

Research article

Guidelines for Development of Area-Based Plantation of Rubber Commodity in Musi Rawas

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Abstract: There has not been a good integration among the central, provincial, and regional levels in the allocation of the budget, thus making the impact of plantation development activities less effective and efficient. This study aimed to analyze the potential of the region and create a pattern for the development of rubber commodity plantations in Musi Rawas District. This study was conducted by analyzing the data and literature review, conducting focus group discussions, mapping and digitizing the potential for rubber commodities using satellite imagery. With the position of the region that is included in the growing stage, the development of the area is directed first for on-farm development. The development of the region is carried out by increasing the production and productivity of rubber plants in Musi Rawas District by replanting and intensifying the rubber plants. The activity strategy focuses more on how to increase the productivity of rubber plants so as to produce high quality claret processing materials (BOKAR) and rubber wood. The development strategy is centered in Tuah Negeri sub-district as the center of the Area and other surrounding sub-district as supporting Areas. Therefore, in order to achieve these production targets, the strategy taken in developing rubber-based plantation areas is the incorporation and strengthening of the rubber agribusiness system.

Keywords: plantation area, rubber plants, development strategy

JEL Classification: Q13, Q58

Abstrak: Belum adanya integrasi yang baik antara pusat, provinsi, dan daerah dalam pengalokasian anggaran, sehingga berdampak pada kegiatan pembangunan perkebunan kurang efektif dan efisien. Penelitian ini bertujuan untuk menganalisis potensi wilayah dan membuat pola pengembangan perkebunan komoditas karet di Kabupaten Musi Rawas. Penelitian ini dilakukan dengan menganalisis data dan studi pustaka, melakukan focus group discussion, pemetaan dan digitalisasi potensi komoditas karet menggunakan citra satelit. Dengan posisi wilayah yang termasuk dalam tahap tumbuh, maka pengembangan wilayah diarahkan terlebih dahulu untuk pengembangan on-farm. Pengembangan wilayah dilakukan dengan meningkatkan produksi dan produktivitas tanaman karet di Kabupaten Musi Rawas dengan melakukan penanaman kembali dan intensifikasi tanaman karet. Strategi kegiatan lebih menitikberatkan pada bagaimana meningkatkan produktivitas tanaman karet sehingga menghasilkan bahan baku bokar dan kayu karet yang berkualitas. Strategi pembangunan dipusatkan di Kecamatan Tuah Negeri sebagai pusat Kawasan dan kecamatan-kecamatan lain di sekitarnya sebagai Kawasan penunjang. Oleh karena itu, untuk mencapai target produksi tersebut, strategi yang diambil dalam pengembangan kawasan perkebunan berbasis karet adalah penggabungan dan penguatan sistem agribisnis karet.

Kata Kunci: areal perkebunan, tanaman karet, strategi pengembangan

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1. INTRODUCTION

Currently, plantation development planning is based solely on desire (Shopping List), so that the plantation development seems like a routine program and activity without a clear direction resulting in being difficult to evaluate the achievements of the plantation development itself. The plantation development without a pattern can have a negative impact on soil and ecosystems (Fox et al. 2014). In addition, it can also cause deforestation (Gaveau et al. 2016) by continuing to open land without paying attention to the environment. The rubber commodity itself is one of the leading commodities in Indonesia (Wijaya, Ilmi, and Darma 2020). Besides the suitable climate (Kamaludin 2018), the Indonesian rubber has a comparative advantage (Daulika, Peng, and Hanani 2020), such as a foreign exchange contributor (Nugraha, Alamsyah, and Sahuri 2018), a source of income for the community, especially for farmers, namely opening job opportunities (Syahza, Backe, and Asmit 2018), diminish poverty (Häuser et al. 2015) and becoming an important raw material for rubber-based industries (Cornish 2017).

In terms of regional development, rubber has a big role in driving economic growth in production areas (Azahar et al. 2016) either those around the rubber plantations or those in environmental conservation (Warren-Thomas, Dolman, and Edwards 2015) as well as biological resources (Ekadinata and Vincent 2011). The milky fluid exuded from the rubber trunk plant is known as latex (Raulf 2014) can be used as a material for making tires (Akca, Gursel, and Sen 2018), gloves and so on. Indonesia still exports rubber products in the form of raw materials (Virginia and Novianti 2020) or semi-finished products. Rubber is an export commodity (Daulika, Peng, and Hanani 2020) with the largest exporting countries, namely Thailand, Indonesia, Malaysia and Vietnam (Kamaludin 2018). On the one hand, the price of rubber is determined by the international market through the Singapore Commodity Index (SICOM) (Fong, Khin, and Lim 2018) to make the Indonesia's position is only as a price taker. On the other hand, the demand for natural rubber continues to increase, driven by the growth of the automotive industry. One of the efforts can be made to increase the productivity of the rubber commodity and thereby increase the supply to industry (Darmawan, Putra, and Wiguna 2014). An optimal supply of raw materials will play an important role in supporting the industry to continue to grow (Septiani et al. 2016), as a result the price will continue to improve. High quality materials are an important value added in the raw material supply chain (Hidayat and Marimin 2014). Apart from the latex, rubber wood can even be economically valuable (Shigematsu et al. 2011).

Currently, there is no Zone-Based Plantation Development Pattern for Rubber Commodity in Musi Rawas District which can be used as a reference for development guidelines. Meanwhile in MOA No. 18 of 2018, the pattern of agricultural development must be implemented through the Regional approach (Setiyanto and Irawan 2016). Consequently, the development pattern for rubber commodity must begin to formulate a guideline for the development of the region. In accordance with the MOA 18/2018, broadly speaking the implementation of agricultural area development can be divided into phases of planning, implementation and reporting.

Regional development can support sustainable development to maintain long-term ecological sustainability (Holden, Linnerud, and Banister 2014). The pattern of plantation development that must be prepared is a pattern of plantation development that uses an area as a center for growth and development of a plantation agribusiness system and business Darmansyah et al. (2014) and Hapsari and Yuniasih (2020) by utilizing science and technology, as well as paying attention to the dimensions of space, time, scale of business and management, carried out on the principle of economic togetherness for the welfare of the community/farmer and other business actors who are in harmony with ensuring the consolidation of a harmonious and sustainable business. The development of the area is expected to be an effort to develop and improve the interdependent and interacting relationships between the economic system (Ascani, Crescenzi, and Iammarino 2012), the community (social system) and the living environment and its natural resources (ecosystem) (Long, Charles, and Stephenson 2015).

