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Development of peatland-friendly commodities to achieve sustainable forest management in Jambi Province

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Abstract. The peatland restoration program has been targeted by the Peatland Restoration Agency (BRG) of 2.4 million hectares from 2016 to 2020 including in Jambi Province. This program must be carried out collaboratively by involving various stakeholders (government, community, academic, NGO, and businessman). However, currently the clearing of peatland areas for oil palm plantations by slash and burn is very potential for forest fires. The paper aims to analyze the development of peatland-friendly commodities based on market expansion in Jambi province. The method used is a qualitative method based on surveys to analyze the socio-economic of community and peatland-friendly commodity market potential. Besides oil palm (*Elaeis guineensis*), seven other peatland-friendly commodities have the potential to be developed in Sinar Wajo Village, Tanjung Jabung Timur Regency, Jambi Province, namely: areca nut (*Areca catechu*), coconut (*Cocos nucifera*), liberica coffee (*Coffea liberica*), durian (*Durio zibethinus*), balangeran (*Shorea balangeran*), petai (*Parkia speciosa*), and jengkol (*Archidendron pauciflorum*). These potential commodities are obtained from the suitability of planting land, community's perception, market and market surveys, and commodity supply chains. The development of peatland-friendly commodities based on market expansion provides alternative livelihoods for communities to increase their income and to achieve sustainable forest management.

1. Introduction

1.1. Background

More than half of the tropical peatlands in this world are existed in Indonesia, specifically in Sumatra and Kalimantan islands. Indonesia's peatlands are approximately 20-21 Mha [1] with 13 Mha of that peatlands are located in Sumatra and Kalimantan. However, most of Indonesia peatlands have been intensively logged and converted to other land uses such as oil palm and other plantation areas. Dohong et al. [2] reported that the main factors of peatland degradation in South-East Asia are logging, drainage, conversion to industrial plantations, and peatland fires. Additionally, Miettinen et al. [3] explained that oil palm and pulp plantation become the main factors of peatland degradation over the past two decades. In 2015, amount 6.3 Mha Indonesia peatland has been converted for industrial plantation (3.2 Mha), and smallholders (3.1 Mha).

This condition affected the increase in carbon emission, peatland fires, and so on. Peatland fires were the major factor in losing the communities' income and productive land, as well as decreasing their



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health. To address these issues, Indonesia established the National Peatland Restoration Agency (Badan Restorasi Gambut) or called by BRG in 2016 (PerPres No. 1/2016). The mandate is to coordinate and facilitate the restoration of degraded peatland (2.0 Mha) in 2016 until 2021. BRG has three main programs, namely rewetting, revegetation and revitalization. Rewetting is the activity in raising groundwater levels in drained peatland to be “nearly natural” such as by using canal blocking and infilling. Revegetation is defined as maintaining a vegetation cover on peatland to increase soil and air humidity, peat decomposition and decrease the possibility of peatland fires such as by enrichment planting and agroforestry system approaches. While revitalization is defined as ensuring the local communities are imbued by improving the livelihood, and additional economic opportunities [4].

Peatland restoration has been targeted by the Peatland Restoration Agency (BRG) of 2.4 million hectares from 2016 to 2020 including in Jambi Province. This program must be carried out collaboratively and participated by various stakeholders (government, community, academic, NGO, and businessman). However, the clearing of peatland areas for oil palm plantations by slash and burn is very risky and potential for forest fires, as well as the conversion of peatland to oil palm plantation is a serious issue due to its impact on flooding, carbon emission, and biodiversity loss. Currently, community livelihood in the peatland area of Jambi Province is still very dependent on the oil palm (*Elaeis guineensis*) such as the local communities in Sinar Wajo Village, Jambi Province. They planted oil palm with monoculture pattern that is very risky for their livelihood resilience. When there is a disturbance to the oil palm, the local communities have no other income sources. Thus, other commodities need to be developed as an alternative livelihoods. One of the alternative ways to tackle those issues was by enrichment planting with peatland-friendly commodities in oil palm areas.

In 2017, biodiversity enrichment in Sinar Wajo Village, East Tanjung Jabung Regency, Jambi Province was carried out by establishing 30 plots (27 plots were planted and 3 plots as a control) on the burned oil palm plantations with total area 21 ha. The types of enrichment plants were balangeran (*Shorea balangeran*), durian (*Durio zibhetinus*), areca nut (*Areca pinanga*), jengkol (*Archidendron pauciflorum*), petai (*Parkia speciosa*), and coffee liberika (*Coffea liberica*).

