Ph.D. Thesis

Development and Subjects of the Processing and Marketing Units as Organized Marketing System for Rubber Smallholders in Indonesia

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Summary

Price of rubber material in Indonesia is lower than other big rubber producer countries, even though Indonesia is the first largest rubber area and the second biggest rubber production in the world. The main problems causing the low price of rubber material re the low quality and individual marketing. Around 85% of rubber material supply comes from smallholders. To overcome this problem, the Indonesian government has implemented a new policy in 2008. The government has encouraged rubber smallholders to organize themselves into a "Processing and Marketing Unit" (PMU). PMU is a medium for technical guidance for smallholders, processing, temporary storage and marketing of rubber material. By PMU, rubber quality and price are expected to improve. Good application of rubber material processing rules on PMU will increase rubber material quality. The improvement of quality and joint marketing will raise selling price. Moreover, marketing is conducted through auction or partnership. Despite of its policy aim only 388 PMUs have been established, and just less than 5% of rubber material was supplied through PMUs in 2017. It means, there were still many farmers who sell rubber material by traditional marketing individually.

The general objectives of this study are to evaluate the impact of the existence of PMU on the rubber smallholders' economy and the constraints of its development. The objectives are divided into two main objectives. First, it aims to compare the differences in the stakeholders' economy between trade by PMU and trade by the traditional markets. The PMU members earned a larger income per area than non-members did. The high productivity and price contributed the members' high income. On the other hand, the present rubber material price sold by PMUs isn't favorable for crumb rubber factories, although rubber material quality is high. This situation seems to be one of the factors which obstruct the spread of the PMUs. Though the PMU can be expected to improve the economic condition of rubber smallholders, the proportion of PMU members in the rubber smallholders is still low. Therefore, the second objective of this

study aims to analysis factors mainly affect the smallholders' choice of a PMU or non-PMU marketing system. Constraints for smallholders to join a PMU include already having customers or middlemen, debt with the middlemen, and the distance from the farmer's house to the middlemen's house. Major supports for smallholders to join a PMU include the rubber material price, easily procured support from the government, and the distance of the farmer's house. PMUs' performance did not significantly affect the participation of farmers in becoming or not becoming members. Even though PMUs' performance was good criteria, the number of smallholders who were members of the PMU did not increase significantly.

A large number of rubber smallholders not joined PMU tend to has a small land acreage, low education level and low rubber income, despite being mostly young, having longer rubber farming experience and large production and family size. Formal education of household head, rubber price and income of PMU members were higher than that of non-PMU members, while rubber farming experience of non-PMU members was greater than PMU members. Land acreage and its production, plus age of the household head and family size were not different.

The alternative solutions for more smallholders to join as a member of the PMU is conducting intensive agriculture extension to them about the benefits of PMU, providing rural economy finance institutions such as credit unions managed by cooperatives, and giving smallholder more land and being granted soft capital loans by agrarian reform.

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INTRODUCTION

1. General Introduction

Asia countries are dominating the world supply of natural rubber, with 92% of total world production in 2016. The two largest natural rubber producing countries in 2016 were in Southeast Asia: Thailand and Indonesia. Thailand is currently the largest producer country, while Indonesia is the second position. Malaysia, Vietnam, China and India are the others producers' countries with producing below one million ton. After 2012, Vietnam has been the third-largest producer replaced Malaysia, as in figure 1. Malaysia, which accounted for 32% of world natural rubber production in 1988, has shifted to other crops and non-agricultural investments and produced only 6% of the world total in 2016 (Chemical Economics Handbook, 2017).

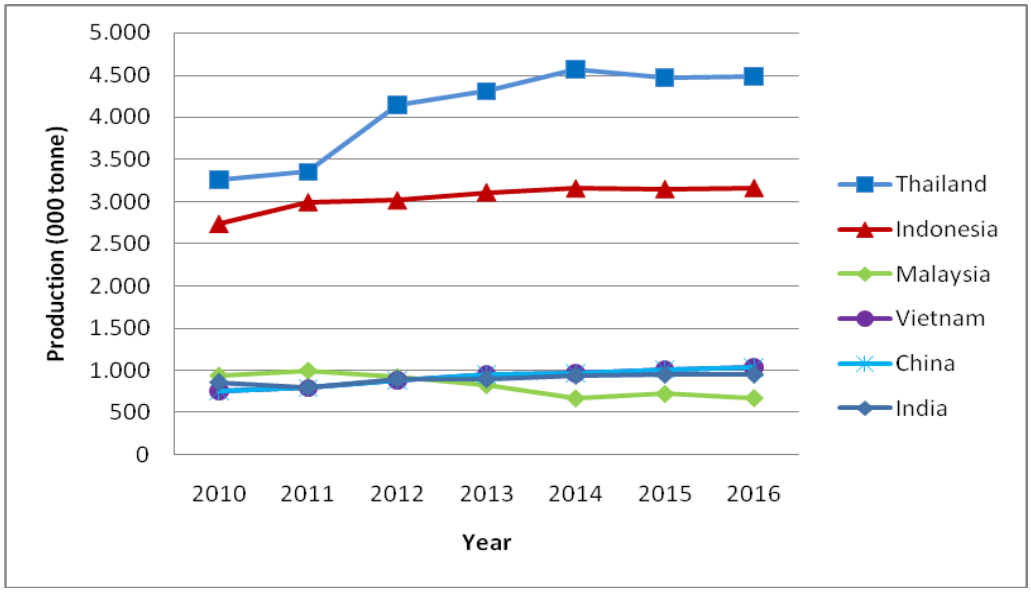

Figure 1. Natural rubber production in the six biggest producer countries
Source: http://www.fao.org/faostat/en/#data/PP

Most of the natural rubber is used for tires. Therefore, tire production greatly influences the demand for natural rubber. Tires and tire products accounted for 70% of the total consumption of world natural rubber in 2016. General rubber product uses include automotive and mechanical parts, medical and health-related products, and non

automotive mechanical parts, which collectively account for the remaining 30% of natural rubber consumption (Chemical Economics Handbook, 2017).

Base on Table 1, global rubber consumption trends continue to increase from 2010 to 2014 with an average growth of 3.1% per year. 7 countries in the top ten countries of the world's natural rubber consumers are in in Asia: China, India, Japan, Indonesia, Thailand, Malaysia and Korea, the rest are America, Brazil and Germany. The ten countries control 78% of world consumption, amounting to 12.2 million tons. Asia is the center of gravity for the consumption of natural rubber. China is the largest consumer of natural rubber in the world with consumption of 4.8 million tons in 2014 or 39% of world consumption. China uses around 80% of its natural rubber for tire manufacture. World demand for natural rubber will also be driven by Eastern European countries and other Asian countries, as tire production continues to move to these locations because of lower-cost labor and growing regional demand.

Table 1. World natural rubber consumption, 2010-2014

Countries	2010	2011	2012	2013	2014
China	3,654.7	3,601.2	3,857.0	4,270.0	4,760.0
India	944.3	957.4	987.7	961.6	1,012.2
USA	925.5	1,029.3	949.5	913.0	932.1
Japan	749.4	772.2	728.0	710.0	709.0
Thailand	487.0	505.0	505.0	521.0	541.0
Indonesia	421.3	460.2	464.5	508.9	539.6
Malaysia	457.8	402.2	441.4	434.1	447.0
Brazil	378.0	381.6	343.4	409.0	413.3
Korea	384.0	401.5	396.3	396.0	402.1
Germany	291.3	276.1	237.7	246.5	227.4
Others	2,095.0	2,217.6	2,085.0	2,066.5	2,175.2
World	10,788.3	11,004.3	10,995.5	11,436.6	12,158.9

Source: IRSG , Statistic Bulletin.

Natural rubber is one of the most prominent commodities of the Indonesian economy, contributing 25%-40% of tree crop export value in the last five years. In 2016, Indonesia produced 3.2 million tons of rubber which accounted for 27.4% of the world’s rubber production (Food and Agriculture Organization (FAO), 2017). More than 15 million Indonesians generate their main income from this commodity.

Natural rubber is one of the crucial commodities of Indonesia agriculture. But the economic condition of rubber smallholders is lower than that of other rubber producing countries such as Thailand, Malaysia and Vietnam. The first factor of the low economic condition is the lower rubber material price. As shown in figure 2, the price of rubber material in Indonesia is less than half of that in Thailand, Malaysia and Vietnam (Asmara and Hanani, 2012; FAO, 2017).

Two issues can be pointed out as the causes of low price. The first is Indonesian rubber farmers' poor bargaining power. Around 85% of rubber material supply comes from smallholders in Indonesia (Directorate General of Estate Crops of Indonesia, 2017). The rubber producers are classified into smallholder, private estate, and state estate in Indonesia. The smallholders are individual farm less than 25 hectare. Most of the smallholders cultivate 2-5 hectare usually without hired labors. Their income can be estimated at around 30 million IDR. IDR is Indonesian currency unit; 10,000 IDR = 77 JPY or 0.73 US$ (Feb. 20.2018). Most of them sell their rubber material to middlemen individually. This marketing system is known as traditional marketing (Arifin, 2005; Sujarwo, 2015). In this system, the middlemen control the price, and they set it as low as possible. The smallholders do not have any choice because all the middlemen buy at a low price (Malian and Djauhari, 1999; Alamsyah et al, 2006; Yuprin, 2009; Herdiansyah et al, 2015: Hasibuan, et al, 2014).

