

# Regional economic empowerment through oil palm economic institutional development

Almasdi Syahza and Brilliant Asmit  
*Universitas Riau, Pekanbaru, Indonesia*

## Abstract

**Purpose** – The purpose of this paper is sixfold: first, to know the ability of area carrying capacity to the development of downstream oil palm industry; second, to know the potential for the development of downstream oil palm industry in efforts to improve the community through employment and business opportunities in the regions; third, to find eco-friendly institutional arrangement strategies of oil palm farming in order to spur economic growth and development; fourth, to formulate strategies for potential environmental impact as a result of institutional arrangement and development of downstream oil palm industry, both in regional and national scope; fifth, to predict the economic multiplier effect as impact of institutional arrangement and development of oil-palm-based downstream industry; and sixth, to include production centers and development areas of oil-palm-based downstream industry in potential areas.

**Design/methodology/approach** – Research location was in potential areas of oil palm plantation development, either in the form of plasma through state-owned enterprises (BUMN) and private-owned enterprises (BUMS), or in the form of self-supporting by community. The research locations were divided into two parts, namely the land area and the coastal area. The land area of Riau consisted of Kampar, Rokan Hulu and Kuantan Singingi Regency, while the coastal area of Riau consisted of Pelalawan, Siak, Bengkalis, Indragiri Hilir, Indragiri Hulu and Rokan Hilir Regency. Both research areas had different productivity which was caused by differences in soil fertility. The required data were primary and secondary data.

**Findings** – Plantation activities have increased the mobility of goods in the villages, causing plantation activities to also open business and employment opportunities for people who are able to accept these opportunities. Since post-1998 crisis, the growth of oil palm plantation area in Riau increased sharply, namely in 1998, the area of oil palm plantations was 901,276 ha, in 2012, 1,119,798 ha and increased to 2,103,175 ha at the end of 2017. Through economic activities that produce goods and services required during the plantation process and the development, downstream industries will have backward linkages. The development of oil palm plantations in Riau has had an impact on economic activities in rural areas. The result of the research in the field is that the average income of farmers in the plantation subsector (especially oil palm) is Rp4,576,696 per month or \$5,781.09 per year. The impact on investment in the estate subsector has been felt by rural communities. This condition also affects the purchasing power of the people, resulting in the increase of mobility of goods and people. During the period 2009–2016, rural communities enjoyed a high level of prosperity. During this period, the price of fresh fruit bunch at the farm level was quite profitable. On the other hand, the production of the plantation area also increased compared to the previous period. The impact of rising prices and increasing production of farmers is that the farmers' welfare index in the countryside had a positive value of 0.43. This index showed the increase of farmers' welfare from the previous period by 43 percent.

**Originality/value** – There are few previous studies which have comprehensively and specifically reviewed the regional economic empowerment through institutional arrangement and development of oil-palm-based downstream industry. The development of oil palm plantations aims to eliminate poverty and underdevelopment, especially in rural areas. In addition, it also pays attention to equity. In broad sense, agricultural development which is based on plantations aims to improve the welfare of the community so that there is a change in the pattern of life of the surrounding community. On the other hand, the success of plantation development that is based on oil palm agribusiness is expected to reduce income inequality between community groups and between regions.

**Keywords** Institutional development, Palm oil economics, Regional economic empowerment

**Paper type** Research paper



## 1. Background

To date, the development of agricultural sector is quite rapid in Indonesia, especially the plantation subsector which is developed in Sumatra and Kalimantan. In Riau Province, particularly, oil palm is a prima donna commodity cultivated by many people and

business entities. Based on the data from Riau Province Plantation Office (2017), the growth of oil palm area increased sharply, i.e. 966,786 ha in 2012 to 2,103,175 ha in 2017. During the period of 2012–2017, the average growth rate was 8.09 percent per year, while other commodities such as rubber and coconut experienced a decrease. The expansion of the plantation area was followed by an increase in the production of fresh fruit bunches (FFBs). FFB production of 1,792,481 tons in 2012 increased to 6,293,541 tons in 2017 with an average annual growth of 13.37 percent.

FFB production is supported by oil palm mill (OPM) which amounted to 143 units with processing capacity of 6,091 tons per h. The OPMs do not spread evenly, they are concentrated in nucleus and plasma plantation area. Meanwhile, the locations of self-help farmers with their dispersed lands are far from the existing OPM. This condition, i.e. the far distance between the plantation area and OPM, leads to the low quality of FFBs which are brought to the mills.

Oil palm farming in Riau area is growing so rapidly, but on the other hand, it is not balanced by the development of FFB processing industry, namely OPM. The lack of processing capacity of the OPM causes a backlog of raw materials at the plantation site. Indirectly, FFB at the level of farmers (self-help farmers) is greatly shaped by collecting traders at the village level. On the other hand, the farmers involved with plasma activities (which are fostered by the foster father) get the priority of FFB processing because the FFB of smallholders is run by a cooperative managed by the foster father (core enterprise).

From what has been revealed above, the researchers propose several objectives of this research proposal, namely, to know the ability of area carrying capacity (ACC) to the development of downstream oil palm industry; to know the potential for the development of downstream oil palm industry in efforts to improve the community through employment and business opportunities in the regions; to find eco-friendly institutional arrangement strategies of oil palm farming in order to spur economic growth and development; to formulate strategies for potential environmental impact as a result of institutional arrangement and development of downstream oil palm industry, both in regional and national scope; to predict the economic multiplier effect (ME) as impact of institutional arrangement and development of oil-palm-based downstream industry; and to include production centers and development areas of oil-palm-based downstream industry in potential areas.

There are few previous studies which have comprehensively and specifically reviewed the regional economic empowerment through institutional arrangement and development of oil-palm-based downstream industry. Some studies which conducted partial tests are as follows: test on ACC by Hjalager (2001), Mwanri *et al.* (2012), Kmieciak *et al.* (2012), Shapira *et al.* (2010), Rokhim *et al.* (2017), Evans and Sawyer (2010), Ateljevic (2009) and Al-Dajani and Marlow (2013); institutional arrangement strategy by Salia *et al.* (2018), Conteh (2012), Rahman *et al.* (2017), Rosenberg (2012), Tijani and Yano (2007), Bayulgen (2015) and Lam (2016); and development of downstream industries (other than oil palm) by Otache (2017), Ibaba (2008), Mohanty (2012), Saifullah *et al.* (2018), Kainiemi *et al.* (2014), Ezema (2015), Yigitcanlar and Sarimin (2015), Ilori *et al.* (2017), Iwami (2001), Xiong *et al.* (2017), Khan (2014), Umejesi and Thompson (2015), Onuorah *et al.* (2015) and Djoumessi *et al.* (2018).

Several previous studies have comprehensively and specifically reviewed regional economic empowerment, but there are still no policy formulations related to oil palm development and derivative products, as well as production center nets and areas for the development of oil-palm-based downstream industries in potential areas.

The development of oil palm plantations aims to eliminate poverty and underdevelopment, especially in rural areas. In addition, it also pays attention to equity. In broad sense, agricultural development which is based on plantations aims to improve the welfare of the community so that there is a change in the pattern of life of the surrounding community.

On the other hand, the success of plantation development that is based on oil palm agribusiness is expected to reduce income inequality between community groups and between regions.

The virtue of this research is to find the strategy of institutional arrangement of oil palm farming in order to spur growth through the development of downstream oil palm industry. The strategy is intended to create economic added value so that efforts to accelerate the economic development of the community can be improved. These findings are useful for agribusiness and government actors as decision makers in relation to the development of oil palm plantations. It is expected that the improvement will result in increasing the added value for oil palm agribusiness actors, especially plasma farmers and self-help farmers (local communities) so as to improve the welfare of the community. After this research is conducted, it can provide a strategic formula to utilize local resources through the development of oil palm plantations and derivative products.

## 2. Literature review

The results of research conducted by Syahza (2005) found that the development of oil palm plantations in Riau region has a double impact on regional economy, particularly in creating employment opportunities. This development has provided trickle down effects which can expand the power of dispersion in the surrounding community. The greater the development, the more the impact will be felt on workers who work in the plantation sector and its derivatives. This impact can be seen from the increase in the income of farmers, so that the purchasing power of rural communities increases, both for primary and secondary needs.