These peatland friendly commodities development needs to be supported by market analysis to expand the markets. It can help local farmers and traders to increase their income and better livelihoods. Market analysis can be the basis for efforts to revitalize the economic activities of communities in the peatland area. The analysis results can also be as a reference for developing peatland friendly commodities based on market expansion. However, the development of peatland friendly commodities was still facing challenges, especially related to the local community's perceptions of the growth and market potential of the commodities.

1.2. Objective

The objective of this paper is to analyze the development of peatland-friendly commodities based on market expansion in Sinar Wajo Village, East Tanjung Jabung Regency, Jambi Province.

2. Method

2.1. Research Area

The research was conducted in Sinar Wajo Village, Tanjung Jabung Timur Regency, Jambi Province. More than 50% of the village area was village Forest. Community livelihood patterns were dominated by coconut, areca nut, and oil palm farming. Peat depth in the village was categorized as medium depth (2-2.5 m). Peatland fire was occurred in Sinar Wajo Village in 2015.

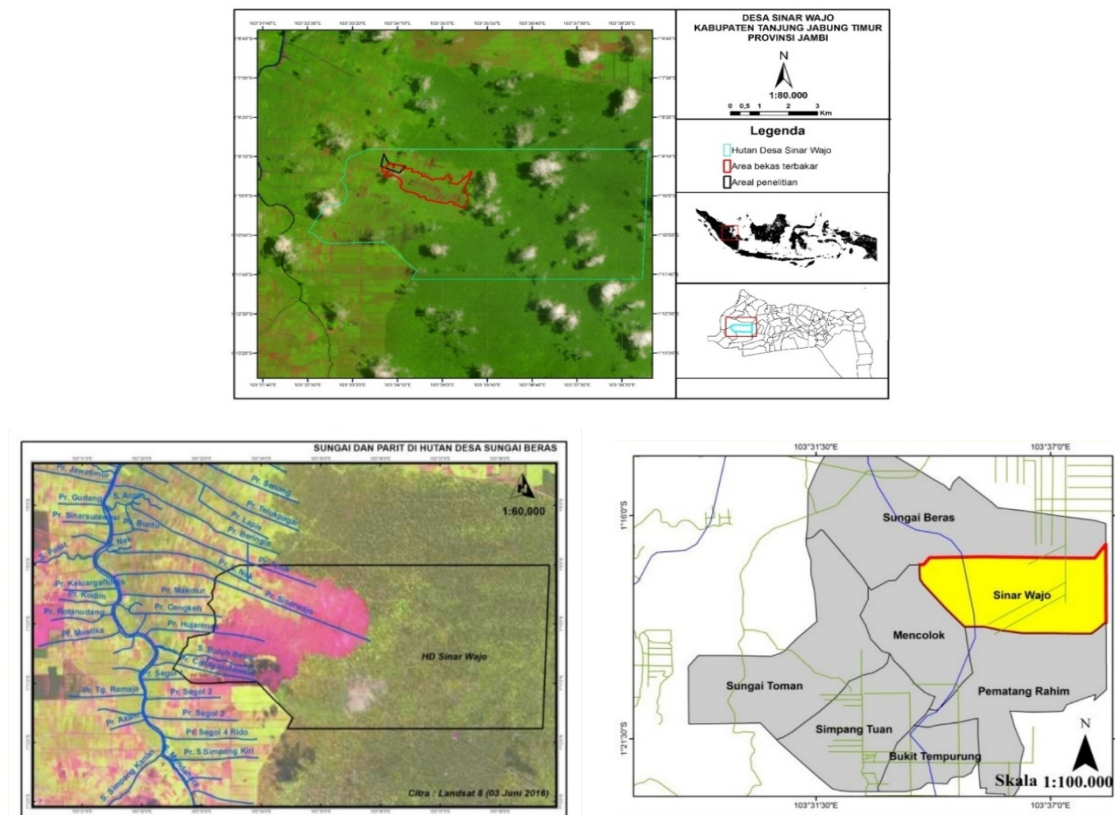


Figure 1 Research Area

Source: <https://earthexplorer.usgs.gov/> (2017) [5]

2.2. Data Collection Methods

The method used is a qualitative method based on surveys to analyze the socio-economic of community and peatland-friendly commodity market potential. A market survey was focused on seven peatland-friendly commodities (areca nut, coconut, liberica coffee, durian, balangeran, petai, and jengkol). A market survey was conducted on farmers, village/subdistrict traders, large traders, factories, sawmill, coffee shop owners, fruit and vegetable sellers, and consumers. Analysis of perception and marketing channels.

