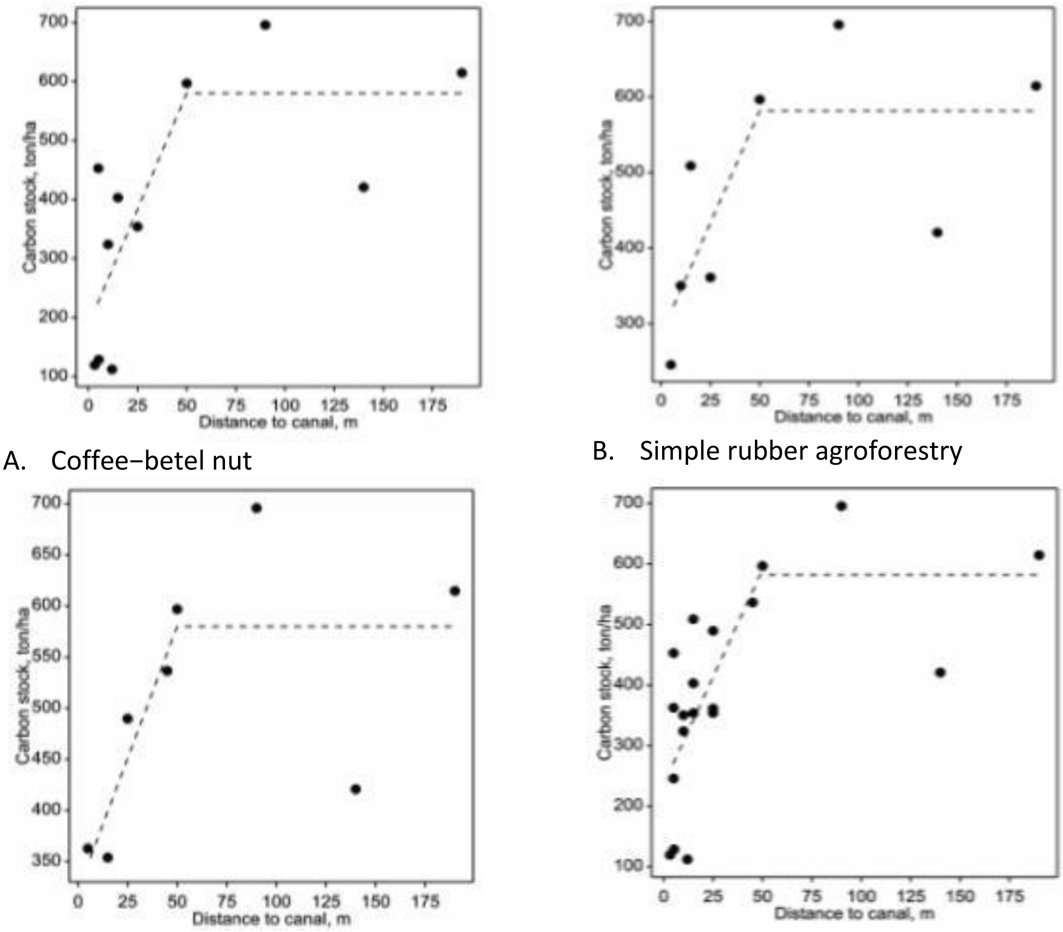


A. Tanjung Jabung Barat, Jambi   B. Lamandau, Central Kalimantan

Figure 9.8 Relationship between peat depth and peat C stock

9.4.3 Carbon loss after land conversion

Broken stick regression analysis was used to estimate potential C stock losses after land-use change (Figure 9.9A–8D).