The impact on communities around the development of oil palm plantations is reflected in the creation of employment and business opportunities for local communities, such as opening food and beverage kiosks, transportation services, home industries and banking services. All of this eventually led to the emergence of traditional markets in residential and rural areas. Thus, the income and welfare level of the community increases. On the other hand, the pattern of public consumption and education will increase as well (Syahza, 2007a).

The activities of oil palm plantation development, which involve a lot of labor and relatively large investment for the downstream industry, are estimated to positively stimulate, grow and create employment and business fields. Through economic activities that produce goods and services needed during the process of oil palm plantation activities and the development of downstream industries, it will have backward linkages. The process of this activity is expected to emerge, among others, construction services, farm labor services, transportation services, food and clothing trade, trade in work equipment and materials needed during the process. On the contrary, it will have forward linkages in post-harvest activities and production processes. The forward linkages process that is expected to emerge is the service sector, including transportation, hotels, cooperatives, banking and trade (Syahza, 2007b). Actually, Riau has a great potential to develop derivative products from oil palm (downstream industry). The downstream oil palm industry in the future can become one of the most strategic and prioritized plantation commodities (Riau Terkini, 2006). However, until today, the downstream industry has not been realized yet.

Development of rural plantations has opened up employment opportunities for people who are able to accept these opportunities. With the existence of plantation companies, the livelihoods of local communities are no longer limited to the primary sector, but it also has expanded their business space in the tertiary sector. Various sources of income that contribute to this sector are traders (trading in daily goods, trading in rubber, transportation tickets and ice sellers), employees (teachers, village government), home industries (tofu, bread and tile printing industries), unskilled laborers, fishermen, wood seekers in the forest and carpenters (Syahza, 2009).

For people in rural areas, until now, the plantation business is an alternative to change the family's economy; therefore, public interest in plantation development is still high. Oil palm farming shows an increase in the welfare of farmers in rural areas. Plantation development activities have led to high population mobility. According to Soemarwoto (2001), the increase in population causes the area of cultivated land to tend to be smaller, this condition causes increased population pressure on the land. Then in the area of shifting cultivation, the increase in population density also increases population pressure on the land because of the increased need for food as a result of the shortening of the land rest period. Furthermore, Mustari and Mapangaja (2005) stated that the increasing population density of land carrying capacity (LCC) would eventually be exceeded. This shows that the land in an area is no longer able to support the above population at a certain level of welfare.

The results of research conducted by Syahza (2010) showed that the development of oil palm plantations in the Riau region had an impact on rural economic activities, where farmers' income ranges from \$4,633.37 to 5,500.32 per year. In addition, it also has an impact on the acceleration of the community's economic development in an effort to reduce poverty in the villages. The impact of these activities can be seen from several indicators, as follows: first, oil palm farming has been able to reduce income inequality in rural areas; second, population pressure without the plantation subsector has exceeded the capability capacity of the land ( $> 1$ ), which was 6.01 in 2004 that increased to 11.04 in 2008; third, LCC in Riau is very high, in 2004 it was 129.3 and in 2008 it increased to 138.77; fourth, increasing population within geographical boundaries has caused severe pressure on available land resources; fifth, increasing the amount of money circulating in rural areas. This condition demands the needs of the community for the establishment of institutions that handle the needs of a community group. Sixth, providing external influences that are positive or beneficial to the surrounding area. The benefits of socio-economic aspects include increasing the welfare of the surrounding community, expanding employment and business opportunities and contributing to regional development. Seventh, some oil palm plantation activities that directly influence the socio-economic and cultural components of the surrounding community include: absorption of local labor; rural community development activities; construction of infrastructure facilities that can be utilized by the local community, especially roads; agricultural, health and education counseling; and payment of the company's obligations to the state (taxes and other compensation costs). Eighth, development of oil palm plantations in the Riau region can reduce income inequality between groups of rural communities. Development of oil palm plantations can also reduce the level of inequality between regencies/cities in Riau.

Oil palm is one of Indonesia's leading commodities that play a role in national economic growth. Its contribution is quite large in generating foreign exchange and employment. The development of the crude palm oil (CPO) processing industry and its derivatives in Indonesia is in line with the growth of plantation areas and oil palm production as a source of raw material. Until 2011, the area of oil palm plantations reached 2,103,175 ha with FFB production of 36,809,252 tons. Meanwhile, the capacity of the OPM was only 30,019,200 tons. The results of the analysis showed that the AAC was 1.584. Each FFB should be processed in less than 8 h or AAC for OPM must be smaller than 1 (AAC, 1). The high production of oil palm plantations in Riau is the potential to increase OPM. The results of calculations based on the development of land area and farm productivity showed that the Riau region still lacks OPM as many as 16 units with a capacity of 60 tons per h or identical to 21 OPM units with a capacity of 45 tons per h. The lack of OPM has an impact on the prices and income of oil palm farmers in rural areas. On the other hand, the high need for OPM in Riau is a business opportunity for investors to develop OPM and derivative products from oil palm (Syahza, 2012).

According to Soemarwoto (2001), the population increase tends to cause a constriction to the arable land. This particular situation heightens the population's pressure toward the land.

On the other side, establishing a plantation would need some land; if this is not controlled by the policymaker, there will be a conversion of land use in rural areas. The rapid development of oil palm plantations makes centers of economic growth in villages around plantation development areas to emerge. This condition causes an increase in the purchasing power of rural communities, especially for routine household needs and the need for production facilities for oil palm plantations. On the other hand, the opening of plantations will require land. If this is not controlled by policy makers, land conversion will occur in rural areas.

This study which was conducted in 2014 was directed for empowering regional economies through institutional arrangements and development of oil-palm-based downstream industries. In the end, a model for the development of sustainable oil palm plantations was formed to support the acceleration of oil palm industry cluster. At the end of the study, it was expected that a policy that was related to the development of oil palm and its derivative products, as well as the netting of production centers and areas for the development of oil-palm-based downstream industries in potential areas, was formulated.

### 3. Research methods

Research location was in potential areas of oil palm plantation development, either in the form of plasma through state-owned enterprises (BUMN) and private-owned enterprises (BUMS), or in the form of self-supporting by community. The research locations were divided into two parts, namely, the land area and the coastal area. The land area of Riau consisted of Kampar, Rokan Hulu and Kuantan Singingi Regency, while the coastal area of Riau consisted of Pelalawan, Siak, Bengkalis, Indragiri Hilir, Indragiri Hulu and Rokan Hilir Regency. Both research areas had different productivity which was caused by differences in soil fertility. The required data were primary and secondary data. Secondary data were obtained from relevant agencies as well as from oil palm companies. The required information was in the form of policy by local government and plantation companies. Primary data were obtained by using a list of questions that have been prepared based on research needs. Rapid Rural Appraisal (RRA) method was conducted to obtain accurate information. RRA is a participatory approach to obtain general data/information and assessment in the field in a relatively short time. In this RRA method, the information collected was limited to the information required in this research that is in accordance with the objectives of the study. However, it was done more in depth by tracing the source of information so as to obtain complete information about something.

The reasons of using RRA method are that it can be implemented rather quickly, flexible and able to identify the understanding of a complex issue within interdisciplinary fields of study, which can support the local community. To get the result of regional economic empowerment research through institutional arrangement and development of oil-palm-based downstream industry, it was necessary to do some analysis, namely:

- (1) capability of ACC;
- (2) development potential of downstream oil palm industry;
- (3) analysis of oil palm institutional arrangement strategy;
- (4) the prediction of economic MEs and the potential for improving the welfare of the people;
- (5) employment and business opportunities in the study area;
- (6) the inclusion of production centers and oil-palm-based downstream industry development areas in potential regions; and
- (7) strategies for potential environmental impacts and sustainable development.