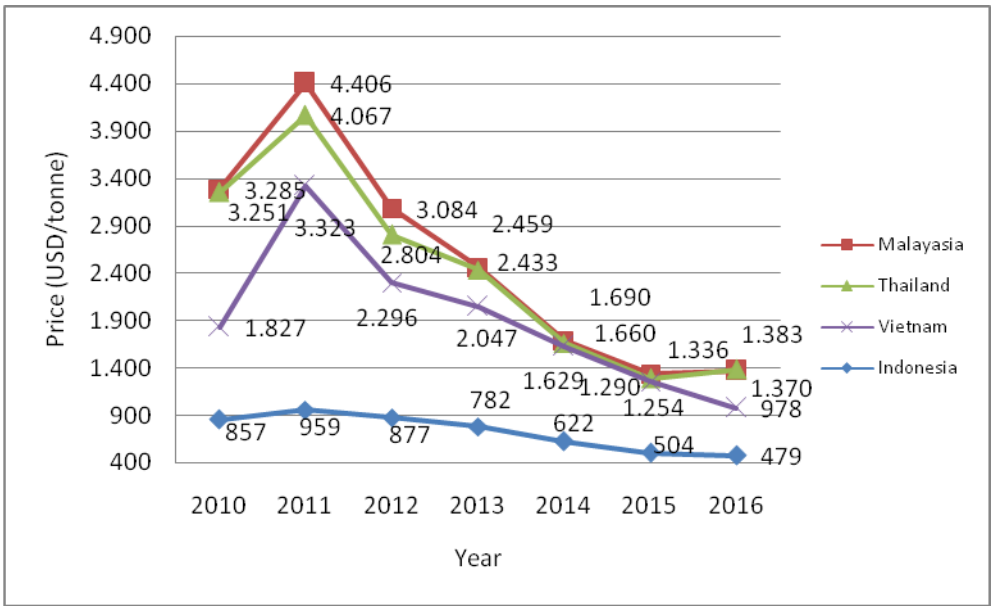

Figure 2. Rubber material price of natural rubber

Source: The Association of Natural Rubber Producing Countries (ANRPC).

The second issue is low quality of the Indonesian rubber material. Most of the rubber material sold by smallholders is the slab form, especially thick slab (99.6%), 48% of them are soaked in water, 66% of them do not use recommended coagulum. Their cleanliness level is 64%, and 55% of their sales frequency is every week (Syarifa, et al, 2013). Short sales frequency causes a high water content in the slab so that the rubber DRC (Dry Rubber Content) is low. The longer the slab is stored, the higher the DRC (Rachmawan and Wijaya, 2018). There are three frequencies of slab sales by farmers, which is every week, every two weeks and every month. Slab is the coagulated form created from milky rubber material by the addition of chemical substances. In rubber factories, rubber material is processed into crumb rubber. The crumb rubber processed by rubber factories is Standard Indonesian Rubber (SIR) 20, the standard for crumb rubber, with no more than 0.2% contaminants. Figure 3 show production flow of Indonesian natural rubber.

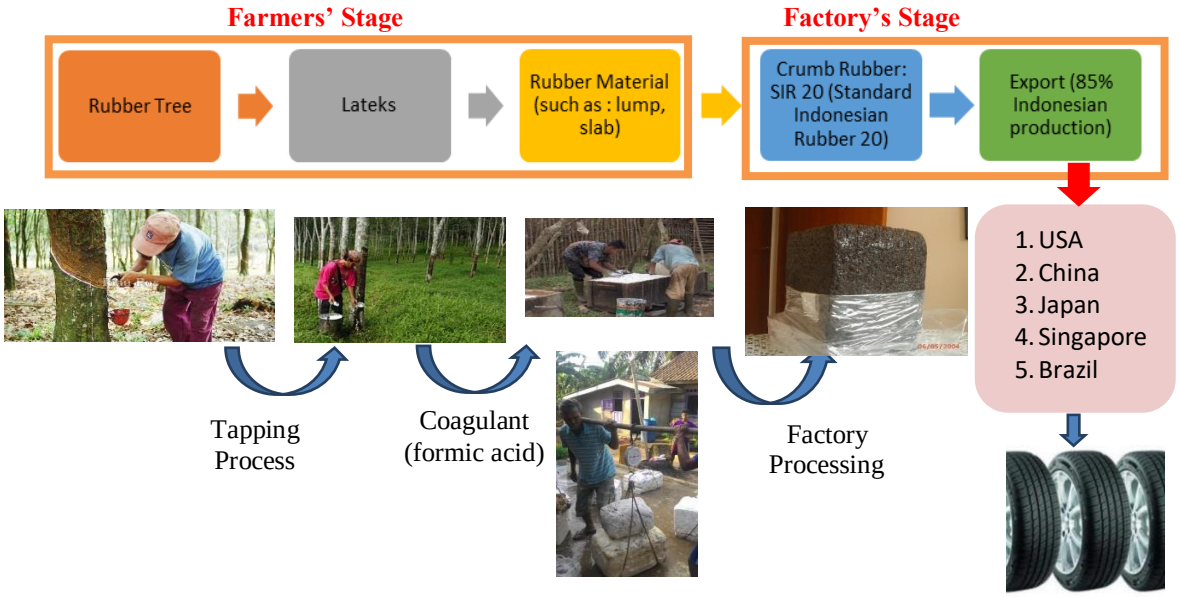

Figure 3. Production flow of Indonesian natural rubber

The most important quality of rubber material is DRC, which indicates proportion of real rubber content. The proportion of contaminants is the other important factor of rubber quality. Rubber factories incur additional costs when they process from low quality rubber material, requiring additional equipment and extra labor to remove the contaminants.

Although the proportion of rubber smallholders in Thailand and Malaysia are not quite different with Indonesia, 60% and 90% respectively, most of the smallholders in Thailand produce rubber material in un-smoked sheet, while in Malaysia produced cup lump. The un-smoked sheet has 90%-95% of DRC, whereas cum lump has 60%-80% of DRC. The slab rubber that is mostly produced by smallholder in Indonesia has 40%-60% of DRC. The difference in DRC is one of the main causes of the price of Indonesian rubber farmers lower than Thailand, Malaysia and Vietnam, such as Figure 2. Rather different in the structure of rubber management in Vietnam, smallholder rubber farmers manage 49%, while the government manages 43% and the rest 8% is managed by the private sector. The rubber processing material produced is dominant in latex.

Indonesian farmers prefer to produce rubber material in slab form for several reasons. First, the farmers more focus on the weight of rubber. They assume, the heavier the greater the income they will get. Second, the slab form makes it easier for farmers to add other ingredients in it to make it heavier. Third, the slab can also hold water, compared to other forms. Fourth, the Indonesian crumb rubber industry which is more dominant in producing SIR 20 which requires raw materials in the slab form.

As the traditional marketing system does not usually conduct quality checks, rubber smallholders have little incentive to improve the quality of their product. Moreover, though rubber material should be dried for improve DRC; the smallholders tend to keep water for avoiding decrease in weight, which is the basis of the price. The price of rubber material in the traditional market is base on the assumption that the quality is low. Figure 4 shows how traditional marketing system work.

Low productivity of rubber farming is another factor of the low economic condition of rubber smallholders. Indonesia's natural rubber production per area was 43% smaller than that of Thailand (FAO, 2017).

To improve these situations, the Indonesian central government has implemented a new policy in 2008. The government has encouraged rubber smallholders to organize themselves into a "Processing and Marketing Unit" (PMU). PMU is the smallholders' organization which aims to improve the members' economic condition by establishing new marketing system base on either auction or a contract system and enhancing the farming productivity. The government has provided technical

support to the smallholders mainly through the PMUs. As there has not been enough extension staff, their technician support has focused on the PMU members.

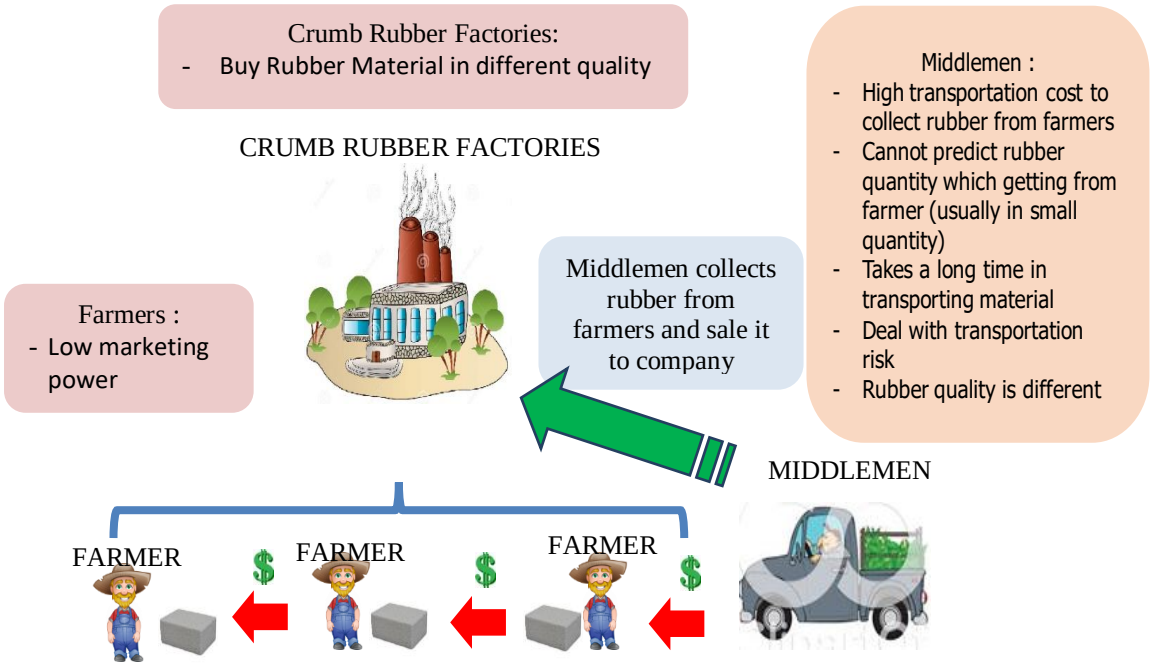

Figure 4. How traditional marketing system works

The marketing system for rubber materials in Indonesia is generally divided into two groups: organized and traditional marketing systems (Nancy et al., 2012). The organized marketing system is characterized by marketing conducted in groups, either in farmers' groups or cooperatives, while the traditional marketing system involves marketing by individuals. Organized marketing systems have been implemented since the 1980's through cooperatives that are integrated with the Smallholders Rubber Development Project (SRDP) (Agustina et al., 2017). However, the scope of this program is too small and only formed several cooperatives. As a result, the traditional marketing system still dominates the rubber marketing system and rubber quality is mostly low. There was no policy regarding organized marketing to improving the quality of rubber from 1980 to 2008.