The existence of the Minister of Agriculture Decree No. 472 of 2018 concerning national plantation areas is established for the Province of South Sumatra that the Rubber Zone is one of

which is in Musi Rawas District as a national rubber area. For this reason, it is necessary to formulate a guideline for the preparation of programs and activities that can be used as a reference in the preparation of integrated planning (M. Holden 2012) among the central, provincial, District, external parties, be it private or BUMN/D, and the community through self-supporting. The development of this plantation area is an integration of the development of the rubber commodity from replanting to downstream so that it produces significant added value and is more efficient (Riadi, Machfud, and Sailah 2011).

An area is a relationship between one type of economic activity, starting from primary production activities, collectors, semi-finished or finished processors (medium, large industry), traders and exporters, as well as supporting activities and services such as financial institutions, business services, education, research, and others. The linkage among the economic activities is important in regional development because complementary relationships between activities will support excellence (Nusantoro 2011). This concerns not only the efficiency of transport costs but also the accuracy and compatibility of the required specifications that will be easier to do since it involves the exchange of "knowledge, relationships, motivation".

The development of this area can also integrate a series of agricultural programs and activities into a unified whole, both from a systemic and regional perspective, so as to encourage increased competitiveness of commodities (Arifin 2013), area and in turn the welfare of farmers as agricultural business actors (Winoto and Siregar 2016). Therefore, the preparation of Area-based plantation development guidelines for Rubber Commodities in Musi Rawas District is an important and urgent need to be carried out. The formulation of this guideline has a very strategic value because it will be used as an operational basis and guide in the phasing of the achievement of the goals and objectives of the plantation sub-sector development for rubber commodities, especially in Musi Rawas District.

2. RESEARCH METHODS

2.1. Focus Group Discussion (FGD)

Focus Group Discussion (FGD) was carried out in Musi Rawas District at the Office of Plantation Directorate General of Plantations, Regional Development Agency of South Sumatra Province, the Office of Plantation of South Sumatra Province and the agencies from Musi Rawas District including The Regional Development Agency, the Office of Plantation, the Office of Plant Service, The Office of Food Crops, The Office of Animal Husbandry, The Office of Trade, The Rubber Research Institute, The Rubber Farmers Association and The Entrepreneurs Association. The FGD also discussed the potential resources and opportunities for agribusiness development in the development of rubber commodity-based plantation areas in Musi Rawas District.

2.2. Mapping

The mapping was conducted for the potential resources, opportunities and areas for developing commodity-based plantation areas in Musi Rawas District using spot satellite imagery 5 and 6 of LAPAN. The results of the image were digitized to see the potential and area of rubber commodities in Musi Rawas District and especially in the Tuah Negeri sub-district as the center of the development area. The satellite imagery was also overlaid with the administrative map of the Musi Rawas District in accordance with the spatial layout plan of Musi Rawas District. Map digitization was carried out using the Arcview application. The results of the mapping were then juxtaposed with the regional potential data to analyze their potential and determine the strategy of activities undertaken for the development of rubber plantation areas in Musi Rawas District. Then the analysis was carried out on the development planning of rubber commodity-based plantation areas in Musi Rawas District.

2.3. Data Analysis

The data obtained from the Central Statistics Agency (BPS) of South Sumatra Province, the plantation statistical data for Musi Rawas District, plantation statistics for South Sumatra Province,

and other library data were analyzed. All the obtained data were displayed in tabular forms and analyzed according to the regional potential and rubber commodities in Musi Rawas.

3. RESULTS AND DISCUSSION

The efforts to establish Musi Rawas as a rubber commodity-based Plantation Area began in 2012, when Musi Rawas District was designated as a pilot in implementing an integrated agricultural development model with a regional approach as outlined in the 2013-2045 Agricultural Development Master Strategy. This decree was confirmed by the Letter of Ministry of Agriculture of 2012 (Number: 1597/RC/110/E1/03/2012 dated March 28, 2012) regarding the Designation of Musi Rawas District as the Center for Development of an Integrated Rubber-Based Agricultural System and the Decree of the Minister of Agriculture No. 472 of 2018 concerning the national plantation areas.

Currently, Musi Rawas District has 14 sub-district with potential for rubber plants, namely: STL Ulu sub-district, Selangit sub-district, Sumber Harta sub-district, Tugu Mulyo sub-district, Purwodadi sub-district, Muara Beliti sub-district, Tiang Pumpung Kepungut sub-district, Jaya Loka sub-district, Suka Karya sub-district, Muara Kelingi sub-district, Cekar sub-district (BTS ULU); Tuah Negeri sub-district, Muara Lakitan Sub-district, and Megang Sakti sub-district. The 14 sub-district, almost all of them have agricultural potential, with a total existing land area of 635,718 ha see Table 1.

Table 1. Area of Land Use in the Musi Rawas District Area by sub-district, 2016 (ha)

No	Sub-district	Paddy Field Area	Non-Paddy Agricultural Land Area	Non-Agricultural Land Area	Total
1	STL. Ulu	7,056	19,291	33,345	59,692
2	Selangit	419	58,048	13,267	71,734
3	Sumber Harta	5,837	3,613	928	10,378
4	Tugu Mulyo	2,748	2,295	1,728	6,771
5	Purwodadi	1,611	3,744	971	6,326
6	Muara Beliti	2,048	13,337	2,178	17,563
7	Tiang Pumpung Kepungut	368	28,549	3,725	32,642
8	Jaya Loka	90	14,941	1,015	16,046
9	Suka Karya	249	9,994	1,910	12,153
10	Muara Kelingi	1,382	48,255	14,945	64,582
11	Cekar (BTS Ulu)	965	59,175	15,014	75,154
12	Tuah Negeri	1,473	20,952	3,920	26,345
13	Muara Lakitan	872	113,543	81,939	196,354
14	Megang Sakti	5,248	26,917	7,813	39,978
TOTAL		30,366	422,654	182,698	635,718

Source: Land area of South Sumatra Province according to its use in 2016, BPS

The total area of rubber plants in Musi Rawas District is 102,721.88 ha (Table 2). The rubber plantations spread across 14 sub-districts, with the largest sub-district being Megang Sakti Sub-district covering an area of 14,664 hectares and Tuah Negeri sub-district covering 13,588 hectares. For the average productivity was still 1.3 tons/ha/year, it was still far below the potential productivity standard of the rubber plants which can reach 2 tons/ha/year.