2.3. Data Analysis

Market survey data that have been collected were processed using qualitative methods and presented in the infographic. Meanwhile, commodity supply chain data was processed using price comparison and marketing channel analysis.

3. Results and Discussions

Besides oil palm (*Elaeis guineensis*), other peatland-friendly commodities have the potential to be developed in Sinar Wajo Village, East Tanjung Jabung Regency, Jambi Province. The potential peatland-friendly commodities were areca nut (*Areca catechu*), coconut (*Cocos nucifera*), liberica coffee (*Coffea liberica*), durian (*Durio zibethinus*), balangeran (*Shorea balangeran*), petai (*Parkia speciosa*), and jengkol (*Archidendron pauciflorum*). These potential commodities were obtained from the suitability of planting land, community's perception, market and market surveys, and commodity supply chains.

Plant growth monitoring activity on biodiversity enrichment plots that were built in 2017 through the calculation of the percentage of enrichment plant growth. This growth monitoring was 6th monitoring since planting. The results of this growth monitoring was compared with the results of the 5th monitoring

was carried out at the age of the plant 5 months after planting (April 2018). Whereas the 6th monitoring was carried out when plants were 11 months after planting (October 2018). Based on the monitoring of the biodiversity enrichment plots, these commodities were able to grow well in the peatland areas considering site species matching. The monitoring was carried out in a participatory manner by the local community in the village. Based on T5 monitoring (5 months after planting) areca nut had the highest percentage of life (98.61%), followed by balangeran, coffee, durian, jengkol, and petai with the percentage of life 97.19%, 96.19%, 93.09%, 92.14%, and 88.36%, respectively. While based on T6 monitoring (11 months after planting) Balangeran had the highest percentage of life (86.55%), followed by coffee, areca nut, petai, jengkol and durian with the percentage of life 82.22%, 71.16%, 62.75%, 58.93%, and 58.68%, respectively. The results of these plant growth monitoring provide a good basis to encourage local farmers to develop peatland-friendly commodities, and not only depend on other than oil palm.