A. Coffee–betel nut

B. Simple rubber agroforestry

C. Coconut + betel nut

D. All data combined

Figure 9.9 Relationship between distance to canal and peat C stock in various land-use systems

Preliminary results of broken stick regression analysis showed that for the first 50 m to the canal,[4] CO_2 emission from forest conversion was about 28.8 CO_2e , 13.6 CO_2e and 9.5 CO_2e tonnes per hectare per year for shaded coffee, simple rubber agroforestry and mixed coconut respectively. However, if land-use systems are not considered, forest conversion in Tanjabar potentially emitted about 15.8 CO_2e tonnes per hectare per year. The variation of emission between land uses can be linked to the type of land management or maintenance of the canals and age of the plots. The lowest emission was found in the mixed coconut system, where the farmer maintained the water level of drainage canals besides the water level controlled by the flow of the river. The highest emission was found in shaded coffee. Canopy cover that is expressed in aboveground biomass can also explain the variation of emissions from forest conversion in peatland areas. Aboveground biomass of shaded coffee is on average 26.0 tonnes per hectare. This value is lowest compared to simple rubber agroforestry (58.0 tonnes per hectare) and mixed coconut (48.3 tonnes per hectare). More open area may increase sunlight exposure and decomposition activity.

9.5 Initial conclusions and way forward

The minimum emission of studied land uses is about 9.5 CO_2e tonnes per hectare per year (mixed coconut) and the maximum is about 28.8 CO_2e tonnes per hectare per year (shaded coffee) with

[4] There is no C loss beyond 50 m to canal

an average of about 15.8 CO_2e tonnes per hectare per year. These values can initially be considered as the C emissions from smallholder plots with simple narrow and shallow canals in Tanjabar peatland areas that are now 25 and 50 years old.

Maswar (2011) found higher emissions of 34–45 t CO_2e tonnes per hectare per year from oil palm plantations in Aceh. By comparing these values to those found in this study, it seems that smallholder farms built with simple canals emit less C compared to large-scale (oil palm) plantations. However, it should be noted that the two studies carry different assumptions and further research is needed to obtain more reliable outputs for comparison.

Accuracies that may have been introduced in the estimates obtained in this study come from the various assumptions applied. Each land cover type observed may have had different initial C stock (reference C stock) based on its peat depth, instead of having one C stock reference of disturbed forest as applied here. Although it is impossible to obtain the exact reference C stock (hence peat depth) of each land cover type, to improve the estimation, more sample plots for reference C stocks should be added.

Peat emission will be estimated based on six-month monitoring cycle on subsidence rates. The data collected in the first two cycles of monitoring is currently being analysed and is thus not available to be reported as yet. Another estimate will be on the effect of fertilizer on peat decomposition rate, of which the monitoring work has just been started recently. Monitoring work for analyzing these two estimates is ongoing and in order to achieve sound estimate it will be continued for the next two years.

The assumption of 100 m distance between canals should also be revisited and more accurate distance measurements should be conducted, for example with GPS measurements and other mapping approaches. The improved distance may lead to lower or higher emission rates; emission values will be lower if the distance between canals is more than 100 m and will be higher if the reference of peat depth is deeper than 100 m.

10 Lessons learned and moving forward

10.1 Summary of approaches

Throughout its three-year implementation, REALU II project in Indonesia has contributed to dialogues on all land-use emission reductions at national, sub-national and site levels. NAMA and its sub-national derivatives have been the umbrella initiatives for REALU to obtain common ground with Indonesia's formal national-to-sub-national efforts, including emerging policies and regulations.

The chapters in this report address multiple subjects on emission reduction efforts for Indonesia in the domains of assessments, action-research and engagement/collaboration. Assessments were needed for better understanding of dynamics, baselines, feasibility and estimates, which are crucial as the foundation for intervention or action plans. In the meantime, actions and engagements have been committed by the project with various stakeholders to demonstrate what it takes to commit to locally feasible and appropriate emission reduction efforts in addition to achieving the anticipated outcomes.

Another angle of the three-year project was to demonstrate the vertical national to sub-national interactions formulated in the concept of 'nesting'. At the Indonesian national level, assessments were conducted on Indonesia's dynamics and readiness apropos of REDD+ mechanisms, while capacity strengthening activities have also become a significant component of REALU contributions to ICRAF's role in the national RAN-GRK arena. REALU Indonesia employs the nesting approach through 'reverse coning', in which at the sub-national level it works in Jambi Province and then zooms in to Tanjung Jabung Barat (Tanjabar) District as the main demonstration area. At the district level, detailed multiple-sector work was carried out for emission reduction efforts that are locally appropriate.