The researchers used the following formula in the approach to the creation of ME on oil palm plantation activities (Syahza, 2005):

$$K = \frac{1}{1 - (MPC \times PSY)}$$

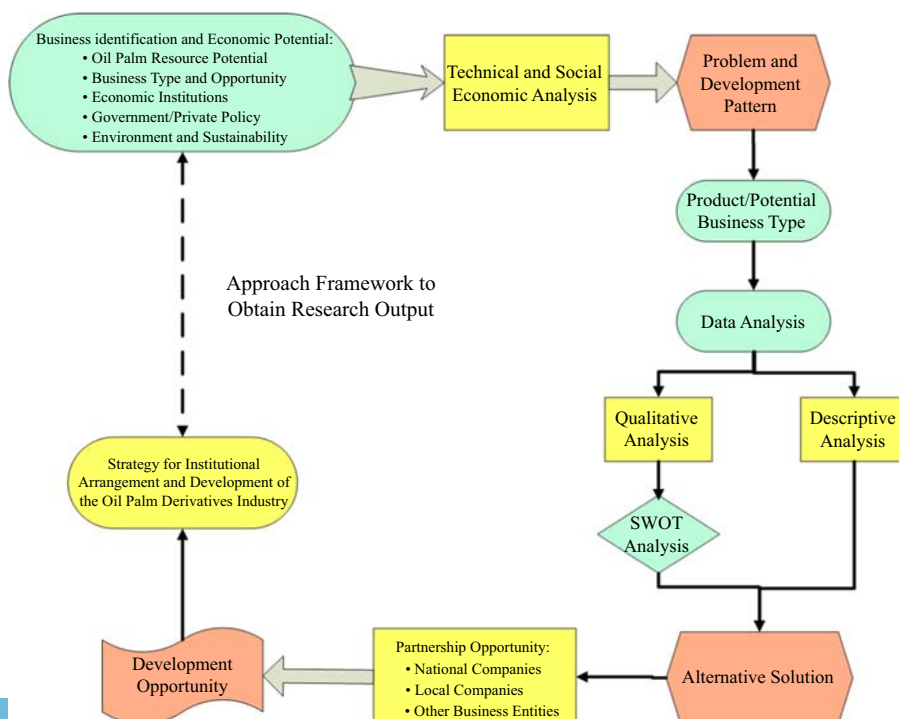
where  $K$  is the economic influence of the region (ME); MPC is the proportion of farmer's income spent in the area; and PSY is part of farmers' expense who generate income in the area or the percentage of the need for oil palm plantation activities that can be met by the local area. The higher the ME rate of oil palm plantation activities ( $K$ ), the higher the turnover of money in rural areas (Figure 1).

In order to know the level of prosperity and the level of welfare of rural communities, especially around the development of oil palm plantations, the researchers conducted a test with the following formula (Todaro and dan Stephen, 2006):

$$G = w_1g_1 + w_2g_2 + \dots + w_i g_i,$$

where  $G$  is the growth index of social welfare;  $g_i$  is the  $-i$  quantile social growth rate; and  $w_i$  is the  $-i$  weight of the welfare of the quantile group.

The increase of welfare of rural communities as a result of oil palm plantation development in Riau was indicated by the increasing value of welfare growth index ( $G$ ) from period to period. Decisions on institutional development strategies and oil palm derivative products were carried out by SWOT analysis. The level of sustainability of oil palm



**Figure 1.** Framework for research on regional economic empowerment through institutional arrangement and oil-palm-based downstream industry development

plantations from the socio-economic and environmental aspects was analyzed by using a multi-dimensional scaling approach which was modified into Rap-Insus-Pom technique (Rapid Appraisal-Index Sustainability of Oil palm Management).

#### 4. Results

##### 4.1 Capability of area carrying capacity (ACC) against development of downstream oil palm industry

The high interest of rural communities in Riau to oil palm farming has made Riau as the largest oil palm producer in Indonesia. Based on data in 2017, the area of oil palm plantations had reached 2,103,175 ha and FFB production was 36,809,252 tons per year with productivity of 22.8 tons per year per ha. Based on land conditions and soil fertility rate in Riau, the productivity of CPO is 3.9 tons per year per ha. Meanwhile, the number of OPMs in Riau is 146 units with a production capacity of 6,254 tons per h. The installed capacity of OPM in Riau is 6,254 tons per h. Due to the high interest of the people to have oil palm plantations, the area of oil palm plantation is predicted to always experience an increase in the future. As the area increases, it will be followed by an increase in the production of FFB. This condition will also cause the processing capacity of FFB be more needed, both in terms of quantity and in terms of its processing capacity. As for the existing area, the production will also increase because there are still many immature plants (IP). Until 2017, the area of IP was 470,713 ha, which spread in 12 regencies/cities. Therefore, it is necessary to analyze ACC in the provision of raw materials of OPM.

The calculation result of ACC of oil palm industry is presented in Table I. The calculation result is based on the assumption of availability of some indicators, namely, productive land area, both for mature plants (MP) and IP; land productivity; and installed capacity. Based on these assumptions, the ACC index score is 1.226 (hours of operation of OPM is 400 h per month and for 25 working days per month). The results of this calculation prove that the ACC score is greater than 1, which means the carrying capacity of Riau to supply the raw material of OPM is big enough. Each one unit of OPM capability is supported by FFB feedstock of 1,226 units. If it is assumed that OPM operations are 500 h per month (20 h per day for 25 days per month) then the ACC score is 0.981. This means that the installed engine capacity is still sufficient for FFB raw material processing. However, on the other side, in reality, there are still FFBs that are late to be processed,

Regency/city	Land area			OPM/capacity		ACC
	MP	IP	Total	Unit	Ton/h	
1. Kampar	320,466	33,262	353,728	35	1,425	1.123
2. Rokan Hulu	254,680	161,756	416,436	22	984	1.302
3. Pelalawan	161,235	21,600	182,835	17	715	1.089
4. Indragiri Hulu	98,222	19,993	118,215	8	285	1.597
5. Kuantan Singingi	105,382	16,189	121,571	10	450	1.108
6. Bengkalis	108,247	62,619	170,866	8	350	1.371
7. Rokan Hilir	216,134	19,602	235,736	22	915	1.056
8. Dumai	20,135	12,281	32,416	1	60	1.412
9. Siak	182,660	50,048	232,708	15	685	1.227
10. Indragiri Hilir	139,696	72,781	212,477	8	385	1.676
11. Pekanbaru	7,498	582	8,080	–	–	–
12. Kepulauan Meranti	–	–	–	–	–	–
Total	1,614,355	470,713	2,085,068	146	6,254	1.226
Working hours of 500 h/month (20 h/day), 25 days/month						1.198
Includes IP, if working hours is 400 h/month						1.584
Includes IP, if working hours is 500 h/month						1.267

**Table I.**  
Calculation result of area carrying capacity (ACC) on oil palm industry in Riau (2017)

this is because the location of OPMs and the plantation areas that do not evenly distributed according to the processing capacity of the OPMs.

For the future, the production of FFB is increasing because there are still immature plantation areas. If it is assumed that all IP and MP are producing, then ACC increases to 1.584. The calculation assumes the working hours of the OPM as 400 h per month. If OPM hours per month is assumed as 500 h (20 h per day, 25 days per month) then ACC score is 1.267. This figure also proves that raw materials for OPM still experience an excess. For more details, the ACC score of each regency/city is presented in Table I.

For information, in the applied provision, FFB should be processed within 8 h after harvest. Otherwise, FFB will experience an increase in its free fatty acid content and this causes the quality of FFB to be decreased after reaching OPM. This will result in a decrease of selling price by farmers. To maintain the quality of FFB, every FFB that arrives in the OPM must be processed directly. It means that ACC should not be greater than 1 ( $ACC < 1$ ). If this can be done, then the quality of FFB and free fatty acid content can be tolerated, and the content of CPO can be increased.

The high score of ACC shows the abundance of raw materials available in Riau. The excess of this raw material will lead to inefficient production process. On the other hand, the excess of raw materials supplied by the farmers will lead to a decrease in the selling price by the farmers themselves. Because the market conditions faced by the farmers are monopsonistic, the farmers do not have bargaining power, so the farmers only act as the recipient of the price of the trader (OPM). This condition also causes the price of FFB at the farm level very fluctuating, especially for pure self-help farmers.