2. Problem Statements

Since the issuance of PMU policy in 2008, only 388 PMUs have been established and just less than 5% of rubber material was supplied through PMUs in

2017. This PMU number is still very small if compared to the potential. Every 100 hectares of rubber smallholder's area can create one PMU. Indonesia has 3.1 million hectares of rubber smallholder's area in 2017 (Directorate General of Estate Crops, 2017) which can predict that 31,000 PMUs could be established. In fact, nowadays, only 1.25% of potential PMUs have been created so far. If this number is increased by including marketing through co-operatives or farmers' groups, it is still small. These data show that many smallholders still sell through the traditional marketing system. However, many studies have found that the organized marketing systems were more efficient for smallholders than traditional marketing systems. These reported by Sujarwo (2015), Herdiansyah et al (2015), Syarifa et al. (2016) and Agustina et al. (2017). Therefore, this study will provide the answers to following research questions.

a) Are there differences in stakeholders' economy between trade by PMU and by the traditional market?
b) Which are factors mainly affect the smallholders' choice of a PMU or non-PMU marketing system?
c) What recommendations that can be proposed to improve more smallholders are interested to join as a member of the PMU?

3. Objectives of the Study

South Sumatra is the biggest rubber producing province in Indonesia with a production of 1.3 million tons from 1.25 million hectares of land area in 2016. These were 31% of Indonesia total rubber production and 23% in the total rubber area. There were 579,574 households depending on rubber plantation as main income in this province. Rubber has the largest number of plantations in this province (Estate Crops Office of South Sumatera Province, 2017). Around 90% of this area is owned by smallholders.

There were 159 PMU in South Sumatera in 2017. This number increased by 30% compared to 2016 (Estate Crop Office of South Sumatera Province, 2017). However, the increase in the number of PMUs has not affects significantly to the organized marketing system. There are many farmers who do not join PMU, many smallholders sell rubber through traditional marketing systems. Therefore, this study evaluates the impact of the existence of PMU on the rubber smallholders' economy and the constraints of its development. The formulation of research objectives is as follows:

a) Compare the differences in the stakeholders' economy between trade by PMU and trade by the traditional markets.
b) Analysis different rubber smallholder characteristics in PMU and non-PMU members
c) Analysis reason smallholders' join and do not join PMU
d) Analysis of PMU performance base on their function
e) Analysis determinant factors for rubber smallholders choosing a PMU or non-PMU marketing channel

4. Previous Study

Many studies related to various issues on rubber marketing of smallholder farmers have already been reported in Indonesia. Herdiansyah, et al (2015) investigated the rubber marketing system in Tebo Regency, Jambi Province. He found there were four marketing channels and the PMU channel was relatively more efficient than the others. The PMU channel generated the lowest marketing margin and the highest margin in farmer's share. A similar topic was investigated by Sujarwo (2015) in Batanghari and Tebo Regency, Jambi Province. Six marketing channels were reported, with the channel consisting of an auction market being the most efficient. Auction markets have become the most influential institution in the rubber marketing system, as they provide support to farmers and buyers in order to find the most beneficial bidding price. Also, auction markets reduce constraints faced by farmers and facilitate a place for buyers and sellers to meet.

Organized marketing systems have been able to improve the quality of rubber material and farmers share. By the organized marketing, rubber material quality was better than traditional marketing. Because of the high quality of rubber material, the farmers share would also be greater in the organized marketing. This was because, by selling rubber material through organized marketing, the crumb rubber factories could provide price incentives for the quality of rubber produced by farmers. If crumb rubber factories bought rubber material from organized marketing, they could get good quality rubber, which does not require extra costs in processing it into crumb rubber (Nancy et al., 2012).

The most fundamental obstacles in strengthening the marketing group was lack of farmers' commitment to keep selling rubber by group, lack of awareness to maintain

raw rubber material quality, and lack of transparency between board and members of groups. For this group, it was needed to provide guidance and extension about organized marketing and technical guidance in improving quality of rubber material. The most fundamental supporting factor in strengthening the marketing group was a fair dealing between management board and members of group, as well as the activities that were bonding the members, such as: savings and loans, and supplying inputs or groceries for farmers (Syarifa et al., 2016).

Syarifa, et al (2013) found that the enforcement of the Regulation of Agriculture Minister and the Regulation of Trade Minister had not been done widely at smallholder level, because middlemen still accepted the low-quality raw rubber material produced by farmers. The problems of rubber processing and marketing that caused the low quality of raw rubber material and the low of farmers' income were still found in some area in South Sumatera Province

Fernando (2014) examined the existence of a rubber auction market and the benefit to farmers in West Sumatra Province. He identified there were three auction market benefits. The first was marketing benefit; auction can make efficiency of time and reduce marketing cost. The second was price transparency; the winning bidder was the buyer who offers the highest price. The third was quality standards; improves rubber quality was due to the implementation of rubber quality standards. The quality standard of rubber material was based on; cleanliness, water content and chopping resistant capacity.

Rahman (2015) suggested that the forward auction of rubber material provided the potential for transactions that were more profitable for smallholders. By the forward auction, smallholders were asked to be willing and being able to join in group farming to produce good quality of rubber material. These conditions could make value of the rubber material sales higher. This study was supported by Agustina et al (2017) that organized marketing system had changed the quality of raw rubber produced by smallholders and increased the farmers' share as well.

Sujarwo (2015) reported factors that significantly influenced smallholders' choice of marketing channel were: (1) location, (2) information access, (3) profitability aspects, and (4) traders' characteristics. Smallholders tended to choose the more

beneficial channel when the distance was further, and when the buying price, the rubber quantity and their education was higher.

Bakar and Fauzi (2013) examined rubber farmers' characteristics in determining the type of marketing institution in Aceh Province. They found that a smallholder's decision to choose a partnership channel or a traditional channel was significantly influenced negatively by the farmer's experience in rubber farming, their formal education, number of family members, and number of tapped rubber trees; while non-formal education and total family income showed a significant positive influence.

5. Significance of the Study

Many researchers have focused their study on organized and traditional marketing channels for smallholders' rubber material. However, these studies have more focus on marketing aspects related to traders and marketing systems. Meanwhile, studies in economic benefits of organized marketing for farmers, especially in marketing organized through PMU is considerably rare. Likewise, there is no study on the choice of marketing channels between PMU and non-PMU, even though such an issue is strongly believed to have constrained the spread of PMUs, the more organized institution of marketing services. The research that has been done is the choice between traditional marketing and partnership, the choice of more than two marketing channels and not focusing on the PMU channel. Therefore, this research is to find out the economic benefits for farmers and crumb rubber factories from organized marketing through PMU and the constraints for develop rapidly.

6. Limitation of The Study

The limitation of the study consists of the following points.

a) PMU's economic benefits for farmers in this study by comparing income between farmers who are PMU members and non-PMU members.
b) PMU's economic impact for crumb rubber factories using data from one factory taken from 29 crumb rubber factories and using data in 2004.
c) This study focuses on economic impact of PMU for stakeholders and determinant factors that influence many rubber smallholders not joined with PMU.

7. Outline of the PMU

The PMU is one of the main policies of Indonesian central government for development of the rubber industry. Each PMU is a business unit created by rubber smallholders in a certain area. The PMU is expected to have three functions. The first function is joint marketing of the members' product. Most PMUs sell the product to middlemen by auction. If they fail to sell the product by auction, they negotiate directly with rubber factories. A few PMUs make contracts with rubber companies to sell the product directly. In both cases, the government supports the PMUs by providing the market information and advice. Also, the government has made the agreement with the rubber factories' association to try to buy rubber material from the PMUs (figure 5).

The second function is the support of production technologies for improving productivity. As mentioned above, the technical support is mainly provided by the government extension staff. The PMUs have built warehouses for keeping the product properly. Improper storage by the smallholders is one of the causes of low product quality. The government has also provided input material such as fertilizers mainly through the PMUs.

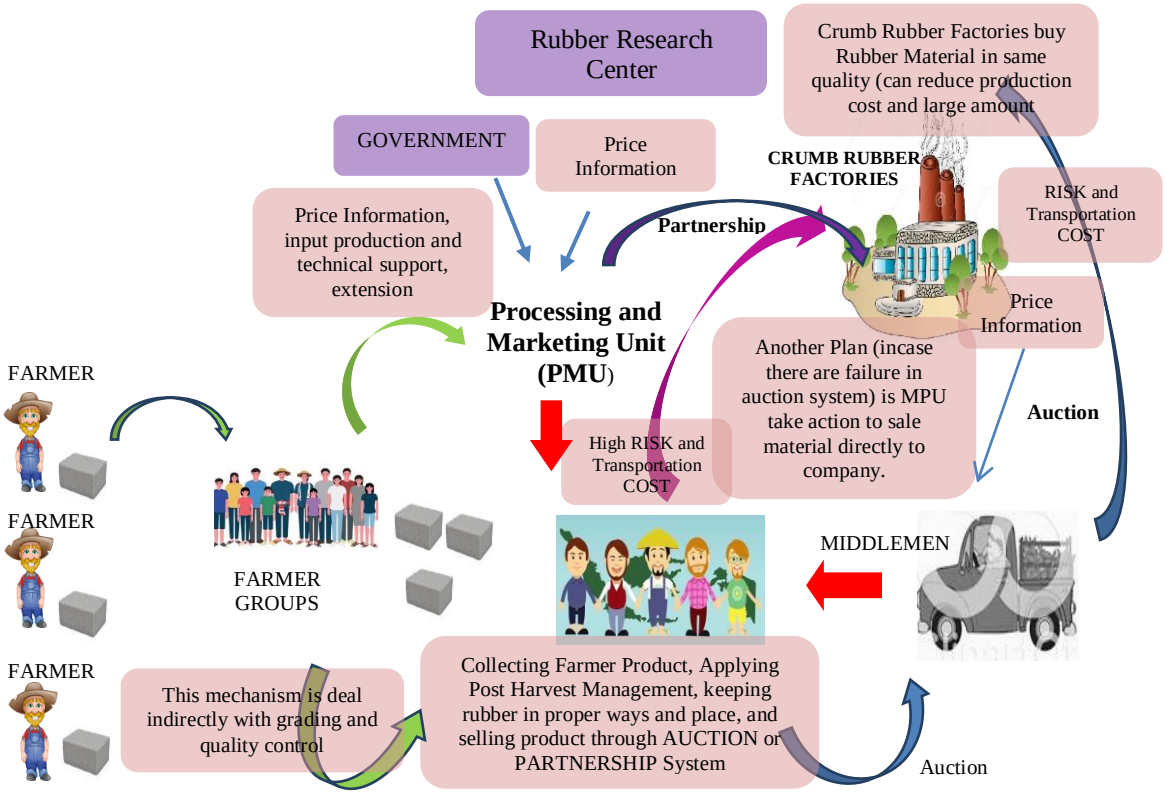

Figure 5. How organized marketing system works

The third function is joint quality control. The PMU checks quality and sells only the products that meet the quality standard. This contributes toward raising the smallholders' awareness of quality improvement and enhancing buyers' reliance on quality.

