Jelutong and rubber based-agroforest systems to improve local livelihood and reduce emission in peatland of Sumatra and Central Kalimantan

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Introduction

Land conversion, massive deforestations and degradation on peat swamp forest increases significant carbon emission and loss of livelihood of people who lives in the peat areas of Sumatra and Central Kalimantan, Indonesia. Decreasing number of livelihood options drive people to look back at the existing livelihoods which can still provide them with a descent living. NTFP producing species such as jelutong (*Dyera polyphylla*), gemor (*Alseodaphne* sp.) and rubber (*Hevea brasiliensis*) are examples of the tree-based livelihoods option which was historically popular in the area.

Jelutong and gemor are commercial tree species that are highly valued for its latex, wood, and bark. Both species spread across the Malaysian peninsular, Singapore and Indonesia (Sumatra and Kalimantan). Now it is difficult to find them due to deforestation, including in the peat swamp forests in the islands of Sumatra and Kalimantan. Meanwhile, rubber was first introduced in Kalimantan at the beginning of the 20th century, which expanded rapidly throughout the island, and was introduced earlier in Sumatra.

Interestingly, current trend showed that many villages in the peat swamp forest area in Sumatra and Central Kalimantan rely on rubber as the main source of livelihoods to the local people. In some areas in Sumatra, jelutong is also popular as one of the economically potential indigenous species in the peatland. Development efforts on promoting and enhancing both jelutong and rubber-based agroforestry in the peatland within these landscapes can improve local livelihoods, reduce the environmental pressure to the remaining peat swamp forest and also providing potential environmental service.

Methodology

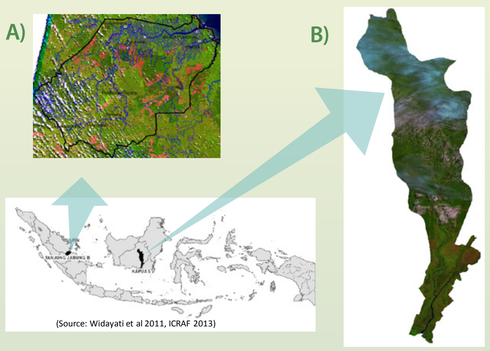

Figure 1. Location of (A) Tanjung Jabung Barat district, Jambi province, Sumatra and (B) Kapuas district, Central Kalimantan province, Kalimantan, Indonesia

The study adopts the Rapid Appraisal of Agroforestry Practices, Systems and Technology (RAFT) framework (Joshi and van Noordwijk. 2009), household surveys on local perceptions, and group discussion. The RAFT framework provides guidelines for the description and analysis of the ways trees are used and the way that they benefit rural livelihoods.

The survey and group discussion in the field was conducted between 2010-2013. The study sites were in Tanjung Jabung Barat district, Jambi province (Sumatra) and Kapuas district, Central Kalimantan province (Kalimantan). Tanjung Jabung Barat district area covers approximately 5 000 km^2, with almost 40% of the area being peat lands in the East towards the coast. The population was approximately 266 952 people with population density around 51 persons/km^2.

Kapuas district area was approximately 14 999 km^2, the Northside was hilly area ranged from 100 - 500 m above sea level, while the Southside consisted of coastal and peatswamp area ranged from 0-5 m above sea level. The population was approximately 329 646 people with population density around 22 persons/km^2.

Results and discussion

Rubber development in the peat landscapes

In Tanjung Jabung Barat district, a study by Khususiyah et al (2013) showed that rubber is an important livelihood options for farmers in both mineral and peat soil landscapes. In three villages in peat soil landscape of Tanjung Jabung Barat, rubber was introduced through Government programs and now become one of important source of income for farmers, especially in Teluk Nilau village (Figure 2).

Based on group discussion with farmers in Teluk Nilau village, rubber was planted in shallow-to-medium peat soil (0.8–1.5 m depth) and applied minimum-to-zero amounts of fertiliser. However, rubber in this area has lower productivity compared to rubber in the mineral area, which is around 300 kg/ha/year.