From the results of calculations based on the existing data, it is predicted that Riau still lacks OPM for the future. This prediction is derived from the existence of a tendency of oil palm plantation area to increase and there are still many numbers of IP. Thus, the development of oil palm processing mills (OPM) is still needed. As a consideration, the prediction results of OPM for the future in Riau are presented in Table II.

The addition of OPM for rural areas is needed as much as 16 units with a processing capacity of 60 tons of FFB per h or identical with 21 OPM units with a processing capacity of 45 tons of FFB per h. If the work hours of OPM is 500 h per month, then the shortage of

Estimated indicator	Quantity
Area of land area (ha) in 2017	2,085,068
Production of FFB (ton) in 2017	36,809,252
Existed OPM (unit)	146
Installed OPM capacity (ton/h)	6,254
<i>Projection of OPM needs</i>	
The existing land area (ha) in 2017	2,085,068
Production (ton of FFB) in 2017	36,809,252
Installed OPM capacity (ton of FFB/h)	6,254
Processing ability (ton of FFB/year) in 2017	30,019,200
Excess raw material (ton of FFB)	6,790,052
OPM shortage (60 tons of FFB/h) <sup>a</sup>	16
OPM shortage (60 tons of FFB/h) <sup>b</sup>	19
<i>Prediction if MP and IP are taken into account</i>	
Processing capacity of OPM	30,019,200
Not yet processed (productivity of 22.8 tons/year)	17,522,309
OPM shortage (60 tons of FFB/h) <sup>a</sup>	41
<b>Notes:</b> <sup>a</sup> Working hours of 600 h/month, 25 days/month; <sup>b</sup> working hours of 500 h/month, 25 days/month	

**Table II.**  
Prediction of oil palm  
processing mills'  
needs in Riau



OPM is as many as 19 units with 60 tons per h of processing capacity (identical with 21 units of OPM with a processing capacity of 45 tons of FFB per h). Because the potential land area is still increasing in the future and there are still many IP, then the prediction of the need for OPM to process FFB is as many as 41 units. However, development needs to be planned well in accordance with the spread of farmers' plantation area, especially self-help farmers. At oil palm activity, distance between harvesting location and processing location in OPM needs to be considered. To guarantee the quality and rendement of oil palm, FFB needs to be already processed in the OPM within 8 h. Therefore, road conditions and the distance between the plantation area and the OPM become a consideration to ensure oil palm's quality. The weakness of self-help farmers' plantation area is that their plantation areas are unevenly distributed, while smallholders of oil palm plantations are in one area. Therefore, it is very easy to determine the location of OPM in the development plan of OPM.

#### *4.2 Potential of development of downstream oil palm industry*

The development of oil palm processing industry up to CPO and palm kernel oil (PKO) level is as many as 146 units with a capacity of 6,245 tons per h, while downstream industries only have one refinery unit, one unit of cooking oil mill and three units of biodiesel plant and the number is growing. If the big potential of CPO is processed into food and energy, it will certainly provide greater added value for the welfare of farmers and the quality of life of people in Riau Province.

Oil palm products have a quite high industry linkage to the front and back. The downstream oil palm industry that is very strategic and involves the livelihood of many people is the cooking oil industry, so the government is paying great attention to the domestic market structure of cooking oil. But a series of government policies are still too focused on CPO and forgetting a set of problems on the structure of the cooking oil industry (Arifin and Rachbini, 2001). Prospects for oil palm agro-industry development in Riau are very bright. To achieve this, there are several steps that need to be done: first, increasing productivity of oil palm plantations; second, building adequate infrastructure and it must be associated with the processing unit; third, developing research and development activities that have been less focused; fourth, inventing new technology for product diversification; and fifth, there must be deregulation in the oil palm industry.

## **5. Discussion**

### *5.1 Strategies to address potential environmental impacts*

The development of oil palm plantations and factories will have an impact on ecological, social and economic components. Therefore, a comprehensive impact mitigation strategy is needed to ensure that problems in oil palm plantations can be addressed properly.

The ecological impacts are generally related to land use that often do not follow the applicable spatial directives, at the regency, provincial and national levels. Land clearing on a wide scale provides the ecological impact of the region, especially to the water system, reduces biodiversity and causes land degradation and reduces carbon stocks. Strategies to address land-use issues for oil palm plantations can be done with a "mosaic" design with a "puzzle" land-use pattern. Oil palm plantation land use is not sustainable, but it is integrated with natural forest vegetation. The puzzle pattern is carried out by considering the forest area that has high conservation value such as river border, catchment or springs, customary forest, flora habitat and endemic fauna, which has high relation to the socio-economic life of surrounding communities.

The strategy pursued in the conversion of peat swamps into agroecology of oil palm plantations should take into account the regulation of water and land management, peat depth, decomposition rate, maturity, parent material and sub stratum. Drainage making should take into account the physiographic and topographic conditions of the land. So that

water level can be arranged and controlled. This situation will avoid subsidence, irreversible drying and prevent peat land fires.

Local knowledge of the community on peat land processing technology becomes a consideration in the management (clearing) of land into oil palm plantations. In addition, recognition of local community land rights is a major factor in avoiding social conflict and determining farmers' income. This condition facilitates the flow of production and increases the price of FFB at the plantation level. If provision of farming credit is effective, it can effectively increase production input, thus increasing the productivity of oil palm crops.

Processing industry is a major factor in supporting oil palm plantations. Waste generated can be solid, liquid and gas, and it must be managed and utilized for various purposes. For an OPM with a capacity of 60 tons of FFB per h, it will produce an average of 40 m<sup>3</sup> per h of liquid waste. The amount of this liquid waste will have a negative impact on the environment. The strategy taken to overcome the waste problem is to do the proper management, so as not to pollute the environment. Proper and correct wastewater treatment by using wastewater treatment plant (WWTP) can avoid contamination. With proper processing, it can reduce the quality of wastewater according to the established quality standards.

The processing of FFBs of oil palm with a plant capacity of 60 tons of FFB per h will result in solid waste in plantation development and oil palm processing mills, including wood waste that is generated during land clearing and solid waste from oil palm processing. Solid waste from oil palm processing plant is in the form of FFBs, fibers and mud from WWTP. The amount of solid waste generated from the processing of oil palm consists of FFBs (21.5 percent), shell (5.4 percent), fiber (12.9 percent) and sludge (4.1 percent) with total solid waste of 43.9 percent.

Empty fruit bunches of 21.5 percent are used as fertilizers or mulchs that are spread on oil palm plantations. Shells and fibers are used as fertilizer/mulch after composting or for street-hardener material. As for sludge from WWTP, after drying, it is used for stockpiling of the basin or for organic matter in the plantation area. Utilization of empty oil palm bunches as organic fertilizer requires six months to one year of degradation. For that, empty bunch of oil palm is cut into pieces and then sown on the surface of the land and oil palm plantations. In this way, fertilization needs with synthetic fertilizers can be reduced to 50 percent (Sa'id, 2001).

Composting system of palm solid waste is done by aerobic composting system which utilizes aerobic microorganism (mold, bacteria and aktinomicetes). In addition to the utilization of these microorganisms, starter or activator of livestock manure is added in the composting process. Solid waste from oil palm processing is used as fertilizer, mulch and street hardener. Fiber produced from the forging process (screw press) is utilized as a boiler fuel, along with the shell. Thus, solid waste from the OPM does not have a negative impact on the environment as a whole.

Air/gas waste comes from the burning of diesel from generating sets and the burning of empty fruit bunches and shells in incinerator. This gas waste is discharged into the open air. Generally, dust waste from the ashes of empty fruit bunches and shells are controlled by the installation of a dust collector before being dumped freely into the air; to catch dust bonds in the rest of the combustion gases, it is flowed through the chimney as high as 25 meters from the ground. Dust from the dust collector is regularly accommodated and discharged into the field for lowland dumps around the plantation area.

Biological wastewater treatment with a 75-day hydrological retention period (HRP) is able to reduce the average waste content of > 90 percent as presented in Table III.

With the liquid waste characteristics, the effective liquid waste treatment is if HRP is more than 75 days, so that the COD and TSS levels can be lowered below the quality standard.

Wastewater treatment from an OPM with a wastewater treatment installation (WWTP) system is intended to reduce pollutant levels below environmental quality standards. Once the quality of the wastewater meets the established quality standards, it can be channeled into the sewer ditch or to the recipient body of the waste. This can be a problem with residents living in the watersheds of an oil palm plantation.