PMU has a function of technical service activities and business development of smallholders group in processing and marketing of rubber material. The technical activities are development of tapping skills, the use of equipment, the implementation of processing and marketing, and the introduction of quality standards. Business development activities are conducted with business partners, among others; cooperation in the supply of coagulant, input production, marketing, transportation, and capital.

8. Methodology

This research used quantitative methods. The methodology will be divided into two parts as explained as below.

a) The first chapter used data from smallholders' survey conducted in Gunung Kemala, which was one of the villages practicing the PMU program. The village is located in the South Sumatra Province, which has the greatest production of natural rubber in Indonesia (Directorate General of Estate Crops of Indonesia, 2015) (See in figure 6 and 7). The selling method of the PMU in this village was auction. There were 650 rubber smallholders in the village. Among them, 485 smallholders participated in the PMU program. In other words, more than 70% of rubber smallholders in the village participated in the PMU. The sample taken in this study was 10 percent of the population; 48 members and 17 non-members. The survey was conducted in 2015 by investigating the production costs of rubber farming, the price and quality of rubber from both PMU members and non-PMU members.

   The impact on rubber factories is discussed base on not only the smallholders' survey but also the case study on rubber factory conducted in 2004. The production costs of crumb rubber from both high-quality rubber material and low-quality material were investigated by the case study. The rubber material from the PMU is considered high quality and that from the traditional marketing is considered low quality. As the study was rather old, the data were converted to real values using an average inflation rate of 7.21%, from 2005 until 2015 for equating with the smallholders' data in 2015.

Figure 6. The largest rubber producing province in Indonesia

Figure 7. Survey location in Gunung Kemala Village in Prabumulih City, South Sumatra Province

b) The data on the second and third chapter were collected in 2017 from four regencies in South Sumatera Province. Regencies were selected purposely to represent the rubber marketing system of smallholders, while random sampling was further applied in selecting villages and the farmers. The criteria used in selecting

villages were: (1) there must be PMU and non-PMU members, and (2) the PMU should already have an applied auction or partnership marketing system. Furthermore, the regency with the largest and the smallest number of PMUs were most preferred. Banyuasin was the selected regency that has the largest number of PMUs, while Ogan Komering Ilir and Ogan Ilir regencies represented the smallest number of PMUs; and all of them used the same marketing system, namely auction. Other selected regency was Musi Rawas in which most smallholders used the partnership system. Primary data were derived from questionnaires used for directly interviewing 240 rubber smallholders in the aforementioned locations.60 samples of smallholders in each village, consisting of 30 PMU and 30 non-PMU members, were randomly taken from a village selected each targeted regency. Thus, the total sample size used in the study was 240 rubber smallholders.

The survey was conducted in 2017 by investigating the characteristics of farmers, rubber farming income, price and quality of rubber from both PMU members and non-PMU members. Besides that, it was also investigated the reasons farmers join or do not join PMU and the performance of PMUs.

The descriptive statistical analysis was conducted on data concerning farmer characteristics and a t-test was used to investigate the difference between characteristics of PMU members and non-PMU members. Then a binary logistic regression equation was used to determine factors affecting the choice of the marketing system.

Rubber smallholders' reasons for choosing a particular marketing channel were based on the factors of price, kinship, trust, friends, and customers (Hasibuan, et al., 2014). This factor was measured using semi-open questions to explore another reason besides those factors. Respondents were asked to choose four reasons which affected their decision of marketing channel and rank them according to the degree of influence. The most influenced reason was given a score of 4, while the second to fourth ranks were scored as 3, 2, and 1.

A PMU's performance was assessed based on its two functions: providing technical services and group business development in rubber processing and marketing. Providing technical activity services consists of providing knowledge about tapping skills, providing knowledge about the use of equipment, and improving the ability

of farmers to implement rubber material marketing processing, according to quality standards used by the PMU. Business development activities consist of cooperation in the provision of coagulant materials, cooperation in the provision of production facilities, facilitation with transportation facilities, and capital provision. The performance indicator was assessed with a scoring method, assigning scores of 3 (very good), 2 (good), or 1 (not good) by the respondents..

The equation was used to analyze the probability of occurrence of a certain category in comparison to the chosen reference category. There were two marketing systems chosen by the smallholders: (1) PMU marketing channel and (2) non-PMU marketing channel. The independent variables were clustered into seven factors which were the smallholders' characteristics: age of household head (AHH), length of formal education (LFE), area of rubber cultivated land (AR), family size (FS), rubber production (RP), rubber income (RI) and rubber farming experience (RFE). Selection of independent variables was based on the results of previous studies (Karli *et al*., 2006; Bakar and Fauzi, 2013; Sikawa and Mugisha, 2012; Kihoro *et al*., 2016).

A binary logistic regression equation was used to determine the factors affecting the choice of marketing system:

$$\mathrm{P} = \log \frac{\rho_{\mathrm{i}}}{1 - \rho_{\mathrm{i}}} = \alpha + \beta_1 \mathrm{AHH} + \beta_2 \mathrm{LFE} + \beta_3 \mathrm{AR} + \beta_4 \mathrm{FS} + \beta_5 \mathrm{RP} + \beta_6 \mathrm{RI} + \beta_7 \mathrm{RFE} + e$$

where P is the smallholder's decision, which equals 1 if the smallholder is a member of a PMU and 0 otherwise; ρi is the probability of the smallholder choosing a PMU marketing system or non-PMU marketing system; α is the intercept and $\beta_{1\text{-}7}$ is parameter estimate.

CHAPTER I
INCOME DIFFERENCE BETWEEN MEMBERS AND NON-MEMBERS OF THE "PROCESSING AND MARKETING UNIT" ORGANIZED BY RUBBER SMALLHOLDERS IN INDONESIA

1. Objective

This chapter specifically aims to compare the differences in the economy of stakeholders, which are rubber smallholders and rubber factories, between trade through PMU and the traditional markets mainly based on the survey in Gunung Kemala.

2. Result and Discussion

2.1. Rubber Smallholders' Income

Table 2 shows the outline of respondents and the difference in income between the members and non-members. The average rubber cultivation area of the members was 4 ha, while that of non-members was 3 ha. It seemed that the smallholders whose farm sizes were rather large tended to participate in the PMU.

Table 2. Comparison of rubber farmers' income between members and non-members smallholders in the PMU, 2014-2015

Description	PMU		Differences	
	Members	Non- members	Actual Number	(%)
Number of Households	48	17		
Rubber Cultivating Area (ha/household)	4.88	3.21	1.67	52
Family Workers (person/household)	2.88	3.06	0.18	-6
Production (kg/ha)	1,766	1,583	183	12
DRC (%)	60	50	10	20
Production by 100% DRC (kg/ha)	1,059	792	268	34
Production Cost per Area (IDR/ha)	3,243,639	1,856,892	1,386,747	75
Fertilizer (IDR/ha)	2,602,891	1,275,588	1,327,303	104
Production Cost by 100 % DRC (IDR/kg)	3,060	2,345	715	30
Price per material weight (IDR/kg)	9,719	6,553	3,166	48
Price by 100% DRC (IDR/kg)	16,198	13,107	3,092	24
Revenue per Area (IDR/ha)	17,161,181	10,374,530	6,786,651	65
Income per Area (IDR/ha)	13,917,542	8,517,638	5,399,904	63
Estimated Income per household (IDR)	67,917,605	27,341,618	40,575987	148

Source: The farmers survey by the author (2015).

The members produced rubber material 12% more quantity per area than non-members did. Moreover, DRC rate of the members are thought to be higher than that of

the non-members. In the PMU quality standard, the DRC rate is set at 60%. As the DRC rate is not checked in traditional marketing, there is no exact data for the DRC rate of non-members. But the DRC rate in traditional marketing is generally estimated to be 50% (Malian and Djauhari, 1999; Rahman, 2015). If the DRC rate of non-members was 50%, the difference in DRC production per area was expanded to 34%. Furthermore, the sales price base on material weight of members was 48% higher than that of the non-members. Though DRC rate of the members was thought to be high, the price per DRC of members was still 24% higher than that of non-members. Consequently, the members got 65% larger revenue per area than the non-members.

On the other hand, the members spent 75% higher costs per area than non-members did. Fertilizer was the main element of the higher cost. More than 90% of this difference was fertilizer cost. The members spent more than twice as much as the non-members on fertilizer per area. Nevertheless, the members earned 63% more per area than non-members, although they spent more production cost. As the cultivating area of members were larger than that of non-members, the difference in the total income from rubber spread more. The total income of members was more than twice larger than that of non-members.

It cannot be stated that the difference in income is solely the result of the PMU program. However, the PMU might certainly contribute to enhance the productivity and reinforce the bargaining power of the members to some extent. The price difference between the members and non-members was very large. In addition, the members' price was higher than the average price in Indonesia which was shown in Figure 2, given above. It can be said that the joint marketing effort and quality control measures exercised by the PMU, the support of the government, and the better relationship with the rubber companies have contributed to the marked difference. One of the main elements of the higher productivity was a greater use of fertilizers. The PMU members had the advantage of being able to obtain fertilizers with the government's support. Moreover, the expected higher product price encouraged farmers to use more fertilizers as it would offset the increased production cost.