Based on the direction of the Musi Rawas District development program, the Rubber-Based Plantation Area Development Center has its development center in Tuah Negeri Sub-district and other supporting sub-districts. Of all the existing Sub-districts, the supporting areas were focused more on four Sub-districts, namely Muarabeliti Sub-districts, Megang Sakti Sub-districts, Sukakarya Sub-districts and Muara Kelingi Sub-districts. Based on this, according to the results of the main program for the development of the rubber area after Tuah Negeri sub-district is Muarabeliti Sub-district, Megang Sakti Sub-district, Sukakarya Sub-district and Muara Kelingi Sub-district. To support the development of rubber plantations in Musi Rawas District, it is necessary to formulate a vision,

mission and objectives of the development of this region in order to create synergy among all parties (stakeholders)

Table 2. Data on the Area of Rubber Plantations in Musi Rawas District in 2016 (ha)

No	Code	Sub-district	TBM	TM	TTM/TTR	Total
1	030	STL Ulu	1,777.07	5,740.22	377.19	7,894.48
2	031	Selangit	1,559.36	3,487.40	355.67	5,402.42
3	032	Sumber Harta	356.81	2,148.27	361.06	2,866.14
4	040	Tugu Mulyo	247.19	2,467.28	222.45	2,936.92
5	041	Purwodadi	132.77	2,255.30	71.34	2,459.40
6	050	Muara Beliti	457.65	3,578.73	205.06	4,241.44
7	051	TPK	787.37	3,135.37	342.17	4,264.91
8	060	Jaya Loka	1,071.40	5,235.63	672.95	6,979.97
9	061	Sukakarya	578.01	3,855.68	315.04	4,748.73
10	070	Muara Kelingi	2,191.28	8,794.79	487.55	11,473.62
11	071	BTS Ulu	2,895.39	6,296.39	2,414.62	11,606.40
12	072	Tuah Negeri	1,814.37	10,827.52	947.04	13,588.92
13	080	Muara Lakitan	2,615.96	6,358.46	619.87	9,594.29
14	090	Megang Sakti	2,007.69	11,372.47	1,284.07	14,664.23
	1605	Musi Rawas	18.492.30	75.553.50	8.676.07	102.721.88

Source: The Office of Plantation of South Sumatra Province 2017 and 2013 Agricultural Census Data

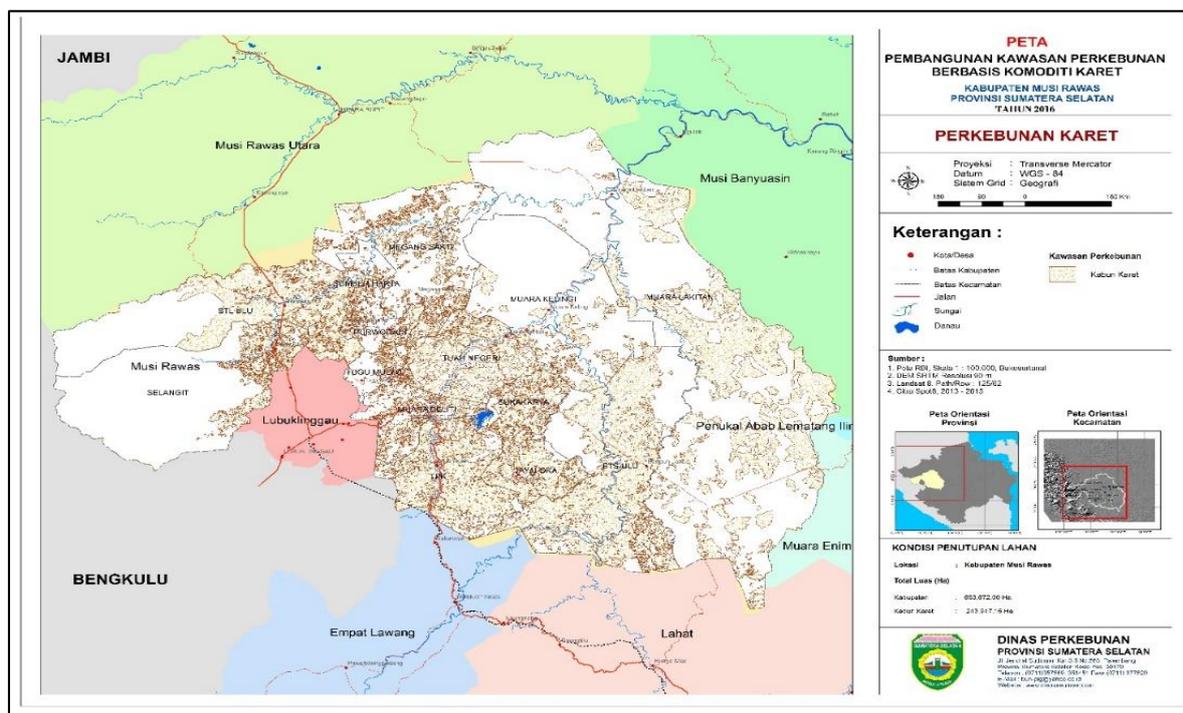


Figure 1. Distribution of Rubber Plantations in Musi Rawas District based on the Satellite Imagery

In general, Musi Rawas District has potential land resources suitable for rubber trees covering an area of approximately 435 thousand hectares (Dinas Perkebunan Provinsi Sumatera Selatan 2017). Based on the overlay results of various maps between the RTRW Map, 5 and 6 LAPAN spot maps, Land Cover and Land Use Maps and Land Suitability Analysis Maps obtained from 435 thousand ha of land suitable for 333 thousand ha of rubber plants, so there is still potential for area expansion rubber plants covering an area of 102 thousand ha. The potential area of 102 thousand ha will be an opportunity and can be exploited if from the perspective of ownership and control it is possible (Figure 1). The area development planning for 5 years, it must have systematic stages and be supported by adequate facilities and infrastructure. If viewed from the existing conditions in the

region in Musi Rawas District, the condition of the area has entered the growth stage which can be seen from the rubber plant production center area having grown well with a total area of rubber plantation of 102,721 ha (Table 3). Consequently, the priority that must be done is with the development of on-farm activities, the technology application to increase productivity and preparation for the downstream industry. Currently the productivity of rubber plants in Musi Rawas District is 1.3 tons/ha/year, while the standard productivity of rubber plants can reach 2 tons/ha/year. At the present time, there are 8,676 ha of old or damaged plants that need to be replanted immediately. If per hectare the rubber plant replanting costs Rp. 7 millions, it requires Rp. 60 billion for the first year to be able to replant all old or damaged plants. Assuming the existing conditions cover an area of 102 thousand ha and a rubber plant life cycle of up to 25 years, this means that there are 4 thousand ha of old/damaged rubber plants per year. If replanting of rubber plants is not immediately carried out per year, there will be 4 thousand ha of rubber plants which accumulate and grow old every year, thus affecting the production and productivity of rubber plants.