10.2 Lessons learned

10.2.1 Dynamics of REDD+ and NAMA in relation to the nesting approach

As discussed in Chapters 2 and 3, in Indonesia we are witnessing the development of two initiatives for emission reduction: REDD+ and action plans on greenhouse gas (GHG) emission reduction under NAMA. Each initiative has made progress in developing strategies and action plans. The major criteria segregating the two, which are sectoral-based, have led to separate processes involving institutional arrangements, policies and regulations, stakeholder engagement and technical guidelines. It remains unclear how the two plans will synergize although this is considered important for responding to the national 26 percent and 41 percent emission reduction targets. At the provincial level, the action plans are channeled separately through SRAP and RAD-GRK. As targets for implementation and actual programs are established under sub-national authorities, it is equally important that synergies also take place at the sub-national level. SRAP and RAD-GRK in Jambi Province are reviewed in Chapter 3 and it is concluded that major effort is still needed to find ways and means to synergize the two initiatives. This could be accomplished by fitting them under the nesting concept, in which convergence and divergence between the two are configured to harmonize planning, targets as well as activities on the ground; in this case in line with the land-based sectors addressing emission reduction.

REALU Indonesia through its demonstration landscape activities in Tanjabar has initiated showcase activities at the other end of the nesting spectrum. The main platform is on low emission development (LED) planning through engagement with the district planning office and other stakeholders (see Chapter 4). LED recognition will serve to exemplify the bottom-up approach of nested emission reduction from district to the provincial and the national level.

As part of the proposed action plans for Tanjabar LED, several focused areas are targeted in the district, each with a certain share of emission reductions (Chapter 4). Further planning should be conducted in these areas for specific mechanisms to develop into implementable activities. This is likely to be a long and iterative process, necessitating formal consultations, policies, regulations and safeguards. For Tanjabar, an exercise, deemed locally appropriate, has been carried out in the peat protection forest area (HLG). In line with the nesting concept, this translation of a one-district action plan into a feasible forest protection-based mechanism demonstrates the cross-sectoral linkage between the sub-national NAMA (or LAAMA) and site-level REDD+.

10.2.2 Incentives and enabling conditions

To promote nature conservation and livelihood sustainability, a range of incentive mechanisms to achieve both goals has been widely developed, reviewed and to various extents applied in different settings. Approaches and activities for peat protection forest efforts, which take into account local people's livelihoods, have been designed and will eventually lead to a community-based forest protection approach (Chapter 5). Non-financial incentive mechanism were co-opted and determined to be appropriate considering the complexities of land tenure issues and the importance of sustainable forest management in the area. This latter aspect links to the district forestry program initiated in this area on forest restoration via jelutong planting. As much as it was considered important to create synergy for successful implementation and for postproject sustainability, careful assessments of the existing program including species selection, in this particular case, should take place. Such independent assessment is necessary to ensure local appropriateness, taking into account ecological, economic and social issues.

Enabling conditions to support emission reduction efforts at the local level were assessed and recommendations follow, in this case in anticipation of the production stage of jelutong planting; they include market potential, harvest and trade policies. In addition, perceptions on tree-based livelihoods in peatland settings were also assessed. This latter assessment also demonstrates how the current farming systems have survived and can be sustained to be locally-oriented climate-smart agroforestry systems in peatland areas.

10.3 Partnerships and capacity strengthening

Most of the components and activities of REALU Indonesia take partnerships into account in light of capacity strengthening and postproject sustainability, to name a few needs.

At the provincial level, engagements with provincial stakeholders have been initiated within SRAP document development and possible synergies with Jambi RAD-GRK documentation. At the district level, engagements with several district government offices and inclusion of competent individuals for project implementation have taken place in almost all areas. At the site level, collaboration with farmers and local communities is essential for proactive community-based peat forest rehabilitation. The formation of farmer groups for acquiring HKm licences is an important step, which was achieved after the long process of trust building between the project and the community. As summed up in Chapter 6, linkages between local institutions and district-level , in this case KPHLG, will be crucial for the successful implementation of HKm in the area.

Capacity strengthening has been channeled through various means. One of the platforms is a series of training workshops on methods and tools developed by ICRAF Indonesia to which REALU contributes. At district and site levels, means for capacity strengthening have been realized via technical assistance, socialization and facilitation, in addition to training.