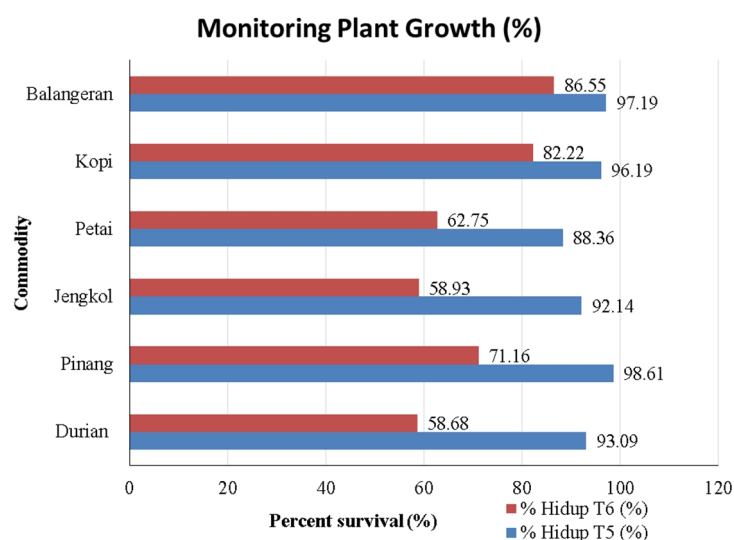


Figure 2 Monitoring Plant Growth of Peatland-Friendly Commodities 2018

3.1. Community Perceptions of Potential Commodities

The plants planted in biodiversity enrichment plots are the plants that have economic value. However, only areca nut commodity has a well-developed market and it is one of the main commodities of farmers in East Tanjung Jabung District, including in Sinar Wajo Village. Other commodities were generally found in the local market, but they have not well-developed in Sinar Wajo Village. It was necessary to conduct a market study of the commodities starting from the village level to the regency or provincial level in Jambi. The study was carried out by tracing the marketing chains of six peatland-friendly commodities (coffee, durian, areca nut, balangeran, petai, and jengkol) that were planted on biodiversity enrichment plots. The survey activities were carried out from the research include community perception, marketing channels, and product prices at various market levels. Besides, market development strategies for these commodities will be prepared. Based on the results of a survey of 33 farmer respondents, 91% of farmers were planted areca nut (*A. catechu*), 79% of farmers were planted oil palm (*E. guineensis*), 42% of farmers were planted coconut (*C. nucifera*), 21% of farmers were planted coffee (*C. liberica*), and none of the farmers planted durian (*D. zibethinus*), petai (*P. speciose*), jengkol (*A. pauciflorum*) and balangeran (*S. balangeran*). In general, the potential for planting and marketing of areca nut and coconut was dominantly very positive, while coffee, durian, petai, and jengkol were dominantly quite positive. The potential of balangeran was being very negative and negative because it takes a long time to grow until harvesting and strict timber marketing regulations.

areca nut (*Areca catechu*), coconut (*Cocos nucifera*), liberica coffee (*Coffea liberica*), durian (*Durio zibethinus*), balangeran (*Shorea balangeran*), petai (*Parkia speciosa*), and jengkol (*Archidendron pauciflorum*).

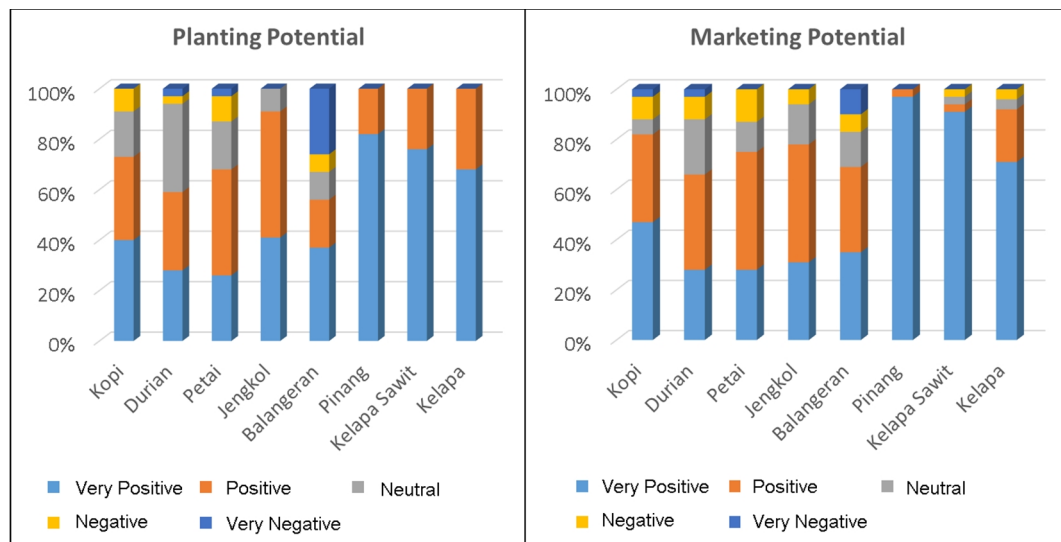


Figure 3 Community Perceptions of Planting and Marketing Potential Commodities

Liberica coffee (*C. liberica*) received a very positive perception of the potential for planting by 40% from respondents, 33% of respondents gave positive perceptions, 18% of respondents rated neutral, and the remaining 9% of respondents considered quite negative. Some of the reasons given by farmer respondents who rated it quite negatively were that the care and harvesting of coffee plants were more complicated than other commodities. Based on a survey of marketing potential, farmers rated 47% very positive and 35% positive. Some of the reasons given by farmer respondents who rated it very positive and positive were that the demand and prices for coffee commodities were quite high. As many as 6% of respondents rated neutral, and 9% of respondents rated quite negative and 3% of respondents rated very negatively. Some of the reasons given by farmer respondents who rated it quite negative and very negative were that there were no collecting traders to collect coffee sold by farmers.