2.2. Crumb Rubber Factories' Income

As for the influence of the PMU on crumb rubber companies, we could not obtain data for comparison between purchasing rubber material through the traditional

marketing and the PMU. Therefore, we consider the possible impact of PMUs by using data from the case study on the differences in the processing cost of crumb rubber from high- and low-quality rubber material.

Table 3 shows the estimated difference in cost and profit of crumb rubber processing between the cases rubber material purchased from the PMUs and the case it purchased from the traditional marketing channels. The rubber material from the PMU was assumed high quality and that from the traditional marketing channels was assumed low quality. The case study data were applied for the production cost except rubber material cost. The rubber material cost was applied rubber material price of the smallholders' survey. The production cost except rubber material cost using high quality material was lower than the cost using low quality material. But the rubber material cost held a large part of the total cost. The rubber material cost of high-quality material from the PMU was higher than that of low-quality material from the traditional marketing channels. Thus, the total cost became higher by purchasing high quality material from the PMU.

Table 3. Comparison of crumb rubber factory profit between processing from high and low rubber material

Description	Raw material quality		Differences	
	High	Low	Actual Number	(%)
Processing Cost (IDR/Kg)	17,327	14,388	2,939	20
Rubber Material (IDR/Kg)	16,198	13,107	3,091	24
Labor (IDR/Kg)	75	108	-33	-31
Others (IDR/Kg)	1,054	1,173	-119	-10
Price (IDR/kg)	22,708	22,708	0	0
Profit (IDR/Kg)	5,381	8,320	-2,939	-35

Source: The survey on the crumb rubber factory in Palembang (2004), the farmers survey by the author (2015).

Note: The values expect rubber material cost were obtained from the survey to the crumb rubber factory in 2004. They were converted to the real value of 2015 by the average inflation rate in the period. Rubber material cost was obtained from the smallholders' survey in 2015 as shown in Table 1.

It can be said that the rubber material price sold by the PMU seemed to be higher than that of the traditional markets for crumb rubber factories even though the quality was high. Therefore, the most of crumb rubber factories would not want to purchase rubber material from the PMUs, although there has been the agreement

between the government and rubber factories' association. We should take this situation into consider for spreading the PMU.

3. Conclusion

The PMU program is one of the main rubber industrial policies in Indonesia, which aims to improve the economic condition of rubber smallholders. In this study, we analyzed the differences in the economic condition between the members and the non-members. The analysis was conducted by the survey on rubber smallholders. The PMU members earned a larger income per area than non-members did. The high productivity and price contributed the members' high income. The PMU seemed to contribute to enhance the members' income to some extent.

Though the PMU can be expected to improve the economic condition of rubber smallholders, the proportion of PMU members in the rubber smallholders is still low. In the village the survey was conducted, more than half of rubber smallholders participated in the PMU. It seems that a large number of the smallholders would participate in the PMUs, if PMUs could be established in each area.

On the other hand, the present rubber material price sold by PMUs isn't favorable for crumb rubber factories, although rubber material quality is high. This situation seems to be one of the factors which obstruct the spread of the PMUs. If the PMUs contribute to improve rubber farming productivity and rubber material quality, they would be beneficial to rubber industry collectively. For spread of the PMU, it is important to improve the system to be favorable for every stakeholder.

CHAPTER II
IDENTIFICATION OF OBSTACLES AND DRIVERS OF SMALLHOLDER RUBBER FARMERS BECOMING MEMBERS OF A PROCESSING AND MARKETING UNIT (PMU) IN INDONESIA

1. Objective

This chapter aims to analyze the main factor affecting whether smallholders' chose a PMU or non-PMU marketing system, to analyze difference of rubber smallholders' characteristics in PMU and non-PMU members, and to find smallholders' reasons to join or not join PMU and members' thought of PMU performance based on the survey in 2017.

2. Results and Discussion

1.1. Different in Rubber Smallholders' Characteristics in PMU and Non-PMU Members

Table 4 shows eight characteristics of the MPU members and the non-PMU members. The socio-economic conditions of PMU members seemed to be better than non-PMU members. The PMU members showed advantages over non-PMU members in terms of three characteristics: formal education level, rubber price and income. Only in length of rubber farming experience, the non-PMU members exceed the PMU members. The characteristics of land acreage and production, the age of household head and family size were not different at the 10% significance level.

The level of education affects a person's mindset and this will then affect their actions. Generally, people with a higher level of education tend to have more information. Moreover, education enables a person to access information coming from various sources. Indeed, decisions taken by people with more education are likely to rely more on rationality than emotion. People with higher levels of education are in a better position to assess and compare the benefits of joining or not joining a PMU. Therefore, in the case of rubber smallholders, it would be unsurprising if the education level of PMU members was higher than that of non-PMU members.

Table 4: Comparison of rubber smallholders' characteristics between PMU and non-PMU members in four rubber production centers of South Sumatera Province, 2017

Characteristics	Descriptive Statistic	Musi Rawas			Banyuasin		OKI		Ogan Ilir		Total	
		PMU	Non PMU		PMU	Non PMU	PMU	Non PMU	PMU	Non PMU	PMU	Non PMU
Formal Education Level of Household Head (year)	Mean	11	11		10^{a}	6^{a}	7	8	8	9	9.29^{a}	8.43^{a}
	SD	1	1		4	3	2	3	3	3	3.30	3.21
Age of Household Head (year)	Mean	43^{c}	47^{c}		48	49	45	47	46	46	45.77	47.28
	SD	9	8		11	14	10	9	11	12	10.08	11.10
Family Size (person)	Mean	3.67	3.30		4.3^{a}	3.6^{a}	4.07	4.27	5.13	5.37	4.29	4.13
	SD	0.92	1.26		1.09	1.13	0.94	0.78	1.50	1.25	1.25	1.37
Size of Rubber Cultivated Land (ha)	Mean	2.47	2.27		1.82^{b}	1.08^{b}	0.93^{b}	1.32^{b}	1.55	1.53	1.69	1.55
	SD	0.78	0.69		0.88	0.51	0.63	0.86	0.71	0.87	0.93	0.86
Farming Experience (year)	Mean	18^{a}	26^{a}		24^{b}	31^{b}	20	17	20	18	18.18^{a}	21.88^{a}
	SD	6	8		11	13	5	4	10	11	8.65	11.16
Rubber Income (IDR million/year)	Mean	66.23^{a}	39.49^{a}		49.47^{a}	17.22^{a}	14.80	15.02	17.84^{b}	23.59^{b}	37.09^{a}	23.83^{a}
	SD	15.93	6.89		29.72	12.95	6.30	8.32	8.47	10.52	27.85	13.74
Rubber Income (IDR million/ha/year)	Mean	27.53^{a}	17.89^{a}		26.68^{a}	16.95^{a}	18.21^{a}	12.88^{a}	13.34	17.52	21.44	16.31
	SD	3.95	1.91		5.59	9.32	4.34	3.27	7.50	9.65	8.07	7.17
Production (kg/year)	Mean	7,038	7,078		$6,946^{a}$	$3,534^{a}$	$1,893^{a}$	$2,708^{a}$	$2,615^{c}$	$3,447^{c}$	4,407	4,623
	SD	1,734	1,310		4,244	2,403	842	1,430	1,117	2,098	2,970	3,365
Production (kg/year/ha)	Mean	$2,920^{a}$	$1,199^{a}$		3,724	3,313	2,285	2,313	1,917	2,391	2,712	2,804
	SD	407	322		747	1,632	457	513	972	1,226	965	1,146
Price (IDR/kg)	Mean	$10,491^{a}$	$6,179^{a}$		$9,471^{a}$	$7,181^{a}$	8,379	8,000	8,105	8,190	$9,111^{a}$	$7,400^{a}$
DRC (%)		62	50		53	50	50	50	50	50	54	50
Price by 100% DRC (IDR/kg)		17,238	12,357		17,869	14,362	16,758	16,000	16,210	16,480	17,019	14,800
Marketing System		Partnership			Auction		Auction		Auction			
Established		2009			2011		2014		2016			

Note: Significant difference between PMU and non-PMU farmers' characteristics: a, b and c denote statistical significance at 1%, 5% and 10% levels, respectively.

In terms of dry rubber content (DRC), the rubber material price received by PMU members was found to be higher than with non-PMU members. The DRC price is usually used to take into account the proportion of actual rubber content given that the rubber material sold varies among farmers (either PMU or non-PMU members). Higher rubber prices for PMU members are a reflection of the PMU existence that can increase the rubber quality and the farmers' bargaining position. Quality of rubber supplied by PMU members must be high, because they follow the rules recommended by the PMU policy. In addition, rubber material must also have the same quality among members because at auction market there is only one price for all PMU members. In general, PMU management has strict rules regarding rubber quality. Rubber that is not in accordance with the specified quality will not be accepted by the PMU board for sale in the auction market. The auction system of the PMU tends to cause rubber prices to be higher than the prices prevailing in traditional markets. With the auction market, there is competition among middlemen in the bargaining prices. Moreover, there are some PMUs that set a minimum price. This minimum pricing is based on price information obtained from social media provided by The Rubber Research Center. Generally, daily rubber prices change because these depend on prices at the international market level.

Furthermore, income of PMU members was also higher than non-PMU members. The higher income of PMU members was due to higher rubber prices, although there was no difference in production per hectare or productivity. It proves that this price factor predominantly affects rubber income. Moreover, if the productivity of PMU members is higher than the non-members, their income will exceed from the non-members' income more. PMU members have access to guidance, not only on processing and marketing of products but also cultivation practices. In addition, PMU members have a greater chance to obtaining subsidized fertilizer from the government. It can be more optimal in providing fertilizer for their rubber plants that can increase land productivity.