Table 3. Land Area Suitable for Rubber Plants and the Potential for Expansion of Rubber Plantations in Musi Rawas District in 2016 (ha)

No	code	Sub-district	Land Area Suitable for Rubber	Area Has Been Used	Potential Remaining Land Appropriate
1	030	STL Ulu	20,509.40	9,965.00	10,544.40
2	031	Selangit	61,719.00	36,784.00	24,935.00
3	032	Sumber Harta	3,713.00	2,325.00	1,388.00
4	040	Tugu Mulyo	2,485.91	1,041.00	1,444.91
5	041	Purwodadi	3,709.00	3,140.00	569.00
6	050	Muara Beliti	13,336.00	12,667.00	669.00
7	051	TPK	27,254.43	24,547.00	2,707.43
8	060	Jaya Loka	14,931.00	14,587.00	344.00
9	061	Sukakarya	10,257.00	7,206.00	3,051.00
10	070	Muara Kelingi	49,038.00	41,942.00	7,096.00
11	071	BTS Ulu	70,393.00	44,293.00	26,100.00
12	072	Tuah Negeri	20,952.09	17,102.00	3,850.09
13	080	Muara Lakitan	113,247.00	103,943.00	9,304.00
14	090	Megang Sakti	23,183.40	13,104.00	10,079.40
	1605	Musi Rawas	434,728.23	332,646.00	102,082.23

Source: Analysis Results

In order to expand the area of rubber plants, it is necessary to collect data on land ownership and control. If from the perspective of ownership and control it is possible, then the expansion of the rubber plantation area in Musi Rawas can be carried out by utilizing the remaining potential, covering an area of 102 thousand ha. The land data collection program is an activity that must be carried out by the Provincial and District Plantation Offices in collaboration with the related agencies and the Ministry of Agrarian Affairs and The Central and Regional Spatial Planning. The area expansion or extensification cannot be decided at the early stages of planning of the development of a rubber plantation area in Musi Rawas District, except for the lands already owned and controlled by the farmers.

The results of the analysis show that the area of rubber land in Musi Rawas District reaches 102 thousand ha (Table 4). The data of the 2013 BPS Agricultural Census show that the area of rubber land owned and controlled by the *Rumah Tangga Usaha Pertanian* (RTUP) was 103 thousand ha. Therefore, there are still around 150 thousand ha of rubber plants in Musi Rawas District for which there is no information on whether the land is owned by farmers outside the Musi Rawas District area, by companies, and rubber plant land but not in the area designated for plantations or is rubber forest land. Collecting the data and information is important because it will determine provincial and district, even national development programs and plans. The total area of rubber land cover in Buah Negeri Sub-district is 17,368 ha, the area of smallholder rubber is 13,588 ha, thus there is land

area of rubber plant still identified as covering 3,779 ha. Of the total area of rubber plants smallholder of 13,588 ha, in Tuan Negeri Sub-district, the immature planting area (TBM) is 1,814.37 ha, the mature plants (TM) are 10,827.52 ha and non-productive, old plants and damaged plants (TTM/TTR) cover 947.04 ha. Based on this, the cultivation management improvement program covers an area of 12,641ha, harvest and post-harvest management programs for 10,827 hectares and replanting 947 hectares.

Table 4. Area of Rubber Land Cover and Area of Household Rubber Plantation in Musi Rawas District in 2016 (ha)

No	code	Sub-district	Rubber Area Cover 2014	Area of Rubber Plantation for Farmers Data ST 2013	Not yet Control Information
1	030	STL Ulu	31,681.02	7,894.48	23,786.53
2	031	Selangit	9,768.98	5,402.42	4,366.56
3	032	Sumber Harta	2,866.14	2,866.14	0.00
4	040	Tugu Mulyo	2,936.92	2,936.92	0.00
5	041	Purwodadi	3,372.69	2,459.40	913.29
6	050	Muara Beliti	6,437.14	4,241.44	2,195.70
7	051	TPK	24,470.42	4,264.91	20,205.51
8	060	Jaya Loka	12,539.55	6,979.97	5,559.58
9	061	Sukakarya	7,971.08	4,748.73	3,222.36
10	070	Muara Kelingi	11,473.62	11,473.62	0.00
11	071	BTS Ulu	48,287.14	11,606.40	36,680.75
12	072	Tuah Negeri	17,368.13	13,588.92	3,779.21
13	080	Muara Lakitan	58,760.54	9,594.29	49,166.26
14	090	Megang Sakti	14,664.23	14,664.23	0.00
	1605	Musi Rawas	252,597.62	102,721.88	149,875.74

Source: The Office of Plantation of South Sumatra Province 2017 and 2013 Agricultural Census Data

The results of preliminary data showed that the area of potential land to be developed as smallholder rubber plantations in Tuan Negeri Sub-district reached an area of 2,282 ha consisting of 2.19 percent of fragile land, 16.04 percent of reeds land and 81.77 percent of other types of land. (Figure 2). This indicates that the total potential of this rubber is very supportive of the availability of rubber raw materials for the development of this area in the future. The area of plantation crops, especially rubber in Tuan Negeri Sub-district, is very dominant, spread evenly in 11 villages. The distribution of dominant rubber plants is in a number of villages, including Jaya Tunggal Village, Lubuk Rumbai, Dharma Sakti, and Petunang. Likewise, the location of the distribution of rubber commodities in the supporting areas is in four Sub-districts, namely Muarabeliti Sub-district, Megang Sakti Sub-district, Sukakarya Sub-district and Muara Kelingi Sub-district.