The liquid waste utilization strategy produced by OPM through land application (LA) can increase the productivity of oil palm. Before the waste is applied to the land for plant's fertilizer, we must know how much the equality of its element content to the plant fertilizer. The content of liquid waste coming out of Anaerobic Pond and Aerobic Pond contains enough elements that can be utilized by plants, such as N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O, MgO, CaO and S which are required by the plant. Application of LA can increase the activity of soil microorganisms and soil ecosystems as well as contamination of surrounding water.

Strategies that can be undertaken to mitigate the potential environmental impacts of oil palm plantations are as follows. First, land-use arrangements: land-use arrangements are the dominant factor in land management in oil palm plantations. The productivity of oil palm plantations is strongly influenced by groundwater conditions. Second, community empowerment: development of oil palm plantations with empowerment strategy is an alternative approach to development that is not only directed to achieve growth alone, but can also create a just and prosperous society with the principle of democracy. Third, cooperation among stakeholders: successful management of oil palm plantations is determined by cooperation among stakeholders, this is due to the characteristics of plantations that are cross-sectoral. The establishment of cross-sectoral institutions to support cooperation between stakeholders can be done by establishing a "joint working group" facilitated by the plantation office. Fourth, management of oil palm production: the productivity of oil palms is influenced by the application of land management technologies that are appropriate to the nature and characteristics of local resources. Fifth, processing industry: the existence of the processing industry is very important in the management of sustainable oil palm plantations. Characteristics of oil palm that are easily damaged require good handling technology. The quality of FFB will decrease further if processing is not done right after FFB has been harvested. The presence of OPMs around oil palm plantations will affect the price of FFB. Sixth, capital structure and access: the weak capital structure and access to capital sources are the cause of the hampered development of agribusiness and oil palm agro-industry. As an industrial mills, oil palm requires considerable production input. This condition should be supported by access to large capital, so as to maintain the production factor.

### 5.2 Development of institutional model of oil palm plantation

Due to the rapid development of the area of smallholder plantations, especially pure self-help plantations, it is necessary to design a model to avoid income inequality between

**Table III.**  
Liquid waste quality of oil palm mill, before and after WWTP 75 with HRP of 75 days

No.	Environmental parameter	Unit	Liquid waste		Reduction (%)	Quality standard <sup>a</sup>
			Before WWTP	After WWTP		
1	BOD	mg/l	30,000	20	99.60	100
2	COD	mg/l	75,090	1,460	98.06	350
3	TSS	mg/l	57,030	1,015	98.22	250
4	Nitrogen (total)	mg/l	50	3	94.00	50
5	Oil and fat	mg/l	40,450	30	99.71	25
6	PH		4.6	8.1	-	6-9

**Note:** <sup>a</sup>The Research Institute of the Planters Association (RISPA), 1990

rural communities. The model designed to improve the welfare of farmers is in the form of plantation-based agroestate (agroestate of plantation).

The model presented is intended to try to neutralize the dichotomies of unfair profit sharing between farmers and companies, in addition to ensuring the development of the company and the sustainability of the processing mill itself. The plantation development program has been limited to smallholders' plantation and companies' plantation. Ownership of farmers is only limited to the plantation areas that have been determined in the plasma program, while the processing mills are only owned by the company. For the future, it is necessary to consider the form of partnership model of plantation development activities, where farmers own the plantation areas as raw material suppliers and own the share in the processing mills. Farmers buy packages through cooperatives consisting of plantation areas and shares of processing industry. Through this plantation agroestate program, farmers have the opportunity to buy/own shares in the processing industry.

Guarantee of raw material availability in quality, quantity and continuity is a must in order to achieve a healthy agro-industry. The linkages between sources of raw materials and agro-industry should be integrated into an ownership. The concept of partnership emphasizes the principle of joint ownership by both farmers and their processing mills, where the management is carried out by farmers' cooperatives.

Application is oriented to the welfare of farmers through the emphasis of efficiency of productive farming processing as well as increased added value in the context of agribusiness, where the institution is designed in network based on the ability and professionalism of various actors, namely, business developers (farming developers), industrial mills, participating farmers' settlements, active participating farmers, managerial business entity (BUP) or cooperatives, or management of managers (farming, industrial mills) and financing institutions.

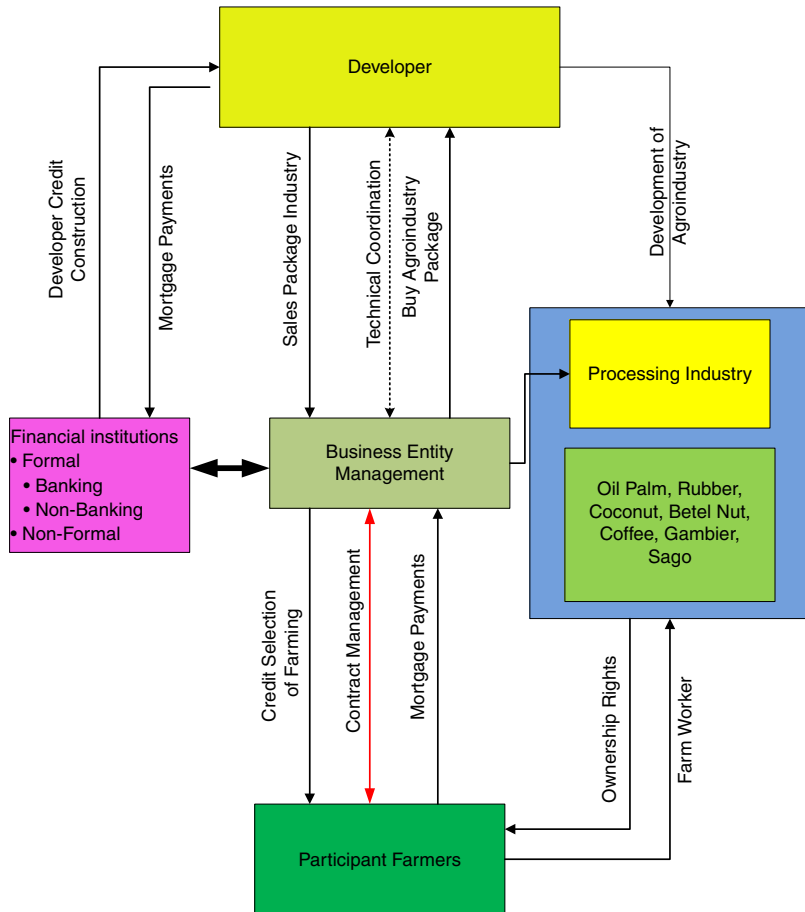
In this plantation-based agroestate model, there are two main business activities: first, the business activities of building the plantation area and the industrial mills; and if necessary, participating farmers' settlement that will be done by the developer company; and second is the business of managing the plantation area and mills owned by the participating farmers, and marketing the results, which are done by the business entity that is the cooperative formed by the participating farmers themselves. The plantation-based agroestate model is the concept of rural plantation development for the future, the concept is in the form of cooperation with the development company.

The agroestate model is designed for community-based rural agricultural (plantation) economic development. The model aims to build plantations that are intended for farmers who do not have plantation land and/or for farmers who own land but have no business capital for the development of their farms. These farmers have absolutely no land to secure their lives or have no land to live worthy of the farm family. This model is the development of the agropolitan concept in the effort of accelerating rural economic development.

The concept of a plantation-based agroestate model that will involve rural communities (for farmers who do not have plantation land) is presented in Figure 2.