The length of rubber farming experience of PMU members and non-PMU members was different, with rubber farming experience of PMU member being shorter than that of non-PMU members. Rubber farming experience of PMU members was 18 years, while that of non-PMU members this was 22 years. The difference in the length of the experience was because of difference in age of starting rubber farming. PMU members started rubber farming at 28 years old, while non-PMU member started at 25 years old. This situation is unexpected as long experience would be expected to lead farmers to choose a more profitable marketing system. This condition is related to the level of education. PMU members have high level of education than non-PMU members. They tried to find jobs out of the agricultural sector firstly and if they did not succeed, they returned to the village and became rubber farmers. Currently, most of farmers in this situation become PMU members. In contrast, non-PMU members because their education is low, they do not try to find work outside of agriculture. They helped their parents and, after marriage, pursued work as rubber farmers. Therefore, PMU members had less experience in rubber farming but they were more critical in making decisions on the choice of existing marketing systems.

Based on statistical analysis, there were four characteristics of rubber smallholder that showed no difference between PMU members and non-PMU members. These were rubber land acreage, rubber production, age of household head and family size. These four research locations have had almost no governmental rubber development programs, so that land ownership was relatively small and land productivity is low. In areas of rubber development, farmers had at least 2 hectares and

were taught good rubber cultivation techniques. Meanwhile, the development of rubber farming through the PMU focuses more on processing techniques and marketing, although farmers involved in farmer organizations are more likely to receive technical guidance from agricultural extension officer and have access to subsidized production materials, such as fertilizer. In fact, farmers in which study location have not received significant support from the government, such as subsidized fertilizer. Similarly, in which study location there are almost no governmental agricultural extension officers. The number of extension staff compared to number of farmers in Indonesia is very small. Most extension staff in Indonesia has more expertise in food crops than perennial crops like rubber. This is because the government focuses more on the development of food crops.

2.2. Reasons smallholders' join and do not join PMUs

Table 5 shows the reasons that farmers chose a PMU marketing channel. The 12 choices were shown for the respondents to select their reasons to participate in the PMU. The three biggest reasons that encouraged rubber smallholders to choose a PMU channel were high price, easy-to-get government support and distance from the PMU. The high price of rubber material was chosen by 42% of the respondents as the first reason. The proportion of total score is 35%. This means that the established purpose of PMUs - for smallholders to obtain higher prices – was recognized by a large number of rubber smallholders. Farmers hope that by becoming PMU members, the selling price of rubber material would increase because they would sell it in groups, carried out through an auction or partnership system, and employ rubber processing methods that meet certain set standards. These three conditions were not found in traditional marketing systems.

The second biggest reason (14%)in the score is easy-to-get governments support. The government has had a policy of providing support only for smallholders who join farmer groups or other agricultural organizations. Government support can take the form of subsidized fertilizers, agricultural extensions, agricultural equipment, and seeds. This was done by the government so that support provided was effective and it was easy to provide guidance and supervision.

Table 5. Reason smallholders chose a PMU rubber material marketing channel, by rank

Reasons	Chosen by rank (score)					
	First	Second	Third	Fourth	Total	%
High price	200	81	12	2	295	35
Easy to get government support	20	39	52	6	117	14
Distance from PMU	56	18	14	10	98	12
Group	40	27	6	3	76	9
Extension employee	0	21	34	8	63	7
Get loan from PMU	36	15	6	1	58	7
Relationship of family with PMU staff	16	30	8	0	54	6
Price transparency	32	9	2	1	44	5
Trust	4	15	0	6	25	3
Friends	4	6	4	0	14	2
Rubber material processing technique	4	0	0	0	4	0
Rubber material quality	0	3	0	0	3	0

Source: Author, from farmers survey, 2017.

The third biggest reason (12%) in the score was the smallholder's distance to the PMU. Sales through a PMU require additional activity to bring the rubber material to the location of auction. Smallholders usually use motorcycles to transport the rubber material. The closer the proximity of their house or rubber plantation to the auction, the more likely they are interested in becoming PMU members. Other reasons affecting whether smallholders' use PMU marketing channels were relatively minor in importance on average under 10 percent. Some efforts to encourage more smallholders to join PMUs might include the development of more farmer groups, an increase in the extension contribution, the establishment of financial institutions by PMUs that can lend money to members, and PMUs' having more active boards, which would invite their families to join the PMU.

Table 5 shows that rubber prices were the biggest attraction for smallholders to join PMUs. However, the rate at which PMUs' spread was still relatively low. Quite number of smallholders were not PMU members. Therefore, it is necessary to see also the dominant reasons causing smallholders to keep non-PMU marketing channels. There were 14 reasons why smallholders chose a non-PMU marketing channel, as shown in Table 6.

Table 6 shows that there were four notable reasons that the non-members chose a non-PMU marketing channel. The biggest reason (23%) in the score was due to the customer middlemen. This was followed in importance by the amount of debt to

middlemen (15%), the distance to the middleman's house (11%), and the price of rubber material (11%). Other reasons were rather insignificant as drivers of marketing system choice.

The existence of customers who usually bought rubber material were the biggest reason (23%) of not joining PMU. The results of this study were in line with the research by Hasibuan et al (2014) in Jambi Province in Indonesia, which suggested that the higher the dependence of farmers on customers, the fewer would join the auction marketing channel. Customers in this study were permanent middlemen who bought farmers' rubber material. This result shows the high dependence of smallholders on customers who bought their rubber material regularly. The existence of these permanent customers for smallholders may guarantee that their rubber material will be bought. A good performance of customers would tend smallholders to sell to certain costumers. Smallholders had enjoyed certain advantages when having permanent customers, including the fact that customers were already familiar with the quality of the rubber material and they were able to borrow money if they encountered financial difficulties.

Table 6. Reason smallholders chose a non-PMU rubber material marketing channel, by rank

Reasons	Chosen by rank					
	First	Second	Third	Fourth	Total	%
Customers	112	99	16	5	232	23
Debt	96	36	20	2	154	15
Distance home from traders	52	33	22	6	113	11
Price	12	63	22	11	108	11
Family connection	48	15	16	0	79	8
Simple system	56	15	4	0	75	7
Rubber area status	48	3	0	2	53	5
Trust	0	30	20	1	51	5
Friends	8	9	14	12	43	4
Processing technique	8	9	14	2	33	3
No others traders	24	6	0	0	30	3
Honesty in weighing	12	3	0	0	15	1
Good services	0	0	8	3	11	1
Freedom to sell	4	3	4	0	11	1

Source: Author, from farmers survey, 2017.

The second biggest reason in the score was debt to middlemen (15%). The middleman would help smallholders if they needed money at short notice. Borrowing money from middlemen resulted in guaranteed future rubber sales, with the debt being paid at the time of the sale. The dependence of smallholders on middlemen would

continue as long as they could not repay the debt. Therefore, as long as smallholders do not have enough income, their dependence on middlemen is high and it will be difficult for them to move to other marketing systems like PMUs.

The distance between a farmer's house and a middleman's house was a strong reason for farmers not choosing the PMU marketing system. In villages, there is a high family relationship between people which can affect daily economic behavior. So that if the farmer's house and the middlemen's house are close, then there is a bad feeling when selling their rubber to other traders. This result is in line with the research by Hasibuan et al (2014)) in Jambi Province in Indonesia that showed that if family relationships were high, farmers were more likely to choose non auction marketing channels. Moreover, middlemen in the village were rich people, so farmers could borrow money from them if they needed to.

An interesting reason—the price of rubber sold to middlemen through traditional channels—was the fourth biggest reason (11%) for farmers choosing non-PMU membership. This proves that the purchase price of middlemen on traditional marketing was still quite attractive to some smallholders. Nevertheless, in Table 4 and a study by Husin et al (2017) showed that there were significant differences between the prices for farmers who were PMU members compared to non-PMU members. This means that even though the price of rubber non-PMU channels is lower, it is still profitable for the rubber smallholders. Middlemen generally determine the purchase price of rubber in non-PMU channels, besides getting information from the crumb rubber factory, also referring to the prices at the nearest PMU channel. Middlemen buy rubber in non-PMU channels after finding out the auction price in the PMU channel.

2.3. PMU performance

The assessment of PMU performance by PMU members showed generally good results. Technical and business development services were equally good, as shown in Table 7. The best technical services were found in PMUs in Musi Rawas Regency, while poor services were found in Ogan Ilir Regency. Technical services were closely related to how long the PMU was in existence. The PMU in Musi Rawas Regency has been established for eight years, while the PMU in Ogan Ilir Regency established only one year ago. In Musi Rawas Regency, the chairman of the PMU became a technical staff person, while in Ogan Ilir Regency, there were no members as technical staff.

Farmers who were members of the PMU in Musi Rawas Regency received training in the use of pieces of equipment, both for the production and processing of products and marketing knowledge, while the PMU in Ogan Ilir Regency only has run processing and marketing training activities. The assessment of PMU technical service performance is presented in Appendix 1.

Table 7. PMU performance based on function

Activities	Musi Rawas		Banyuasin		OKI		Ogan Ilir		Average	
	Score	Criteria	Score	Criteria	Score	Criteria	Score	Criteria	Score	Criteria
Technical service function	9.57	Very Good	6.90	Good	7.14	Good	5.00	Not Good	7.15	Good
Business development	8.10	Good	10.40	Very Good	6.83	Good	5.63	Not Good	7.74	Good
Total	17.67	Good	17.30	Good	13.97	Good	10.63	Not Good	14.89	Good

Source: Author, from farmers survey and using the likert scale, 2017.

Provision of knowledge about tapping skill activities of rubber farmers was classified as not good, even though in Musi Rawas Regency and Ogan Komering Ilir Regency it was considered good. Only in these two regencies, farmers received training on tapping skills and processing equipment. Not all members of the PMU received training, however, only representatives of farmer groups. This situation caused the assessment of PMU members not to be maximal towards the skills development of rubber farmers.

The business development activities of PMU were classified as very good in Banyuasin Regency, but not good in Ogan Ilir Regency. The best PMU business development activities were found to be in Banyuasin Regency. In Banyuasin, the PMU had carried out collaborative activities in supplying coagulant, providing production facilities, and providing transportation facilities to bring rubber material from farmer's houses or gardens to auctions. Only capital provision facilities were not available. The business development activities of the PMU in Ogan Ilir Regency were classified as not good. In this PMU, the only activity carried out collaborative in the provision of coagulant for rubber materials. The complete business development activities in each research location are presented in Appendix 2.