Durian (*D. zibethinus*) commodity received a very positive perception of the potential for planting by 28% from respondents, 31% of respondents rated quite positive, 35% of respondents rated neutral, and the remaining 3% of respondents rated quite negative and 3% of respondents rated very negatively. Some of the reasons given by farmer respondents who rated neutral, negative, and very negative were that the durian commodity was difficult to grow on peatlands. Based on a survey of marketing potential, most of the farmers rated 28% very positive and 38% of respondents positive, and 22% of respondents rated neutral, and 9% of respondents rated it quite negative and 3% considered very negative. Some of the reasons given by farmer respondents who rated neutral, negative and very negative were that there were no collectors to accommodate durian sold by the farmers.

Petai (*P. speciose*) received a very positive perception of the potential for the planting 26%, 42% of respondents rated positive, 19% of respondents rated neutral, and the remaining 10% of respondents rated quite negative and 3% of respondents rated very negatively. Some of the reasons given by farmer respondents who rated neutral, negative, and very negative were that the petai commodity had stems that easily collapsed on the peatland area and the difficulty of providing petai seeds. Based on a survey of marketing potential, most farmers considered that 28% were very positive and 47% were quite positive. Some of the reasons given by farmer respondents who rated it very positive and positive were that many petai demands in the market. The remaining 12% of respondents rated neutral and 13% of respondents rated quite negative.

Jengkol (*A. pauciflorum*) received a very positive perception of the potential for the planting of 41%, 50% of respondents rated positive, and the remaining 9% of respondents rated neutral. Some of the reasons given by farmer respondents who rated very positive and positive, were that the jengkol commodity was easy to grow and that its growth was good enough on the peatlands. Based on a survey of marketing potential, most farmers rated 31% very positive and 47% of respondents rated positive. Some of the reasons given by farmer respondents who rated it very positive and positive were that many demands for jengkol and could be traded by being deposited in stalls. The remaining 16% of respondents rated neutral and 6% of respondents rated quite negative.

Areca nut (*A. catechu*) commodity received mostly very positive perception for planting potentials of 97%, and the remaining 3% of respondents rated positively. Some of the reasons given by farmer respondents, who rated positive and very positive, were that areca nut was easy to grow and has good growth in peatlands and relatively easy for harvesting. Based on the survey of marketing potential, most farmers rated 82% very positive and 18% of respondents rated positively. Some of the reasons given by farmer respondents who rated it very positively and were quite positive were that there were many areca demands and there were already areca nut traders at the village level. However, some farmers complained about the current decline in areca nut production.

Balangeran (*S. balangeran*) received a very positive perception of the potential for planting by 37%, 19% of respondents rated positive, 11% of respondents rated neutral, and the remaining 7% of respondents rated negative and 26% of respondents rated very negatively. Some of the reasons given by farmer respondents who rated neutral, negative, and very negative were that the balangeran commodity was difficult to grow, had a long growth in the peatlands, and was vulnerable to pests. Based on the survey of marketing potential, most farmers rated 35% very positive and 34% of respondents rated positive, 14% of respondents rated neutral, and 7% of respondents rated negative and 10% of respondents rated very negative. Some of the reasons given by farmer respondents who rated neutral, negative, and very negative were that there were no collectors to accommodate balangeran wood and relatively strict timber trading rules/regulations from the government.

3.2. Marketing Channel Analysis of Peatland-friendly Commodities

Areca nut (*A. catechu*) commodity of Sinar Wajo Village farmers was mostly sold through the village/sub-district ('toke') to Kuala Tungkal Market (larger traders). The total sales of areca nut trader was 10 tons/month or 120 tons per year with a purchase price of around IDR 12,000 - 16,000/kg. Whereas for large traders in the form of CV (exporters), the purchase of areca nuts reaches an average of 72,000 tons per year with a purchase price of IDR 150,000/kg. Two largest importer countries were India and Pakistan with an average volume of 32,400 tons/year.

Petai (*P. speciose*) commodity which is traded at Angso Duo Market comes from Jambi, Tempino, Sei Landai, Simpang Pramuka, Bungo, Tebo, Aceh, Medan and Lampung. The amount purchased by traders from collectors reaches an average of 28,800 kg per year. The purchase price of petai from the village trader was IDR 7,000-10,000/kg. Meanwhile, the district trader sells petai to the Angso Duo Market at an average of IDR 15,000-30,000/kg, and consumer price reached IDR 30.000-40,000/kg.