For more details, the model can be explained as follows:

- In the plantation areas managed by self-help farmers, investors build oil palm processing plant (OPM) as a container or market guarantee for self-help farming. The OPM built is expected to be a target market for self-help farmers. Government's policy should give the investor permission that OPM development does not have to have a support plantation area. As a guarantee of raw materials, cooperation between investors with farmers' groups or cooperatives in the region is formed.
- Land ownership by farmers is valued as equity participation in oil palm plantation and industry. Therefore, farmers' plantation area and OPM form a unity. This system

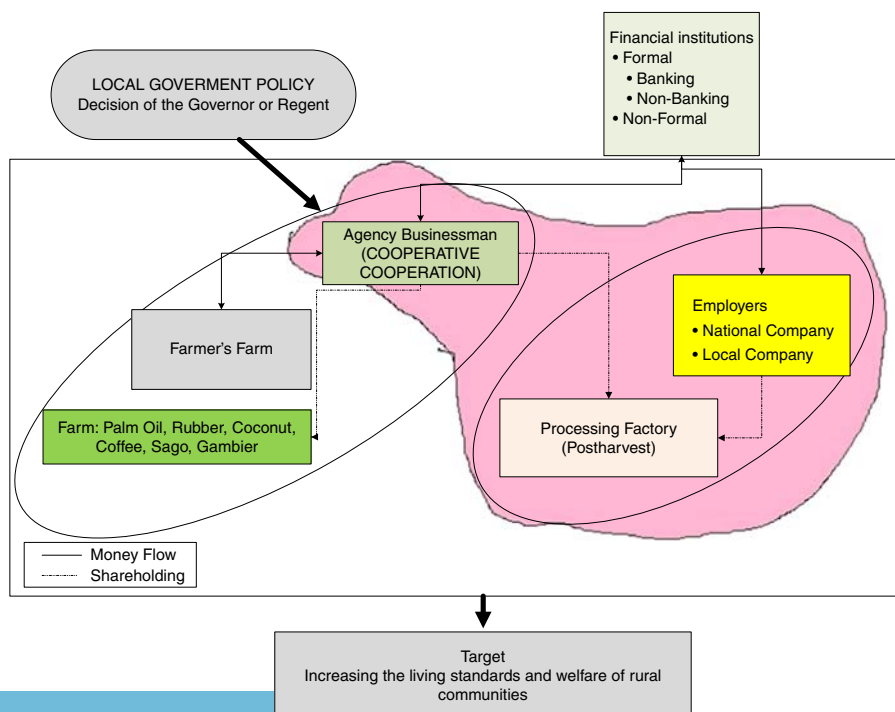


**Figure 2.** Conceptual scheme of oil-palm-based agroestate model in rural areas (modified from Syahza, 2007b)

will involve farmers in the ownership rights of OPM or the farmers feel that they have a right in the OPM. Thus, the guarantee of raw material supply for OPM in the form of FFB is more secure, because farmers also have hope of CPO sales' profits.

- For villagers or rural areas that do not have plantation areas, developers develop plantation area (farming) and processing mills (agribusiness) to plantations in ready-to-produce form and industrial mills in the form of ready-for-operation mills. Sources of funds to build factory plantation areas may use self-help funds or loans from banks or other possible parties. In this condition, local governments can also contribute in the form of capital loans through regional expenditure budget (APBD) or local government investment.
- The plantation areas and mills that have been built by the developers are sold in the form of kaveling unit or factory shares to active farmers, i.e. farmers who are really interested to manage the plantation area and the participants are rural communities. As the owner of the plantation area, the participants will receive the land ownership certificate. In addition, the participants will receive securities in the form of stock sheet as a proof of mill ownership.

- Participating farmers buy plantation areas and factory shares by using the existing credit facilities. This credit scheme is facilitated by the developer or the cooperative. The participating farmers as owners of the land units hand over the management (fee management) of which the amount has been determined in the management contract based on the agreement. The management services company will manage the plantation areas and mills with the best and professional plantation management principles.
- Capital ownership (industry) for participating farmers is limited to a maximum of 40 percent of total working capital, while the rest is owned by companies and local government shares. It aims to keep business management professionals. Model of share ownership can be seen in Figure 3.
- In the management of the plantation area, active farmers are grouped into overlay farmer group and are required as workers who earn wages according to the agreement.
- Farmers' income is expected to be quite large, as it can come from various sources. For active farmers, their income will be sourced from their own plantation crops, wages and factory stock dividends. Another advantage is that the continuity of raw materials for the industry will be guaranteed because the farmers feel they have a business agro-industry so that the possibility of selling the results of the plantation to other industries will be avoided.
- The developer will return the capital used (self-help funds, and loan from the financing institution) and will benefit from the proceeds of the plantation and the shares of the industrial mills that have been built.



**Figure 3.**  
Draft of capital  
ownership on  
oil-palm-based  
agroestate model  
in rural areas

Development of plantation agroestate model for rural farmers who have their own land is in the form of plantation-based farming. However, the farmers do not have sufficient capital for plantation development; thus, it is developed through agroestate model of partnership pattern. The form of activities is the development of plantations through the utilization of credit facilities from banking or non-banking financial institutions. The goal is to build and develop smallholders' plantations in new or existing areas with advanced technology to enable farmers to earn a decent income. It also embodies an agribusiness management system by incorporating various integrated production, processing and marketing activities.

The implementation of plantation development with agroestate model of partnership pattern is done by companies in the field of plantation designated as the core company (partners) with the guidance and support of local government agencies whose functions are related to plantation development. Partnership embraced in the development of plantation business by utilizing credit facilities is the core partnership pattern with plasma (farmers). In this partnership, the farmers are represented by a business entity formed directly by the farmers, namely cooperatives. The co-ordination of the plantation project development with agroestate model of partnership pattern is carried out by the provincial and regency plantation project development team established by the governor and the regent. Thus, the partnership between plantation companies and cooperatives takes place in an integrated and sustainable manner.

The partnership pattern of agroestate program provides an opportunity for participating farmers to own shares in the processing industry (agro-industry). The procedure of share ownership can be arranged by agreement between the farmers, in this case, represented by the cooperative with the core company and the government through the relevant agencies. In this program, it is recommended that the share ownership in the processing industry should involve three components, namely, farmers through cooperatives; core companies; and local governments, while the composition of share ownership can be arranged based on the agreement of the three components. On the other hand, Wijaya (2002) discloses the benefits of cooperating: helping to improve socio-economic standards in the region by utilizing the potential and employment; having a direct benefit, because it is suitable with the lives of rural people; and helping the economics of growth of rural areas, it can grow because cooperatives are firmly rooted in the countryside. The design of industrial capital ownership through plantation agroestate is presented in Figure 3.

The empowerment of rural economy with agroestate model of partnership pattern should meet the following requirements:

- participating farmers in the agroestate are local people who own land, including farmers whose land is exposed to the development of plasma plantations or which have not been and are already members of the cooperative;
- preparation and determination of prospective participating farmers is done by the management of the cooperative known to the village head as the basis of ratification by the regent;
- potential participating farmers are given the opportunity to participate in the development of the plantation area as labor;
- participating farmers are entitled to plantation areas (farming) with the area as in accordance with established cooperative agreements between farmers and cooperatives and core companies;
- Participating farmers receive the proceeds from the sale of commodities after deducting the credit installments and liabilities to the cooperatives;
- participating farmers receive certificates of ownership of the plantation area after the credit is paid off;

- farmers have the right to ask for responsibility for the implementation of the development of the plantation area to the cooperative management through member meetings;
- participating farmers must be subject to any provisions set out in the agrostate model of plantation development; and
- farmers are entitled to an opportunity to buy shares in industries built by core companies.

Cooperation of rural plantation development by involving plantation business actors, local government and local communities will be able to reduce the socio-economic disparities in rural areas. Local communities will feel the impact of plantation development through involvement and income generation. In synergy, it will bring up the purchasing power and demand of goods, thus increasing the mobility of goods in rural areas. This condition will lead to improvements in the living standards of rural communities and the growth of rural growth centers.

### *5.3 Production center and development area of downstream oil palm industry in potential areas*

Indonesia's CPO sector continues to grow rapidly from year to year. CPO production increased to 21.0m tons in 2012 from 19.4m tons in the previous year. In 2017, production is expected to rise by 4.7 percent to around 22.0m tons. Meanwhile, total exports also increased. In 2012, it was recorded at 15.65m tons, then it was expected to jump to 18.0m tons in 2017. To date, Indonesia still occupies the top position as the world's largest producer of CPO, with production of 21.8m tons in 2012. Of the total production, it is estimated that only about 25 percent (or about 5.45m tons) is consumed by the domestic market. As the world's largest CPO producer, Indonesia continues to develop new export markets to market its products and expand existing markets; for example, Pakistan, Bangladesh, Eastern Europe and China.