Based on the previous description, the development program for the next five years will focus on Tuan Negeri Sub-district which is supported by the surrounding sub-districts bordering Tuan Negeri Sub-district. Tuan Negeri Sub-district has an area suitable for rubber plants covering an area of approximately 20,952 ha and has been used around 17,102 ha and there is still potential for expansion of around 3,850 ha. However, this potential will become an opportunity after the data collection on ownership and authority was carried out. The results of the analysis showed that the density or plant population per ha in Tuan Negeri Sub-district was 497 trees per ha and this showed according to the recommendation, where with a 3x5 m spacing, the plant density will reach 500 - 550 trees per ha (Table 5). The average density of plants in Musi Rawas District is 543 trees per ha, where several sub-districts have an average density of over 550 trees per hectare, namely Sumber Harta, TPK and Muara Kelingi Sub-districts. The rubber rejuvenation program in Tuan Negeri Sub-district covering an area of 947 ha required rubber seeds totalling approximately 520 thousand polybags, with reserves for the possibility of damaged or dead seeds in the transportation process or early planting that were still vulnerable to around 10 percent, so the minimum seed requirement was 575 thousand polybags.

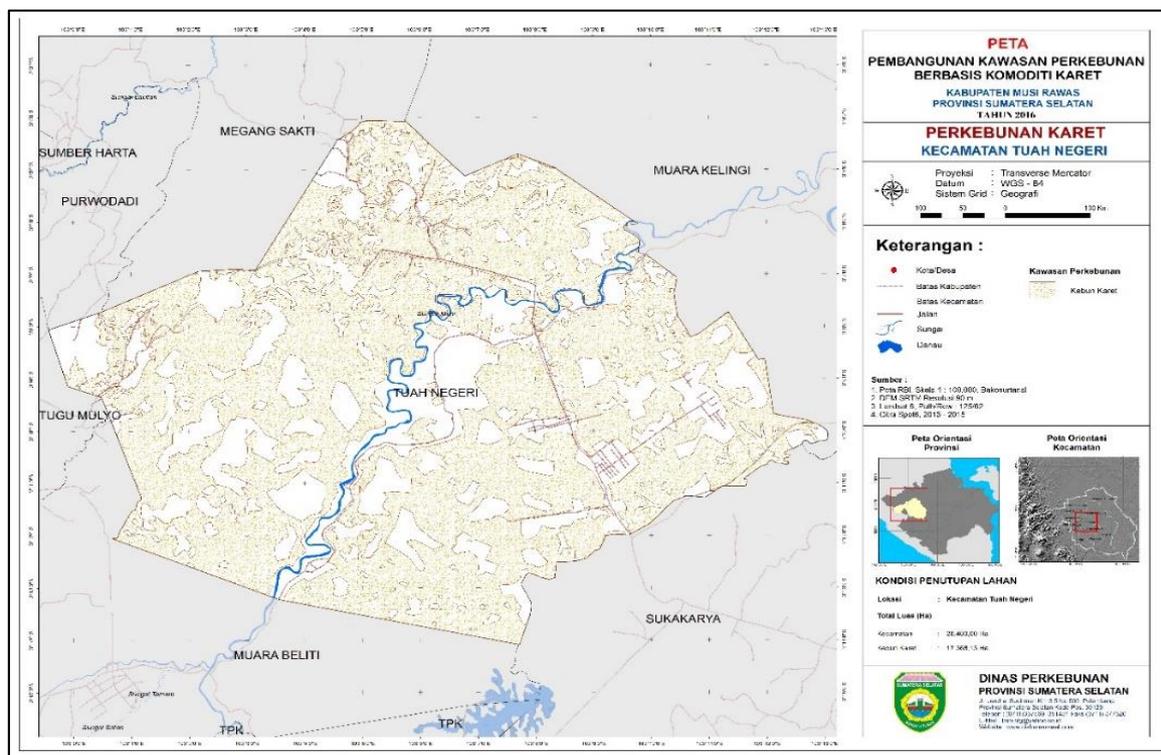


Figure 2. Distribution of Rubber Trees in Tuah Negeri Sub-district based on Satellite Imagery

Table 5. Plant Population and the Average Number of Rubber Stands per ha in Musi Rawas District in 2016

No	code	Sub-district	TBM	TM	TTM/TTR	total	Average Per Ha
1	030	STL Ulu	912,773	2,948,410	193,741	4,054,924	513.64
2	031	Selangit	765,550	1,712,097	174,610	2,652,257	490.94
3	032	Sumber Harta	204,315	1,230,134	206,750	1,641,199	572.62
4	040	Tugu Mulyo	133,144	1,328,943	119,818	1,581,905	538.63
5	041	Purwodadi	70,457	1,196,862	37,861	1,305,180	530.69
6	050	Muara Beliti	200,079	1,564,579	89,650	1,854,308	437.19
7	051	TPK	448,326	1,785,280	194,833	2,428,439	569.40
8	060	Jaya Loka	529,920	2,589,569	332,843	3,452,332	494.61
9	061	Sukakarya	310,646	2,072,212	169,315	2,552,173	537.44
10	070	Muara Kelingi	1,232,713	4,947,536	274,271	6,454,520	562.55
11	071	BTS Ulu	1,977,766	4,300,903	1,649,366	7,928,035	683.07
12	072	Tuah Negeri	901,804	5,381,647	470,710	6,754,161	497.03
13	080	Muara Lakitan	1,428,156	3,471,337	338,412	5,237,905	545.94
14	090	Megang Sakti	1,071,775	607,1024	685,480	7,828,279	533.83
15	1605	Musi Rawas	10.187.424	40.600.533	4.937.660	55.725.617	542.49

Source: The Office of Plantation of South Sumatra Province 2017 and 2013 Agricultural Census Data

The development of rejuvenation and rehabilitation of rubber plants in Musi Rawas District has the potential to integrate rubber with other plants and livestock, both large and small ruminants. In the integration of rubber plants with other plants, the use of rubber footpath until the age of 3 years or before the closing of the rubber plant canopy was intended to increase the land productivity and farmers' income. Even with the plant replanting Pattern with a new spacing of 18 m x 3 m x 2.5 m, it is very potential for intercropping. Besides being able to be for the long term, it can also provide additional income as long as the rubber plant is not yet productive. If it is planted with paddy, the potential production can be up to 2.5 tons/ha, the potential production for corn plants is 2 tons/ha and the potential for soybean plants is up to 1.5 tons/ha. In addition, the cropping pattern can be carried out twice a year, so that the intercropping can provide additional income alternatives for farmers for more than Rp. 12 million/year as long as the rubber plants still do not produce.