2. Conclusion

The survey showed that the education level of PMU members was higher than that of non-PMU members. The education level of people tends to affect their decision-

making: the higher the level, the greater the rationality employed. Moreover, being a member of PMU was more beneficial, resulting in an increased rubber price. The increase in rubber price is due to the high quality of rubber material and applied new marketing system by auction or partnership system. The high price of rubber causes the income of PMU members to be greater, even though in terms of productivity there was no difference between PMU members and non-PMU members.

The high selling price of rubber material, easy access to government support, and house distance from PMU were the three biggest driving factors for farmers joining PMUs. On the other hand, the existence of permanent customers, debts to middlemen, distance to the middleman house and rubber material prices are the four biggest factors that cause farmers not to join a PMU. However, from the institutional side, PMUs have been able to carry out their functions, especially those that have long been established. For a newly established PMU area, a lot of guidance from the government is needed.

Farmers' debt from traders seems to be the biggest obstacle to encouraging farmers to join a PMU. Farmers cannot sell to other traders if they are indebted to traders because the debt will be paid through the sale of rubber. Generally, rubber sales transactions are carried out once a week. During this transaction, the farmer's debt is paid. If the debt has not been paid off, the farmer can not sell to another trader.

In order to be able to break the dependence of farmers on traders, it is necessary to have financial institutions such as cooperatives that can replace the role of these traders. Unfortunately, there was no cooperative in research area. Farmers are not likely to go to the bank because procedures and requirements are difficult to fulfill and money is not immediately available like borrowing from traders.

CHAPTER III
A DETERMINANT OF MARKETING SYSTEM CHOICE BY RUBBER SMALLHOLDERS IN INDONESIA

1. Objective

This chapter aims to analyze why so many rubber smallholders did not join PMU. This chapter aims specially to analyze determinant factors of the smallholders' choice of a PMU or non-PMU marketing channel.

2. Result and Discussion

2.1. Determinant Factor for Rubber Smallholders Choosing PMU or Non-PMU Marketing Channel

Factors expected to have a significant influence on rubber farmers' decision to choose PMU or non-PMU marketing channels for selling rubber material are the age of household head, formal education length, size of rubber cultivated land, family size, rubber production, rubber income and farming experience. The result of a binary logistic regression analysis of data on the decision of farmers is presented in Table 8, while the estimated regression equation is:

$$P = -0.482 + 0.025AHH + 0.062LFE + 0.850AR - 0.311FS - 0.003RP + 0.438RI - 0.033RFE$$

The regression results obtained were good because the coefficient of determination (R^2) was quite large (60%) and the value of $\chi 2$ was large (142.98). Almost all of parameter signs are as expected and all independent variables are significant up to the 30% level. The R^2 value means 60% of decisions on choice of marketing systems can be explained by variables in the equation; the remaining 40% is explained by other variables not included in the equation. The value of $\chi 2$ shows that the seven variables in the equation significantly influenced the decision of farmers in choosing a marketing system. AHH, LFE, AR and RI have a positive influence on marketing system, while FS, RP and RFE have a negative influence to 70% confidence level.

Table 8 shows that the AHH variable was positively and significantly related to the choice of PMU marketing channel on 25% level with an odds ratio of 1.025. This means that if the age of household head is increased by one year, the chance of the farmer choosing the PMU channel will increase by 1.025 times from the beginning and vice versa, *ceteris paribus*. It shows that in choosing the rubber marketing channel, AHH has an influence where the older are more likely to choose PMU channels than the younger ones. Older farmers have more accumulated knowledge in assessing marketing trends compared to younger ones, so they choose the profit-driven marketing system. This finding is consistent with results of Kihoro et al (2016) who reported that older farmers are more likely to choose direct selling to the factory rather than to wholesalers with milk marketing in Kenya.

This result was different from the age of household head in Table 4. This is because the significant level used was different. In Table 4 was used a significant level of 10% level, whereas in regression equation was used a significant level of up to 30% level and AHH was significant at the 25% level. Besides that the data variation in the regression equation for AHH is smaller than in Table 4. The standard deviation of AHH in Table 4 are 10.08 year and 11.10 year for PMU members and non PMU members, respectively, while in Table 8 only 0.021 years. This condition causes AHH to be significant in the regression equation.

Table 8. Parameter estimates and odds ratio values of determinant factors for rubber smallholders' decisions in choosing PMU or non-PMU marketing channels

Variable	Parameters Estimate	Standard Error	Wald Value	Significant Level	*Odd Ratio Value*
Age of Household Head (AHH)	0.025	0.021	1.362	0.243	1.025
Length of Formal Education (LFE)	0.062	0.057	1.188	0.276	1.064
Area of Rubber Cultivated Land (AR)	0.850	0.376	5.110	0.024	2.341
Family Size (FS)	-0.311	0.152	4.167	0.041	0.733
Rubber Production (RP)	-0.003	0.001	22.732	0.000	0.997
Rubber Income (RI)	0.438	0.087	25.510	0.000	1.549
Rubber Farming Expereince (RFE)	-0.033	0.020	2.824	0.093	0.967
Constant	-0.482	1.156	0.174	0.677	0.618
$R^2 = 0.596$; $\chi^2 = 142.98$; db = 7					

Note: a, b, c, d and e denote statistical significance at 1%, 5%, 10%, 25% and 30% levels, respectively.

As expected *a priori*, LFE was positively and significantly related to the probability of choosing PMU channel with an odds ratio of 1.064. According to Girma

and Abebaw (2012), the length of formal education is linked to the critical thinking skills of farmers resulting in their decision to sell at the highest price while minimizing costs. The odds ratio value means was that if LFE of household head increased by one year, the probability of choosing a PMU channel over a non-PMU channel increased 1.064 times from the beginning and vice versa, *ceteris paribus*. Less educated farmers are not well informed of the benefits of the organized marketing channel. The higher the level of education achieved, the higher the chances of adopting a new marketing channel due to new knowledge exposure (Sikawa and Mugisha, 2012). PMU members' education length was more than that of non-PMU members. Average LFE for a PMU member was 9.29 years, while for a non-PMU member this was 8.42 years. This result shows that formal education plays an important role in selecting marketing channels.

The area of rubber cultivated land (AR) was positively and significantly related to the choice of PMU marketing channel with an odds ratio of 2.341. As expected *a priori* which hypothesized between the areas of rubber cultivated land and choice of PMU marketing channel. The farmer with the larger area of rubber cultivated land may have greater production and receive more income. If the farmers have enough income, they are less likely to borrow money from the middlemen and more independence of selling their rubber through a rubber marketing channel with a high price, like a PMU marketing channel. These results show that if the area of rubber cultivated land increased by one hectare, the chances of a farmer choosing a PMU marketing channel increased 2.341 times than that of the non-PMU channels vice versa, *ceteris paribus*. Farmers who own a large rubber area will have high production and this will lead to greater income. A large income can ensure the fulfillment of family needs and decrease the probability of borrowing from middlemen. In contrast, for farmers who have a small area of land will generate low income and which can lead them to borrow money in order to cover household expenses. Moreover, farmers who have a small area of land can do share profit with other farmers or middlemen that have more rubber area. If this happens, it is almost certain that the farmer is unlikely to join PMU marketing channel.

Similar to AHH, AR also in the regression equation has a smaller variation than in Table 4. The standard deviations of AHH in Table 4 are 0.93 hectare and 0.86 hectare for PMU members and non PMU members, respectively, while in Table 8 only 0.376 hectare. This condition causes AR to be significant in the regression equation.

A negative and significant relationship was found in Family Size (FS), with an odds ratio of 0.733. This value implies that if the number of family members increased by one person, then the chances of a farmer becoming a PMU member decreased 0.733 times and vice versa, *ceteris paribus*. This result is in line with research conducted by Bakar and Fauzi (2013) on rubber farmers in Aceh Province, which showed that the greater the number of family members, the lower the chances of a farmer choosing partnership institutions. According to this study, the number of family members was related to family expenditure. A large number of family members required a large income, especially if there were some family members who were of school-age which led to greater expenses. This situation encouraged low income farmers to deal with middlemen. Borrowing from middlemen is the easiest choice for farmers because of the difficulty of access from banks which requires complicated procedures or other institutions such as cooperatives is also very limited because very few cooperatives provide credit for rubber farmers.

Total Rubber Production (RP) was negatively but significantly related to the probability of choosing a PMU channel over a non-PMU channel, with an odds ratio of 0.997. This means that if rubber production increased by 1 kilogram, the chance of a farmer joining the PMU decreased 0.997 times vice versa, *ceteris paribus*. The farmers with large production have high bargaining power with traders in non-PMU marketing channels. By the simple system in non-PMU channel, then farmers who have large production tend to sell through a non-PMU channel. In contrast, farmers who have small production tend to sell through the PMU channel because it can increase bargaining power.

As expected, *a priori* rubber income (RI) was positively and significantly related to the probability of choosing a PMU channel over a non-PMU channel of marketing, with an odds ratio of 1.549. All else being equal, one million IDR increases in rubber income led to a 1.549-fold increase in the probability of choosing the PMU marketing channel and vice versa. This result is in line with the research of Bakar and Fauzi (2013), who reported that a greater income of farmers increased the chances of them choosing the greater partnership channel for marketing. Conversely, smallholders' opportunities to sell through the non-PMU marketing channel decreased if their income was sufficient to live on.

Contrary to *a priori* expectation, the rubber farming experience (RFE) variable was negatively but significantly associated with the probability of choosing the PMU channel instead of the non-PMU channel for marketing, with an odds ratio of 0.967. This means that if the rubber farmers' experience increases by one year, their chances of choosing PMU marketing channels will decrease by 0.967 times, vice versa, *ceteris paribus*. This finding is line with Bakar and Fauzi (2013) who reported a negative relationship between rubber farming experience and choice of a partnership channel in Aceh Province. Farmers who had longer experience of rubber farming tended to have a closer relationship with middlemen than those who were new to rubber farming. The relationship between farmer and middlemen continued to the next generation. This dependence became stronger because the relationship between farmers and middlemen not only involved buying and selling rubber but also involved lending money to farmers.