The increase of CPO production is supported by the total area of oil palm plantations that continues to grow to 7.9m ha in 2017 from 7.5m ha in 2012. The government is currently fixing infrastructure in all CPO fields in Indonesia, including five basic clusters which have been prepared by the government, namely, the North Coast of Java, East Coast of Sumatra, East Kalimantan, Sulawesi and Merauke.

Nevertheless, Indonesia as the world's largest producer of oil palm, is still getting the smallest added value of oil palm production since most of the oil palm is still exported in the form of CPO or in its simplest form of preparation such as cooking oil, whereas the added value of downstream CPO industry is very large.

Given that the role of oil palm in the world's supply of oil consumption is getting bigger, the market opportunity for CPO and its processing products are getting bigger. Similarly, Indonesia's potential to become a producer of CPO is still large because it is still supported by the availability of land for development. However, efforts to obtain greater added value from oil palm are not merely exported in the form of CPO.

Efforts to develop CPO processing industry cannot go without government support because so far, the market demand makes it more profitable to export CPO than to process it domestically. In addition, CPO-based industries in Indonesia have not been fully integrated (between upstream and downstream industries). The potential of high raw materials should be utilized for the development of downstream industries because they have high added value and ME, which is very significant.

In terms of geography and employment, Indonesia has the potential to be a place for developing oil palm plantations and CPO industries. In terms of competitiveness of raw materials, Indonesia has a high availability of raw materials considering Indonesia has the most extensive national oil palm plantation in the world. On the other hand, Malaysia is expected to experience saturation point due to the increasingly narrow land. The planned



expansion of Indonesian oil palm plantations is expected to increase Indonesia's role in the field of oil palm in the whole world. On the other hand, Malaysia as the world's second CPO producer no longer owns new development land, there is only an increase in productivity that is averaged to 3 percent.

The development of oil palm derivatives has excellent prospects in the future. In the framework of its development, it should be supported by all stakeholders, starting from cultivation of crops, production processes and marketing. This effort also needs to be supported by related institutions such as R&D, HR, machinery and equipment providers and banking/capitalization. Therefore, in order to realize the efforts to increase CPO production and export of CPO derivative products, both in the type, volume and value of exports through the development of CPO downstream industry and to fill the void of existing industrial downstream production capacity, it is necessary to formulate roadmap for CPO industrial cluster development.

Utilization of CPO for processed products is divided into food industry and non-food industry. The example of food industries are cooking oil, margarine, shortening, cocoa butter substitutes (CBSs) and vegetable ghee industries. On the other hand, the example of non-food industries are oleochemicals (fatty acids, fatty alcohols, glycerin) and biodiesel industries. To date, there are about 23 types of CPO derivative products that have been produced in Indonesia. The conditions of core, supporting and other industries related to CPO are, among others:

- (1) Core industries that have been developed, namely the CPO industry and PKO industry.
- (2) Related industries that have started to develop (including CPO derivatives): stearine, refinery bleaching deodorizing (RBD) PO, RBD palmolein, margarine, shortening, RBD palm stearine, CBS/CBE, creaming fats and vegetable ghee. Similarly, related industries of palm kernel, including fatty alcohol and fatty acid.
- (3) Undeveloped related industries, namely, palm kernel cake, crude palm fatty acid, RBD palm kernel stearin, metallic salt, polyetoxylat derivatives, fatty amines, fatty amida, soaps, animal feed, glycerol and glycerin.
- (4) Supporting industries that have been developed, namely, OPM equipment machine industry, palm cooking oil equipment machine industry, storage tank, pipeline, packaging industry and research institution (Oil Palm Research Center).
- (5) Supporting undeveloped industries, namely, CPO derivative machine industry, fine chemicals industry, phospat acid industry, breeding business, research institute, etc.

*Upstream industrial group.* Oil palm is one of Indonesia's leading commodities that play a role in the growth of national economy, with a substantial contribution in the production and employment absorption. The development of the CPO processing industry and its derivatives in Indonesia is in line with the growth of plantation area and oil palm production as a source of raw materials.

Oil palm plantations produce oil palm fruit/FFBs (upstream) which are then processed into CPO (downstream for oil palm plantation and upstream for CPO-based industries). Aside for producing CPO products, FFB processing also produces PKO products. Production of PKO increases along with the increase of CPO products, which is about 20 percent of the CPO produced.

*Midstream industrial group.* From palm oil (CPO) and PKO, various types of oil palm products that are used as raw materials for downstream industries for both food and non-food categories can be produced. Among the midstream industrial group of oil palms are olein, stearin and basic oleochemicals (fatty acids, fatty alcohols, fatty amines, methyl ester, glycerol).

*Downstream industrial group.* From midstream oil palm products, various types of products can be produced, most of which are products that have a potential market share, both for domestic market share and export market share. The development of downstream oil palm industry needs to be done, given the high added value of the downstream oil palm products. The type of downstream oil palm industry has a very broad spectrum, up to more than 100 downstream products that can be produced on an industrial scale. However, only about 23 types of downstream products (food and non-food) that have been commercially produced in Indonesia.

Some of the downstream products of CPO and PKO that have been produced for food category include: cooking oil, salad oil, shortening, margarine, CBS, vanaspati, vegetable ghee, food emulsifier, fat powder and ice cream. Non-food categories include: surfactant, biodiesel and other derived oleochemicals. The installed capacity of the world's basic oleochemical industry is far greater than the world's oleochemical demand. But world's demand for oleochemical products continues to increase from year to year. The increase in world oleochemical demand at an average rate is of about 5 percent per year.

#### 5.4 Welfare of farmers and regional economy

If observed carefully, the development of oil palm plantation area experiences a sharp increase. In 2000, the area of oil palm plantations was 3.2m ha and in 2016, it increased to 13.5m ha with an average growth rate of 11.71 percent per year. In terms of production, in 2000, it was 4.1m tons and in 2016, it increased to 27m tons. Average annual production growth was 15.6 percent. In Riau, oil palm plantations developed very rapidly, namely in 2000, it grew from 966,786 ha to 2,372,402 ha in 2016. The plantation area of oil palm reached 56 percent of the rest owned by private companies and state-owned enterprises.

The development of these plantations is evidence that public interest in oil palm is very high. Why is people's desire for oil palm so high? It is because oil palm commodity from the farmer side is a commodity which market is guaranteed compared to other superior commodities such as rubber and coconut. The development of oil palm and its processing factories/OPM has created a market for the production of oil palm plantations by farmers in the form of FFBs. As a result of this research, oil palm has provided a high level of welfare in villages, both for those who are directly involved and those who are not directly involved. Oil palm cultivation has provided a ME on the economy in the villages. Table IV only present the results of research in Riau that oil palm has an economic impact positively on the economy of the community, especially in rural areas. Since 2006, the index of rural community welfare has been positive. For example, the 2006 period (after the crisis) in the rural community welfare index increased compared to 1998 at 1.72, meaning that the rural community's welfare increased by 172 percent. Likewise, in the next period, it has always been positive. In 2017, the rural welfare index increased to 27 percent during the 2015–2017 period. The welfare felt by rural communities is the impact of oil palm farming.

In terms of regional economy, the economic ME also showed a large index number of more than 1, namely in 2017, the ME index was 3.43. This means that every oil palm

Description	1995	1998	2006	Year 2009	2012	2015	2017
Welfare index	0.49	-1.09	1.72	0.18	0.12	0.43	0.27
Economic multiplier effect			4.23	2.48	3.03	3.28	3.43

**Table IV.**  
Economic impact  
and community  
welfare (Riau)

investment of Rp1 in the past period in the village will cause the money supply in the village to be Rp3.43 in the next period. From the results of the study since 1995 (see Table IV), it showed that oil palm has been contributing economically and well to the people of Riau, especially rural communities. ME will cause the money supply in the villages to increase, then it will lead to the purchasing power of the people and the demand for goods also increases. Thus, it will lead to mobility of goods and services to or from rural town areas. To illustrate, in a village, there are 500 households (KK) that do oil palm cultivation with the assumption that each household has an income of IDR4m per month (2 ha of land area). Therefore, in that village, Rp2bn will circulate every month. Of course, not all needs can be met in the villages, thus, they also spend their money in urban areas. The increase in the money supply in the villages in synergy also causes the increase of money supply in a region. Please note that this prosperity is only enjoyed by regions that have oil palm, while areas that do not carry out oil palm cultivation are far from being prosperous; as an example, Meranti Islands Regency, most of the area of Indragiri Hilir Regency. Economic inequality between regions and between groups looks quite high.