Apart from pineapples, planting *barangan* bananas (*Musa acuminata* Linn.) between rubber plants can also provide additional income for farmers in addition to increasing banana consumption to improve the household nutrition of farmers. Shade tolerant intercrops such as cardamom can grow and provide good yields in order to increase farmers' income. The potential for integration with other crops of high economic value both vegetables and spices also needs to be studied in order to increase the farmers' income. Besides increasing income, the intercropping will save farmer household income when the price of rubber decreases. Rubber plants require land cover crops and grass is also available under the rubber plants as a source of feed for ruminants. If one hectare of rubber plantation is able to provide 2 out of 4 potential cattle or buffalo feed, then the capacity of large ruminant livestock in Tuah Negeri Sub-district would reach more than 25 thousand units of cattle equivalent to cows. At the moment, the population of cows and water buffaloes in Tuah Negeri Sub-district is still around 4 thousand heads of cattle (2700 cows and 1300 water buffaloes) and 1000 goats/sheep equivalent to cows (5000 head of goats and 300 sheep).

There is a potential to increase the livestock population of 20 thousand heads, equivalent to a cow. Besides increasing the income from livestock, the potential for waste from livestock can be used as fertilizer for crops. Piloting the integration model of rubber plants with other crops and livestock is needed in order to accelerate the adoption of this technology innovation. In addition to rubber latex production, the intercropping and livestock production, the effort to utilize rubber wood would provide opportunities to increase farmers' income and develop the wood processing industry in Tuah Negeri Sub-district. So far, the rubber plant wood in the form of logs has been accommodated by two rubber wood processing industry units in the Palembang area. However, the potential for this wood can be processed into small industrial products and people's handicrafts to develop the regional economy of Musi Rawas District. Coaching and training as well as piloting for this activity need to be done. These rubber plant wood products can be directed for the manufacture of furniture, floors, finger joints and others that can be done by the local communities on a small scale and households. With a total of 4.9 million rubber stands for rubber trees that are ready to be rejuvenated, the potential for rubber plant wood utilization is enormous. For this reason, it is necessary to collaborate with factories that use rubber plant wood so that the cost of land clearing during rejuvenation can be obtained from the sale of rubber plant wood.

Table 6. Number of Rubber Plantation Business Households and Average Rubber Land Tenure in Musi Rawas District in 2016

No	code	Sub-district	Number of Rubber Business Households (RT)	Average Land Ownership (Ha/RT)
1	030	STL Ulu	4.945	1.60
2	031	Selangit	3.293	1.64
3	032	Sumber Harta	3.552	0.81
4	040	Tugu Mulyo	6.062	0.48
5	041	Purwodadi	3.319	0.74
6	050	Muara Beliti	2.926	1.45
7	051	TPK	1.436	2.97
8	060	Jaya Loka	2.587	2.70
9	061	Sukakarya	2.327	2.04
10	070	Muara Kelingi	6.662	1.72
11	071	BTS Ulu	5.744	2.02
12	072	Tuah Negeri	4.903	2.77
13	080	Muara Lakitan	4.932	1.95
14	090	Megang Sakti	9.762	1.50
15	1605	Musi Rawas	62.450	1.64

Source: The Office of Plantation of South Sumatra Province 2017 and 2013 Agricultural Census Data

Socialization to rubber plant farmers about good and correct rubber tapping so that the quality of the tapping field becomes better to increase yield of rubber wood, followed by an increase in the selling price of wood. In addition, there is a need for socialization regarding the added value of rubber plant wood during the rejuvenation which can be used for additional replanting costs. The

number of rubber farming households in Musi Rawas District including those who are not owners and cultivate rubber plants (workers and laborers) is as many as 62,450 households. The number of households in Tuah Negeri District is 4,903 households. The average area of rubber plants cultivated in Musi Rawas District is 1.64 ha per household and in Tuah Negeri Sub-district is 2.77 ha per household (Table 6).

If we are going to concentrate the rubber commodity-based plantation area in Tuah Negeri Sub-district, we must first focus on improving human resources in this sub-district. Improving the quality of farmers in Tuah Negeri Sub-district can be carried out by implementing: 1) Training on Plantation Cultivation (Good Agriculture Practices) covering cultivation methods, tapping techniques and so on; 2) Group dynamics aiming to strengthen togetherness in institutions so as to create strong farmer groups and have good management; 3) Integrated Pest Observer Field School; the biggest loss due to poor cultivation is due to the aging of the rubber plant which is easily damaged. This is due to the attack of plant pests and diseases reducing production and even causing death to plant. Therefore, knowing how to control pests and diseases is expected to increase the production and lifespan of rubber plants.

The concept and approach of the group need to be changed not only for the needs when there are project activities or assistance but also towards an approach as a development driver including TOT training for rubber development in all areas of Musi Rawas District and South Sumatra Province even on a national scale. In other words, the farmer groups and institutions must be established in advance, and this must cooperate with the local extension coordinating agency. In general, the condition of smallholder rubber plantations has spacing and is irregular so that the condition of the plantation resembles a forest, using non-cloned seeds or random rubber seeds. Although using superior clones, nursery techniques are also not as recommended. Most of the existing plantation plants are those that are still relatively young and yielding but look old because of unsuitable tapping techniques. Intensive tapping without being accompanied by adequate fertilizer intake and plant maintenance causes the plants to age quickly and have a short productive life. The plant age which should reach 25-30 years, it is only up to 12 to 15 years that they must be replanted again because of that reason. Efforts to intensify and replant still experience problems as there are no funding sources available for replanting. Based on this condition, piloting, training and mentoring along with the provision of assistance are needed. The training required includes cultivation, plant management and care, breeding of superior clone seeds, harvesting techniques and post-harvest handling.