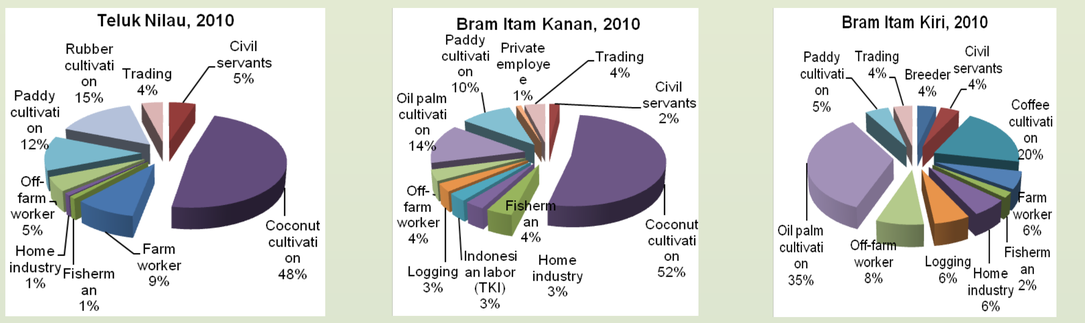

Figure 2. Livelihoods options in three villages in peat landscape of Tanjung Jabung Barat district, Jambi province (Sumatra)
(Source: Khususiyah et al. 2013)

Furthermore, in Kapuas district of Central Kalimantan province, rubber also becomes a major income for farmers that live in peat soil landscapes. Suyanto et al (2009) study in Kapuas district, specifically in the Ex-Mega Rice Project area, showed that rubber was found as an important livelihood option for farmers in eight villages of the study area (Figure 3). Rubber is usually planted in mineral soil along the large river (namely pamatang area). Recently, similar to Teluk Nilau village, farmers also planted rubber in shallow to medium peat soil.

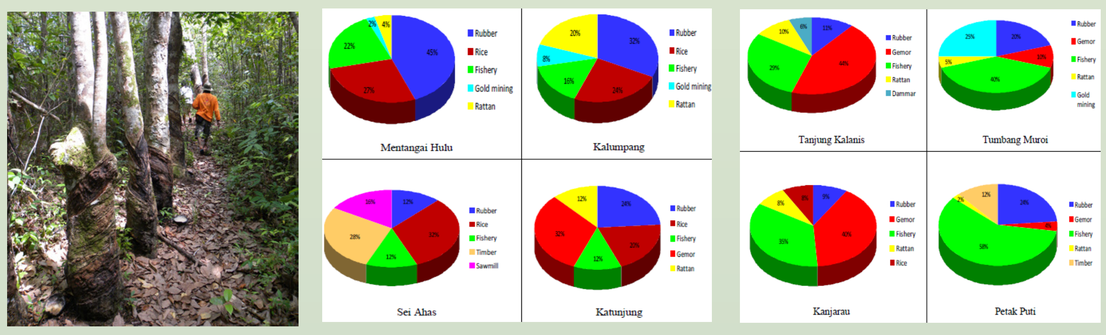

Figure 3. Rubber agroforest in Central Kalimantan (left); Livelihoods options in eight villages of peat landscape of Kapuas district, Central Kalimantan province (Kalimantan)(right)
(Source: Suyanto et al. 2009)

However, in general, peat soil with a depth more than 50 cm is considered a severe limiting factor of land suitability for rubber (Sugiyanto et al. 1998; Watson in Wijaya et al. 2009). Other research (Djainudin et al. 2003 in Agus et al. 2008) found that peat soil with 1.4–2 m of thickness is classified into marginal suitable (S3 suitability class) for some annual crops such as rubber, while thin peat soil is classified as slightly suitable (S2 suitability class). Peat with a thickness of 2–3 m is not suitable for annual crops unless there were insertions of an enrichment layer of mineral soil or mud.

The key challenge in developing rubber in peat landscape and also reducing potential emission from the activity is on how to maximize the use of remaining mineral soil area (*pamatang* area) within the villages and the selection process of the new site of rubber gardens. In the Central Kalimantan case, rubber rejuvenation and improving maintenance of old rubber gardens in pamatang area will increase sufficient income for farmers. For extensive purpose of rubber gardens, selections of rubber plots should use extra data on peat depth and land suitability in order to make sure that new rubber will be planted in suitable peat depth and also easy to access. While in Teluk Nilau village, enhancing the existing rubber gardens, rejuvenating and improving maintenance of the plots are options to increase the productivity which will have affects on livelihoods and emission reduction.

'Reinventing' jelutong in the peat landscapes

Figure 4. Smallholder jelutung in Tanjung Jabung Barat district

As one of the native peatswamp forest species which has been promoted as the forest rehabilitation species in many areas in Indonesia, jelutong has now become more popular in Tanjung Jabung Barat district. Several local government programs promote jelutong especially in *Hutan Lindung Gambut* (the peat protection forest) area of Tanjung Jabung Barat. The programs led farmers' initiative in jelutong planting outside the protected areas. As an important species in the past, local people are quite optimistic with the future of jelutong, as farmers started to plant jelutong in their own peatland plots, which will also reduce the potential emissions in the landscapes.