Regarding the industrialization of oil palm in Riau, I strongly agree that it should be carried out by both the regional and private governments. However, a form of policy that encourages palm industrialization is much needed. This policy must have an impact on the regional economy. If we pay attention now, farmers only receive their rights to FFB. After the FFB process that produces CPO is finished, it entirely becomes the right of the entrepreneur (capital owner). The added value created after a large post-harvest is on CPO and this is enjoyed properly by the capital owner. Moreover, the proceeds from the sale of CPO are stored outside the Riau region, even abroad. Thus, it is not a surprise that oil palm post-harvest activities do not affect money supply in Riau.

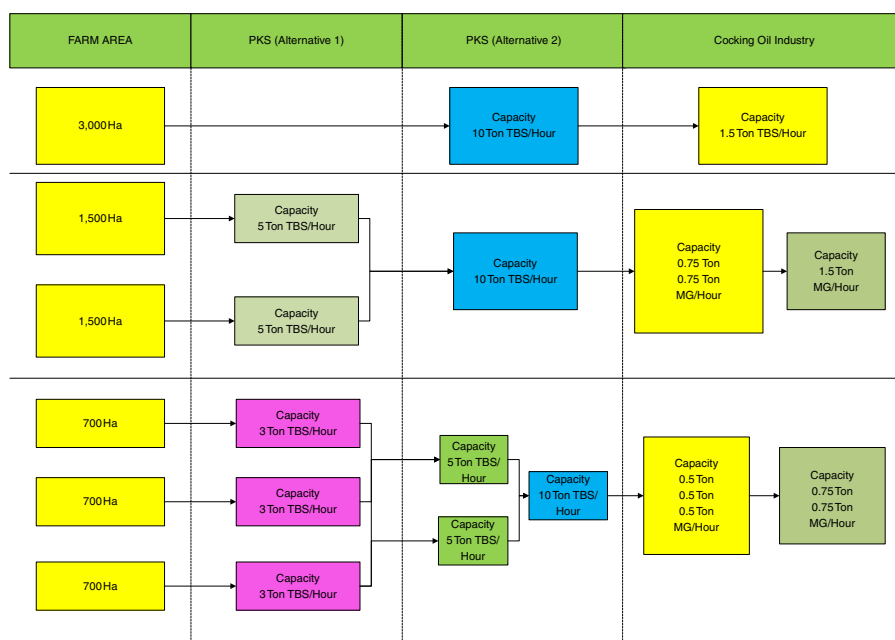
Therefore, the industrialization of oil palm in Riau region needs to be encouraged primarily to create new markets for oil-palm-based products. If the industrialization of oil palm is developed, it will have an impact on the regional economy, especially for job opportunities and business opportunities. The development of industrialization (downstream industry) of oil palm is expected to be able to create new job opportunities and contribute to the regions, especially taxes and retribution. With the development of the downstream oil palm industry, it will guarantee CPO market in Riau. Thus, it will have an impact on the demand for industrial raw materials, especially FFB, at the level of farmers.

##### *5.5 Small-scale oil palm mill entrepreneurship model*

Agribusiness entrepreneurship with oil palm commodities is a business that integrates farming/cultivation activities, the exploitation of oil palm factories into an ownership that emphasizes the principle of joint ownership by both farmers and their processing mills. The OPM model should consider the production capacity of each business activity, the availability of land (that is increasingly limited), the availability of the processing industry (especially the production capacity) and the amount of investment costs.

Considering that the oil palm plantation managed by self-help farmers is located in dispersion (not in a stretch like plasma farmers), the construction of the OPM should be adjusted to the area of supporting plantation areas in a region. The harmony between the area of the farming area and the OPM and the small-scale cooking oil mill is presented in Figure 4.

The cooking oil mill can be designed up to a capacity of 1.5 tons of MGS per h or 7,200 MGS per year, assuming working hours of 16 h per day, 25 days per month and 12 months per year. This oil palm refinery mill is designed to refine CPO material into cooking palm oil and is equipped with fractionation process equipment, so that the product produced is RBD palmolein which is an "A"-grade cooking oil product.



**Figure 4.**  
Concept scheme of oil palm mill (OPM) and small-scale cooking oil mill in rural area

## 6. Conclusion and suggestions

The conclusions of this study are: first, plantation activities have increased the mobility of goods in the villages, causing plantation activities to also open business and employment opportunities for people who are able to accept these opportunities. The existence of plantation companies makes local people's livelihoods no longer limited to the primary sector in meeting the needs of their families, but has expanded their business activities in the tertiary sector. Second, since post-1998 crisis, the growth of oil palm plantation area in Riau increased sharply, namely in 1998, the area of oil palm plantations was 901,276 ha, in 2012, 1,119,798 ha and increased to 2,103,175 ha at the end of 2017. During the period of 2012–2017, the average growth rate was 6.5 percent per year, while other plantation commodities such as rubber and coconut area experienced a decrease. Third, plantation development activities that involve relatively large investments for downstream industries are thought to positively stimulate, grow and create jobs and fieldwork. Through economic activities that produce goods and services required during the plantation process and the development, downstream industries will have backward linkages. Fourth, the development of oil palm plantations in Riau has had an impact on economic activities in rural areas. The result of the research in the field is that the average income of farmers in the plantation subsector (especially oil palm) is Rp4,576,696 per month. If it is assumed that the rupiah exchange rate against the dollar is \$1 = Rp9,500, the income of oil palm farmers in rural area is \$5,781.09 per year. This income is clearly much higher than the national per capita income. Oil palm plantation development activities also have an impact on the acceleration of economic development of communities in an effort to eradicate poverty in rural areas. Fifth, in 2006, the ME amounted to 4.23. An overview of each investment in the region of Rp1.00 causing the money supply of Rp4.23. The impact of rural oil palm investments has brought economic impact to rural communities. In 2009, the number of MEs amounted to 3.03. In 2016, the rate of economic MEs in rural areas increased to 3.48. The impact on investment in the estate subsector has been felt by rural communities. This condition also

affects the purchasing power of the people, resulting in the increase of mobility of goods and people. Sixth, during the period of 2006–2009, the welfare index of oil palm farmers experienced a positive value of 0.12. Although in the year of 2008–2009 the world economy experienced a global crisis, people still had time to enjoy their welfare. This was evidenced by the increase of farmers' welfare by 12 percent. During the period 2009–2016, rural communities enjoyed a high level of prosperity. During this period, the price of FFB at the farm level was quite profitable. On the other hand, the production of the plantation area also increased compared to the previous period. The impact of rising prices and increasing production of farmers is that the farmers' welfare index in the countryside had a positive value of 0.43. This index showed the increase of farmers' welfare from the previous period by 43 percent.

The development of oil palm plantations in Riau has had an economic impact on the rural economy. Until now, the growth rate of oil palm plantation development is 6.5 percent. It is predicted that it will always grow in the future. On the other hand, plantation area productivity is also increasing. Increased production of the plantation area must be balanced with the processing mills of FFB. To create a balance between raw materials and processing mills, additional 16 units of OPM are required with a capacity of 60 tons per h or identical to 19 OPM units with a capacity of 45 tons per h. If calculated, the immature crops require as many as 41 units of OPM with processing capacity of 60 tons per h in the future. The purpose of OPM development is to suppress price distortion between plasma farmers and non-plasma farmers (self-help farmers). OPM development is emphasized in the location of oil palm self-help cultivation that is done by the community.

This research finding is useful for people working in agricultural business and for the government as the policymaker related to the development of palm oil plantation. An improvement in order to increase the value for the agricultural businesses of palm oil, specifically plasma and self-help farmers (local community), is expected to escalate the community welfare.

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