3. Conclusion

In Indonesia, a large number of rubber-producing smallholders have not yet joined a PMU. The main factors are because most of them have a small land acreage, low education level and low rubber income, despite being mostly young, having longer rubber farming experience and large production and family size.

Smallholders' choice of the PMU marketing system requires critical thinking and consideration because these systems tend to be selected by more highly educated and older smallholders. In addition, with a large land acreage and sufficient income from rubber farming, smallholders would not be dependent on middlemen. They would sell their rubber material through profitable rubber marketing channels, like the PMU marketing channels. On the other hand, if smallholders have big rubber production and no debt to middlemen, they have good bargaining position with middlemen. This condition will encourage farmers to choose the PMU channel. In contrast, the large number of family members and the longer experience in rubber farming will encourage farmers to more dependence on the middlemen. The alternative solutions for more smallholders are interested to join as a member of the PMU is by conducting intensive agriculture extension to them about the benefits of PMU and providing rural economy finance institutions such as credit unions managed by cooperatives.

CHAPTER IV
GENERAL FINDINGS AND DISCUSSION

1. PMU marketing channel improves the income of smallholders

This study concluded that rubber farming income of PMU members was fairly larger than that of non-PMU members. As to the surveyed farmers, the income of the member was 63% larger than that of the non-members. The increased income was due to increased prices and production per area. In the survey, they were 24% and 34% larger in the members respectively. Price increases were due to four factors; (1) the improvement in quality, (2) implementing of a join marketing system, (3) government supports and (4) the good relationship between PMU and crumb rubber companies. The quality improvement was due to the implementation of a product processing system according to PMU standards while implementing of a join marketing system can increasing the bargaining power of farmers with the traders allowed farmers to sell their rubber material through an auction or partnership. Government supports were providing easily accessible rubber price information, facilitating an agreement between PMU and the crumb rubber factories association, providing rubber warehouse and technical guidance through extension staffs. A good relationship with the crumb rubber factory is realized in the form of a rubber sales contract.

2. Crumb rubber companies can get high quality rubber material from PMU, but its price is too high for them compared with the effect of cost cut

The crumb rubber companies in producing SIR 20 can use high quality rubber material from PMUs or low quality rubber material from traditional markets. If using low quality rubber material, requiring additional costs for equipment, extra labor and electricity to remove the contaminants. It turns out that the additional costs of using low quality rubber material are still lower than the additional costs of using high quality rubber material from PMU.

In the condition of the rubber material supply which is smaller than the demand of the current crumb rubber factories, there is a tendency for the factories to accept all ranges of quality of rubber materials on the market. Moreover, the government does not supervise and punish anyone who violates regulations safeguarding the use of clean

rubber materials, so rubber factories can set a strategy to remain profitable despite using low quality rubber materials. One strategy is to buy rubber not based on the DRC and cooperate with middlemen who buy rubber from farmers and sell it to crumb rubber factories. Middlemen also buy rubber material from farmers not based on DRC but based on traders' estimates.

3. Many rubber smallholders are in debt to middlemen

Farmers who have low incomes will be easily bound by debt from middlemen and must sell them rubber for paying back. Borrowing money from middlemen is very easy and the money is immediately obtained. Middlemen do not charge interest on loans but hope that farmers will sell rubber to him; generally, the farmers promised to pay when selling rubber products.

The dependency on the middlemen causes farmers to not be able to join PMUs, even though they know that the selling price of rubber at PMUs is higher. On the other hand, PMUs can not lend money to farmers because they do not have any program established to do so. Borrowing money at a financial institution, like a bank has complicated procedures and money cannot be obtained immediately as it can from a middleman.

4. Performance of PMUs

Although the policy of establishing PMUs began in 2008, many new PMUs were formed in 2013. The formation of PMUs was proposed by farmers to the Regency Plantation Office. The formation of a PMU requires: (1) a minimum membership of 25, (2) a plantation area of at least 100 hectares, and (3) latex production to be least 800 kilograms of dry rubber every 3 days. This requirement is to make the volume of rubber production traded relatively large. Moreover, the requirements for a minimum number of members are the same for establishing a cooperative. It is expected that in the future PMUs will become business activity units by forming cooperatives.

Quite a number of PMUs have just been formed, causing the services provided to members to be limited in scope. Generally, the latest PMU services for members include are rubber marketing, knowledge of rubber quality standards and provision of recommended coagulant. Other activities such as developing tapping skills, knowledge of the use of equipment, knowledge of processing and marketing, cooperation in supply

of production input and capital supply have not been widely carried out. The limited number of activities and services provided one reason why many rubber farmers have not been interested in joining or forming a new PMU.

5. Formal education level and ownership of rubber land play a major role in PMU membership

Farmers who are members of a PMU have a higher level of formal education compared to farmers who are not members. This suggests that formal education is one of the keys factors that influence farmers to join or not join a PMU. Generally, the education of farmers in Indonesia is classified as low and dominated by elementary school graduates. This is one of the obstacles to increasing the number of farmers who join PMUs. In fact, although it is 20 years after the implementation of the PMU policy, less than 10% of farmers have become PMU members.

Likewise, rubber land ownership turned out to be an obstacle to encouraging farmers to join PMUs. Farmers who have limited land will have low incomes. Moreover, rural area livelihoods are generally not diverse and only rely on one type of livelihood. This causes farmers often to be bound by debt to the middlemen or else they must increase the area of rubber tapped land by tapping other people's rubber through a profit sharing system. Generally, when farmers tap rubber from other people, the type of rubber marketing employed will depend on the owner of the rubber plantation in question.

CHAPTER V
GENERAL CONCLUSIONS AND RECOMMENDATIONS

1. General conclusions

The development of organized marketing such as PMUs is one of the solutions for the problem of the low prices for rubber smallholders in Indonesia. Unfortunately, the numbers of PMUs and farmers who are members of PMUs are still extremely small. Therefore, this study attempted to evaluate the impact of PMUs on the economics of rubber smallholders' and the constraints of their development and then propose some recommendations. There are five conclusions in this study:

1) PMUs are able to increase farmers' incomes by 48% per area or 148% per household. However, rubber processing materials from PMUs are less economic for crumb rubber factories because rubber material price from PMUs is more expensive which results in an increase in production costs by 20% and a 35% reduction in profits. While there is low quality rubber on the market, the crumb rubber factories will still buy it even though government regulations prohibit them from buying low quality. It is thought to be one of the reasons that PMU haven't increased even though it has contributed to the smallholders' economy.
2) PMUs are able to improve the quality of rubber produced by farmers through the application of quality processing standards at the farm level. This quality improvement is because farmers use recommended coagulant, do not soak rubber in water, do not expose the rubber to direct sunlight and do not put contaminates into the rubber.
3) The three main reasons farmers become members of at PMU are the higher rubber prices offered, the possibility to get support from the government and the fact that PMUs are not located far away. By contrast, the three main reasons why farmers do not join PMUs are because they already have customers, they are tied by debt to middlemen their homes are not located far away from middlemen.
4) PMUs have not provided a very satisfying service for their members because some activities have not been carried out, especially in relatively newly

establish PMUs. This service limitation is due to the lack of guidance given by the government to these new PMUs.

5) Age of the household head, formal education, land acreage and rubber income seemed to be the main drivers that increased the likelihood of being a PMU member as compared to family size, rubber production, and rubber farming experience.

2. Recommendations

The results of the research indicate that PMUs can contribute to increase the income of farmers. This potential income increase did not mean that farmers became PMU members. This is because there are still some obstacles that prevent farmers from becoming PMU members. The following are some recommendations proposed to overcome these constraints:

Table 9. Activities recommended for stakeholders to improve PMU membership

Stakeholders	Recommendations
PMU members	- Invite farmers who are not yet members by telling them the benefits of being a member of a PMU
PMU	- Improve services to members in accordance with the functions of the PMU - Establish a cooperative in which one of its business units is responsible for savings and loans and the provision of production facilities - Improve quality standards
Government	- Train PMU members to become technical staff at PMUs - Supervise and take firm action against stakeholders who trade in dirty rubber according to government regulations on clean rubber - Record and provide middlemen directives on clean rubber - Carry out agrarian reform by giving at least 4 hectares to farmers by granting them soft capital loans - Help PMUs to establish cooperatives so that they are expected to help low-income and limited land farmers - Conduct managerial training and guidance for PMU management - Facilitate DRC measuring tools
Crumb rubber factories	- Conduct partnerships or buy rubber directly from PMUs

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Appendices

Appendix 1. PMU performance base on technical services function

Activities	Musi Rawas		Banyuasin		OKI		Ogan Ilir		Average	
	Score	Criteria	Score	Criteria	Score	Criteria	Score	Criteria	Score	Criteria
Development of rubber farmers' skills	2.07	Good	1.07	Not Good	1.87	Good	1.00	Not Good	1.50	Not Good
Knowledge of the use of equipment	2.87	Very Good	1.13	Not Good	1.87	Good	1.00	Not Good	1.72	Good
Knowledge of processing and marketing	2.73	Very Good	1.80	Good	1.50	Not Good	2.00	Good	2.01	Good
The quality standard used by PMU	1.90	Good	2.90	Very Good	1.90	Good	1.00	Not Good	1.93	Good
Total	9.57	Very Good	6.90	Good	7.14	Good	5.00	Not Good	7.15	Good

Appendix 2. PMU performance base on business development function

Activities	Musi Rawas		Banyuasin		OKI		Ogan Ilir		Average	
	Score	Criteria	Score	Criteria	Score	Criteria	Score	Criteria	Score	Criteria
Cooperation in supply of coagulant	2.03	Good	3.00	Very Good	2.40	Very Good	2.00	Good	2.36	Very Good
Cooperation in supply of production input	1.20	Not Good	2.97	Very Good	2.43	Very Good	1.63	Not Good	2.06	Good
Facilitate for transportation facilities	2.07	Good	3.00	Very Good	1.00	Not Good	1.00	Not Good	1.77	Good
Capital supply	2.80	Very Good	1.43	Not Good	1.00	Not Good	1.00	Not Good	1.56	Not Good
Total	8.10	Good	10.40	Very Good	6.83	Good	5.63	Not Good	7.74	Good

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