Jengkol (*A. pauciflorum*) commodity which is traded at Angso Duo Market also comes from Jambi, Tempino, Sei Landai, Simpang Pramuka, Bungo, Tebo, Aceh, Medan and Lampung. The amount purchased by traders from collectors reaches an average of 23,400 kg per year. The purchase price of jengkol from the village trader was IDR 5,000/kg. Meanwhile, the district trader sells jengkol to the Angso Duo Market at an average of IDR 10,000/kg, and consumer price reached IDR 20,000/kg.

Table 1 Marketing Channel and Price Analysis of Peatland-friendly commodities

Commodities	Farmers	Village/Sub-district Traders	Processors/District Traders	Consumers
Areca nut 	IDR 8.000-12.000/kg dry peeled	IDR 12.000-16.000/ kg dry peeled	USD 10/kg dry peeled (IDR 150.000/kg)	(Overseas)/Exporters
Liberica coffee 	IDR 1,500-2500/kg wet; IDR 10.000-20.000/kg dry	IDR 30.000-40.000/kg dry	IDR 100.000-150.000/kg processed green bean	IDR 8.000-15.000/10 gram powder/cup → IDR 800.000-1.500.000/kg
Petai 	-	IDR 7.000-10.000/kg or IDR 5.000 - 10.000/bunch	IDR 15.000-30.000/kg or IDR 10.000-15.000/bunch	IDR 30.000-40.000/kg or IDR 15.000-20.000/bunch or IDR 110.000/kg peeled
Jengkol 	-	IDR 5.000/kg	IDR 10.000/kg	IDR 20.000/kg
Durian 	-	IDR 5.000/piece	IDR 10.000/piece	IDR 35.000-75.000/piece
Balangeran 	800.000/m ³ log wood	-	IDR 1.200.000/m ³ log wood	IDR 2,5-4,5 million/m ³ processed wood

Durian (*D. zibethinus*) in the markets mostly came from Bungo, Kumpeh - Muaro Jambi, Medan, and Padang. The average amount of durian purchased by traders per month reached 300 pieces per month at village trader price of IDR 5,000 per kg and district trader price IDR 10.000/piece. Then the average consumer price reached IDR 35,000 - 75,000/piece.

Coffee (*C. liberica*) in the markets mostly came from Tanjung Jabung (Liberica), Merangin (Robusta), Kerinci (Arabica). The price of coffee at the farmer's level is IDR 10,000 - 20,000 per kg dry. Meanwhile, the price at the level of collectors is IDR 30,000 - 40,000 per kg dry. Prices at the processing level are IDR 100,000 - 150,000 per kg of processed green beans. In the coffee shop, the consumers' price of coffee quite significant higher reached IDR 800,000 - 1,500,000 per kg.

Timber commodities came from Kumpeh and Muara Jambi, with the sales destination area were Jambi and Jakarta Provinces. One of the traders/sawmills interviewed that the average amount of wood purchases was 80 m³ per week or 320 m³ per month. The purchase price from the farmer was directly IDR 800,000/m³ and the purchase from *toke* is IDR 1,200,000/m³. The average timber sales were 200 m³ per month with a selling price of IDR 2,500,000-4,500,000/m³.

Based on survey analysis, the challenges in management and marketing peatland friendly commodities, are access to roads and transportation, lack of farmer groups, access to capital, weather/climate, and market access. The policy and program expectations: price stability, road improvement, input aids (seedlings, fertilizer, capital), extension program (planting, processing, and marketing).

4. Conclusions

Balangeran (*S. balangeran*), areca nut (*A. catechu*), liberica coffee (*C. liberica*), durian (*D. zibethinus*), petai (*P. speciose*), jengkol (*A. pauciflorum*) commodities can grow well on experimental peatlands plots. Areca nut commodity market has developed, but still dominated by collectors ('toke') and the production was quite volatile. Coffee, balangeran, durian, petai, and jengkol commodities are

still imported from outside but the market potential is still quite positive. Coffee has a good market potential so it needs to be encouraged for planting and processing into green beans according to the market demand (coffee shop). The development of peatland-friendly commodities based on market expansion provides alternative livelihoods for communities to increase their income and to achieve sustainable forest management.

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