10.4 Moving forward to 'securing emission reduction with a landscape approach'

Various goals and achievements in REALU II Indonesia have become moving targets and the dynamics on the ground require flexibility from the project's perspectives without compromising the overall goals, objectives and outcomes. Despite progress through the three years of implementation, several areas need further action and improvement in the years to come. The list below provides entry points to identify continuing activities, gaps to be addressed and areas for improvement.

1. National readiness will be evaluated through various other aspects including commitment to landscape and all land-use approaches and safeguarding aspects. Backstopping activities should continue in this context.
2. Engagements at the provincial level for linkage with national and district levels should continue as well as to hook up with the REDD+ scheme and the land-based sector for GHG emission reduction action plans.
3. As part of LED, documentation of district action plans should be formalized for recognition as technical background documents within RAD-GRK and to demonstrate the bottom-up nested emission reduction process.
4. In addition to the ongoing efforts on community-based peat forest protection, locally appropriate peatland tree-based farming systems should be well identified and incentive mechanisms should be explored for their sustainability. This should include strengthening and improvement of enabling conditions.
5. Local capacity strengthening should continue to take place where relevant as part of the plan to improve enabling conditions to support emission reduction efforts.
6. As part of the linking-knowledge-to-action concept, relevant assessments should continue to be conducted whenever necessary. Peat emission estimates will be continued in order to achieve reliable estimates. Other assessments deemed relevant are ex-ante assessments of emission reduction impacts at the district level, assessments of leakage and identification of risks and threats *vis-à-vis* emission reduction at the local level.

11 Annexes

11.1 Annex 1 – REDD cost tables

Table A1. Cost standard of forest establishment ('000 IDR ha^{-1}) according to Forestry Minister Decree No. P.64/Menhut-II/2009

	Industrial forest	HTR
Planning	267.5–371.3	267.5–371.3
Physical infrastructure	2090–2873.7	127.5–231.8
Administration	1031.2–1417.9	-
Planting	5320.4–7315.5	5320.4–7315.5
Maintenance	2796.3–3844.9	2796.3–3844.9
Protection	415.2–570.9	415.2–570.9
Taxes	5.6–12.4	3–12.4
Social responsibilities	18.56–25.52	18.56–25.52

Table A2. National Rehabilitation Movement (GERHAN)

Tahun	Allocated fund (million IDR)	Implementation (ha)	Estimated cost (million IDR/ha)
2003	813 308	295 455	2.75
2004	1 773 139	464 470	3.82
2005	1 681 406	447 246	3.76

Source: unpublished data

Table A3. Media coverage on forest fire mitigation budgets

No	Location	Level	Year	Area (ha)	Budget	Rp/ha
1	Sumsel	Province	2009	3 742 327	700 000 000	187
2	Riau	Province	2009	9 456 160	500 000 000	53
3	Riau	Province	2010	9 456 160	3 500 000 000	370
4	Kalteng	Province	2002	12 652 822	600 000 000	47
5	Kalteng	Province	2007	12 652 822	4 600 000 000	364
6	Kalbar	Province	2008	9 101 760	1 000 000 000	110

11.2 Annex 2 - List of Publications

List of publications under REALU Indonesia (status as of September 2013)