The age of the workforce quite determines the success in doing the job, both physical and non-physical. Older workers have weak and limited physical energy, on the other hand, young workers have strong physical abilities (Pembangunan and Pembangunan 2018). The rubber farmers in Tuah Negeri Sub-district are still in the productive age group and most of them are in the 35 to 55 age group. However, the rubber business for young people is decreasing. Introductory programs, education and training for young people are needed. Apart from the education for the young generation to explore business interests in various fields of rubber business, starting from captive breeding, cultivation, processing and marketing as well as utilizing rubber wood for various household needs, the most important thing in rubber development is group revitalization. The role of farmer groups in marketing is very low, including in other activities. The development of rubber plantation areas in various fields has good prospects for employment. The number of workers working in the rubber business currently reached around 14,485 or 52.68% of the total population of Tuah Negeri in 2016. In 2021, with the development of rubber from upstream to downstream, the rate of labor absorption is expected to increase to 21,426 people or 62.35 percent of the population in Tuah Negeri Sub-district.

Human resource development in various rubber businesses will drive agribusiness from upstream to downstream. At the location of the area, namely Lubuk Rumbai Village of Tuah Negeri Sub-district, a UPT (Technical Implementation Unit) of Rubber Commodity-Based Plantation Area was established. At the Provincial Level, a Project Management Unit will be established in the form of a Provincial UPT and a UPT in Musi Rawas District and there will be a secretariat office in each (Figure 3). All institutions within the development organizations and institutions direct their full

support in efforts to empower farmers and farmer organizations (Farmers Groups/Combined Farmers Groups) in increasing their capacity and ability to produce BOKAR and Rubber Timber which have continuous quantity and quality and high added value.

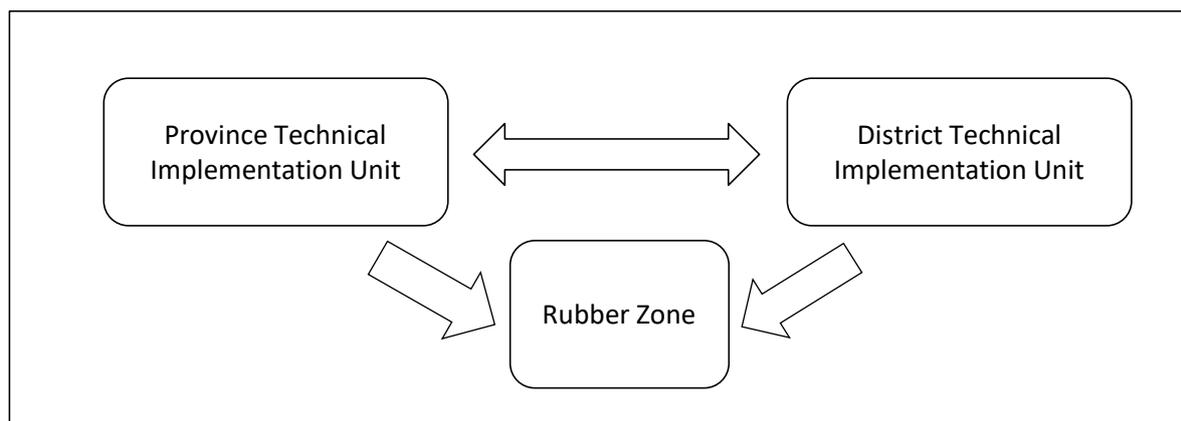


Figure 3. The pattern of monitoring the implementation of Area development

The development of rubber commodity-based plantation areas is designed according to the agribusiness system (Setiyanto 2013). In the upstream subsystem the provision of infrastructure resources (roads, irrigation and others) and production facilities (fertilizers, seeds and others), capital, market information and technology are presented up to the location of the area (Figure 4). This process is directed at supporting increased production through the capacity of farmers and institutions in regional locations. In the cultivation subsystem being developed is a cultivation process that is in accordance with the specific conditions of the location with an effort to increase productivity and yield quality. Farm management is directed at increasing productivity and product quality and diversification of business as well as continuity of production and environmentally friendly. The processing and marketing subsystems are directed towards increasing production of high quality, efficiency, supporting the downstream rubber industry and increasing exports with a smooth distribution system.

The development requires support in the form of developing patterns of procurement and supply of supporting infrastructure and facilities, capital, technology and market information. The pattern of facilitation and assistance in the context of developing human resources, institutions and business management at the level of input, farming business, processing and marketing businesses supported by the quality control and assurance patterns, as well as a process of reciprocal relations are an important activity. For this to work, the right partnership pattern becomes a necessity. This pattern leads to cross-sectoral cooperation within the government and between agribusiness actors ranging from upstream to downstream, either the farmers, private or public, to participate actively, fully dedicatedly and responsibly according to their respective duties. To further optimize the development in the area, it is necessary to pay attention to the existing supporting facilities and infrastructure. Improvement of production roads to facilitate the entry and exit of raw materials and facilitate the transportation of rubber wood during rejuvenation is needed. In addition, to facilitate the implementation of the tillage because the soil is full of roots for intercropping and also for land clearing without burning.

Area development should be gradual and in accordance with the potential of the region. The preparation of programs and activities must be integrated from either the State Budget, Provincial Budget, District Budget or other Private Parties. Stages of Area development for the next 5 years must follow the flow: 1) Preparation of an Action Plan, carried out in conjunction with the completion of a District Regulation or Musi Rawas District Regulation concerning the location of a Rubber Commodity-Based Plantation Area along with a District budgeting plan synchronized with the Provincial Budget and State Budget and other funds; preparing the Technical Team for Regional Development and allocating secretarial offices and allocating and managing their assets related to both hardware and software; the policies and supporting regulations needed include efforts to

create an investment climate conducive to investment, granting land certification, quality seeds, farming and processed products with low costs and easy procedures, guarantee of ease of obtaining loan and ease of export and marketing of products (first year); 2) Preparation for Office Operations, Secretariat and Recruitment of Regional Supporting HR Needs (from the first year to the second year); 3) Implementation of Plant and Animal Integration Model and Preparation for Rubber Timber Industry Training and Quality Improvement of Harvest Products (first to fifth years); 4) Operational Activity of Area Development in Tuah Negeri Sub-district (second year); 5) Development of Areas in the Year of Expansion of Development in Other Sub-districts in Musi Rawas District (second to fifth years); 6) Finalization of Regional Development of Musi Rawas District (Year four).