Study on farmer preferences in peat areas of Tanjung Jabung Barat (Janudianto et al. 2013) showed that farmer's perception on land suitability of the peat (or former peat) area were positive (Figure 5); 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. In term of farming system, out of 54 respondents, 65 percent prefer mixed-farming systems as opposed to 35 percent who opted for monoculture; and 96 percent of respondent were aware of jelutong while only 4 percent did not. Most of the mixed-farming systems are 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.

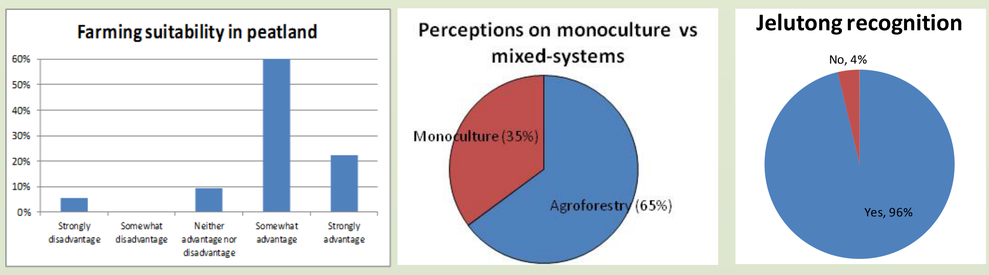

Figure 5. Perceptions on the suitability and benefits of peatland for farming (left); benefits of mixed farming and monoculture systems (middle); and farmer awareness of the jelutong species (right) (Source: Janudianto et al. 2013)

Most farmers (60 percent) also mentioned that currently it would be extremely difficult to market jelutong latex, due to non-existing buyers in the area (Figure 6). However, with regard to the future, many farmers (60 percent) revealed that market access to jelutong latex looks promising. These positive perceptions are mostly based on what they have heard about jelutong latex prices in the past and promotion of jelutong in the peat protection forest area, which will attract buyers and exporters.

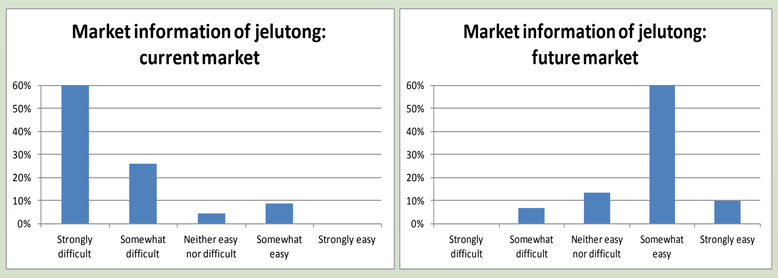

Figure 6. Perceptions of markets for jelutong at present (left) and in the future (right) (Source: Janudianto et al. 2013)

However, looking up the figures of jelutong latex production in Jambi and Central Kalimantan as studied by Perdana and Sofiyuddin (2013), in the early 1990s the production reach the highest number and has declined since then. The study found that in Central Kalimantan, to date many people have relied on tapping and trading latex in these regencies where the trees are abundant. While in Jambi, the potential for jelutong latex marketing can be achieved, although heavily, by the implementing of NTFP regulations within the protected peat forest where farmers now live. Intensive coordination between district and provincial forestry agencies as well as trade and industrial agencies to disseminate related legislation to all stakeholders will be strongly required.

Recommendation

Jelutong as native peatland species is a potential species to be intercropped with other profitable crops such as oil palm and betelnut as found on peatland in Tanjung Jabung Barat, Jambi. Active support from relevant government and non-government agencies is required to build the capacity of farmers in jelutong seed certification and cultivation as well as technical marketing assistance. A policy framework and analysis of implementation practicalities regarding jelutong management and marketing are required, which will need intensive coordination between district and provincial forestry agencies as well as trade and industrial agencies to disseminate related regulations to all stakeholders.

Rubber-based agroforestry system is an important livelihood option for farmers in peat soil landscapes both in Jambi and Central Kalimantan. Maximizing the use of remaining mineral soil area (*pamatang* area) within the village and the selection new sites of rubber gardens in Central Kalimantan are the two main important study areas for future research. In Jambi, rejuvenating and improving maintenance of plots are options to increase the productivity which will affect livelihoods and emission reduction.

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