Published	
Journal paper	
1.	Sofiyuddin M., Rahmanulloh A., and Suyanto S. 2012. Assessment of Profitability of Land Use Systems in Tanjung Jabung Barat District, Jambi Province, Indonesia. Open Journal of Forestry
2.	Mulia R., Widayati A., Agung P., Suyanto S. and Zulkarnain MT. 2013. Low carbon emission development strategies for Jambi, Indonesia: simulation and trade-off analysis using the FALLOW model, Mitigation and Adaptation Strategies for Global Change (DOI 10.1007/s11027-013-9485-8)
Conference paper	
3.	Khususiyah N., Suyanto S. and Janudianto. 2013. Migrants, livelihoods and equity: Understanding for Emissions Reduction in Jambi, Indonesia. IUFRO-2013, Fukuoka, Japan
4.	Agung P., Galudra G., Soedomo S. and Nugroho B. 2013. How tenure insecurity formulates land market institutions in the limited production forest area in Tanjung Jabung Barat district, Jambi province, Indonesia. IUFRO-2013, Fukuoka, Japan
5.	Zulkarnain MT, Ekadinata A. and Widayati A. 2013. Land Cover Mapping of Tanjung Jabung Barat, Jambi Using Landsat - Alos Palsar Data Fusion and Object Based Hierarchical Classification, Asian Conference of Remote Sensing, Bali, Indonesia
Poster at conferences	
6.	Suyanto S. and Ekadinata A. 2013. Opportunity costs of emissions caused by land-use changes , ESP Conference, Bali, Indonesia
7.	Johana F., Agung P., Widayati A. and Suyanto S. 2013. Low emission development as part of maintaining ecosystem services in Tanjung Jabung Barat, ESP Conference, Bali, Indonesia
8.	Janudianto, Sofiyuddin M., Perdana A. and Jasnari. 2013. Jelutong and rubber based-agroforest systems to improve local livelihood and reduce emission in peatland of Sumatra and Central Kalimantan, ESP Conference, Bali, Indonesia
9.	Sofiyuddin M., Janudianto and Jasnari. 2013. Coffee-based agroforestry as an alternative to improve local livelihood and reduce emission in peat landscapes of Sumatra, , ESP Conference, Bali, Indonesia
Policy Briefs	
10.	Widayati A, Johana F, Zulkarnain MT and Mulyoutami E. 2012. *Perubahan Penggunaan Lahan, Faktor Pemicu dan Pengaruhnya terhadap Emisi CO2 di Kabupaten Tanjung Jabung Barat (Tanjabar), Propinsi Jambi* (Land Use Changes, Driving Factors and the Consequences on CO_2 Emissions in Tanjung Jabung Barat, Jambi). Brief No 21. Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. 4p.
11.	Khususiyah N, Sofiyuddin M and Suyanto S. 2012. *Strategi Sumber Penghidupan Petani di Tanjung Jabung Barat* (Local Livelihood Strategies in Tanjung Jabung Barat). Brief No 22. Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. 4p.
12.	Sofiyuddin M, Janudianto and Perdana A. 2012. *Potensi Pengembangan dan Pemasaran Jelutung di Tanjung Jabung Barat* (Development and Mareket Potentials of Jelutung in Tanjung Jabung Barat). Brief No 23. Bogor, Indonesia. World Agroforestry Centre -

	ICRAF, SEA Regional Office. 4p.
13.	Agung P, Novia CY, Jasnari and Galudra G. 2012. *Menuju Pengelolaan Hutan Lindung Gambut Lestari di Tanjung Jabung Barat* (Towards Sustainable Management of Peat Protection Forest in Tanjung Jabung Barat). Brief No 24. Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. 4p.
14.	Ekadinata A and Agung P. 2011. Planning for low-emissions development in Tanjung Jabung barat district, Jambi province, Indonesia. Brief No 20. Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. 6 p.
Under review/ongoing	
Journal paper	
15.	P. Agung, G. Galudra, R. Maryani and S. Suyanto (under review). Reform or Reversal: The Impact of REDD+ Readiness to Forest Governance in Indonesia, Climate Policy
16.	G. Galudra, S. Suyanto and P. Agung (under review). Migrant, land market and carbon emission in Jambi, Indonesia: land tenure change and the prospect of emission reduction Mitigation and Adaptation Strategies for Global Change
17.	B. Lusiana, M. van Noordwijk, F. Johana, G. Galudra, S. Suyanto and G. Cadisch (under review) . Implication of uncertainty and scale in carbon emission estimates on locally appropriate designs to reduce emissions from deforestation and degradation (REDD+), Mitigation and Adaptation Strategies for Global Change
18.	B. Lusiana, M. Van Noordwijk, M.T. Zulkarnaen, A. Widayati and G. Cadisch (ongoing) Uncertainty of net landscape carbon loss: error propagation from land cover classification and plot-level carbon stocks
Conference presentation	
19.	A. Widayati, H.L. Tata, G. Galudra, F. Johana and P. Agung. Understanding land use change drivers and the consequential ecosystem services in peatland areas: implications on conservation efforts (accepted as oral presentation at GLP, 2014)

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