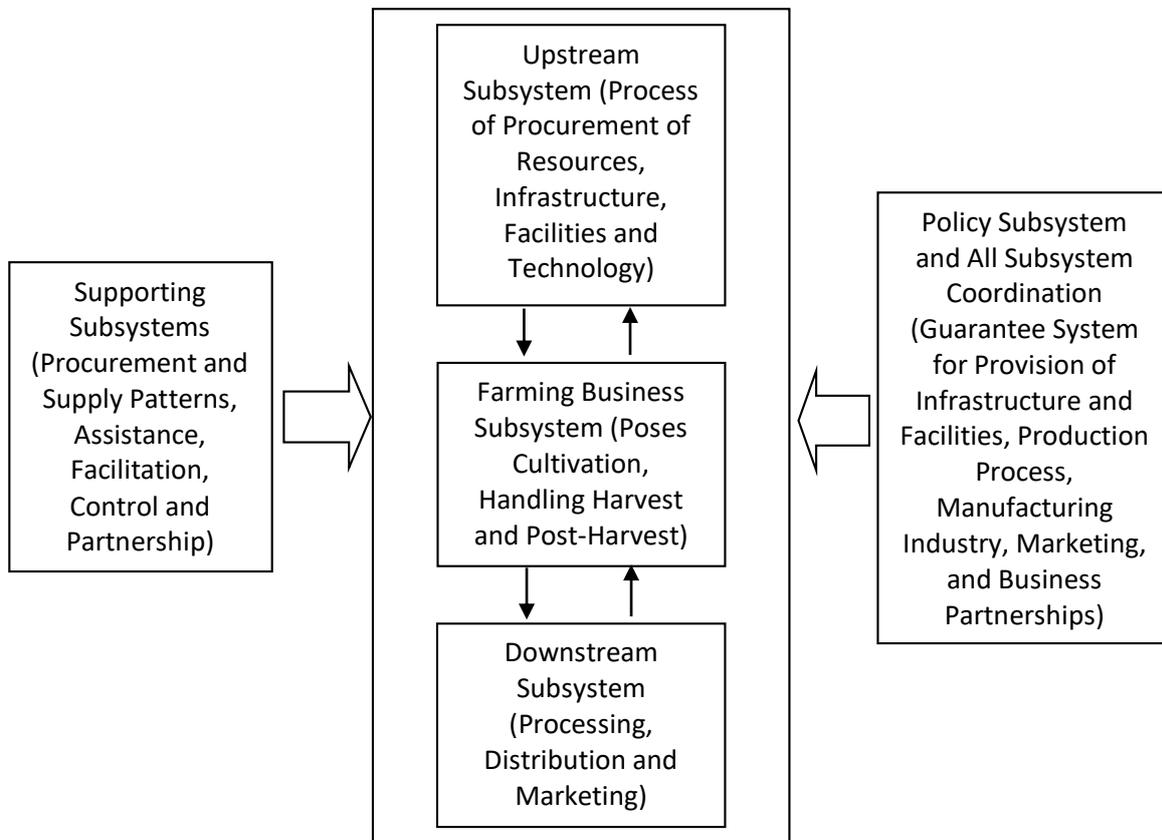


Figure 4. Model Framework for Developing Rubber Commodity-Based Plantation Areas in Musi Rawas District

The strategy in the Development of Rubber Commodity-Based Plantation areas in Musi Rawas District must be with an integrated vertical and horizontal development. The regional development must be integrated and collaborated between the sectors and institutions. It is a cross-agency coordination, the Regional Development Agency (Bappeda) must be the coordinator in this implementation. Based on the existing condition of the region, the development condition of the rubber commodity-based area in Musi Rawas District has entered the Growth stage, viewed from the production center area of rubber plants having grown well with a total rubber planyarea of 102,721 ha. Therefore, the priority that must be done is with the development of on-farm activities, the application of technology to increase productivity and preparation for the downstream industry. The steps to take are how to increase production and productivity by replanting and intensifying rubber trees. In addition, the intercropping activities with crops can be carried out as long as the plants are immature and can even be carried out for more than 5 years by changing new crop patterns. Handling the replanting and rehabilitating of the rubber plantation using high quality seeds can also increase crop production. Besides, the empowerment of rubber farmers through farmer institutions and partnerships with rubber companies operating in the Musi Rawas District region.

The rubber development is carried out in order to support the rubber industry downstream program and the development of the Tanjung Api-Api Integrated Economic Zone. Vertical integration is also demonstrated by the effort to utilize rubber plant wood where on a large scale partnering with rubber wood processing companies and on a small industrial scale, rubber wood processing guidance is carried out in the area location. Horizontal integration is carried out through the development of intercroops and livestock cultivation. Integration also directs efforts to develop cohesiveness between actors and stakeholders. The area's final products are high quality Rubber Processing Materials (BOKAR) and rubber plant wood. In order to achieve these production targets, the strategy taken in developing rubber-based plantation areas is the integration and strengthening of the rubber agribusiness system. The completeness is intended that all subsystem components in the agribusiness system are fully available in the regional locations. The strengthening is intended that the components in the agribusiness subsystem are strengthened or their capacity is increased to be able to encourage the growth of the agribusiness area. The development of rubber commodity-based plantation areas is directed at efforts to create a model of rehabilitation and rejuvenation of community rubber which is applied with the names of the Participatory Rehabilitation and Replanting Model. Based on the recommendations of the Rubber Research Center and the Sembawa Research Center program, the main basis for the participatory approach in the community rubber rehabilitation and replanting program is the need to change the community rubber development paradigm from an "assisted project" approach to a "self-supporting community movement") or "bottom-up approach". The basic principle of the self-supporting community movement approach is to encourage people to learn to solve their own problems using their own resources and to encourage people to participate in every development process.

4. CONCLUSION

With the position of the area included in the growth stage, the development of rubber commodity-based plantation areas in Musi Rawas District is directed first for on-farm development. How to increase the productivity from the rubber plants to its optimal potential and also the implementation of future development strategies by more integrating the use of funding sources from the central and regional governments, and self-supporting and private parties. In order for the implementation to run according to the plans and objectives, for implementation in the regions, it is necessary to establish a Technical Implementation Unit (TIU) or Project Management Unit (PMU) consisting of all related parties. Then, the District Plantation Office and related agencies at the district level prepare action plans for operational activities at the Regency level and the Provincial Plantation Service along with related agencies at the provincial level prepare an action plan for the basis for operational activities at the provincial level. If each of these parties can support each other in harmony do their duties and functions, then the development of the rubber area can be realized well.

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