

A determinant of marketing system choice by rubber smallholders in Indonesia

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Abstract

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The objective of the research was to determine the driving factors behind rubber smallholders' decision to sell their rubber material either by a Processing and Marketing Unit (PMU) or by a non-PMU marketing system. The study population comprised 240 farmers, half of which represented the PMU members and the rest were non-PMU smallholders. These were interviewed to record the farming behavior of smallholders in the largest rubber production area in Indonesia, namely South Sumatera Province. T-test analysis was used to analyze for different characteristic and a binary logistic regression equation to determine factors affecting choice of the marketing system. Research results showed that formal education of household head, rubber price and income of PMU members was 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 significantly different between PMU members and non-PMU members. Age of the household head, formal education, land acreage and rubber income seemed to be the main driver that increased the likelihood of being a PMU member as compared to family size, rubber production, and rubber farming experience. Efforts 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 co-operatives.

Keywords: organized marketing; smallholders; processing; marketing unit

Abbreviations: PMU – Processing and Marketing Unit; SRDP – Smallholders Rubber Development Project; DRC – Dry Rubber Content; AHH – Age of Household Head; LFE – Length of Formal Education; AR – Area of Rubber cultivated land; FS – Family Size; RP – Rubber Production; RI – Rubber Income; RFE – Rubber Farming Experience; SD – Standard Deviation

Introduction

Background

Indonesia is the second largest natural rubber producer in the world after Thailand. Smallholders play an important role in the rubber industry in Indonesia. Around 85% of rubber area is owned by smallholders and the rest managed by private

and government estates (Directorate General of Estate Crops, 2016). Marketing is one of the big challenges for smallholders in Indonesia. The marketing of agriculture produce faces many obstacles, such as the local trading system, and is generally traditional and not yet well organized (Sukesi and Farid, 2009).

The marketing system for rubber materials in Indonesia is generally divided into two groups, namely 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 co-operatives, while the traditional marketing system involves marketing by individuals. Organized marketing systems have been implemented since the 1980's through farmers' groups or co-operatives that are integrated with the Smallholders Rubber Development Project (SRDP) (Agustina et al., 2017). The development of organized marketing has been intensified since the issuance of central government policy in 2008 concerning the establishment of a rubber material Processing and Marketing Unit (PMU). PMU is a medium for technical guidance for smallholders, processing, temporary storage and marketing of rubber material. Through a PMU, rubber quality and price is expected to increase (Alamsyah et al., 2017). Good application of rubber material processing rules on PMU will increase rubber material quality. The improvement of quality and applied marketing in groups will bring increasing in selling price. Moreover, marketing is conducted through auction or partnership. Both conditions are expected to increase the price and income of smallholders.

Nevertheless, since the issuance of this policy and until 2017, only 388 PMUs have been established. This PMU number is still very small when compared to the potential. Given that every 100 hectares of rubber-producing smallholders can form one PMU, with 3.1 million hectares of such rubber producing smallholders in Indonesia in 2017 (Directorate General of Estate Crops, 2017), 31,000 PMUs should have been established. However, 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 income, price and efficiency of organized marketing systems are more profitable for smallholders than traditional marketing systems. This was reported by Husin et al. (2017), Sujarwo (2015), Herdiansyah (2015), Syarifah et al. (2016) and Agustina et al. (2017).

Many researchers have focused their study on organized and traditional marketing channels for smallholders' rubber material. However, most of these studies simply focused on the efficiency of the marketing channel, and farmers' and traders' incomes. Meanwhile, studies of factors that influence smallholders' choice of organized or non-organized marketing systems is considerably rare, even though such an issue is strongly believed to have constrained the spread of PMUs, the more organized institution of marketing services. Therefore, in order to assess which factors mainly affect the smallholders' choice of a PMU or non-PMU marketing sys-

tem, a questionnaire survey was conducted of rubber-producing smallholders from Indonesia.

Previous research

Many studies related to various issues on rubber marketing of smallholder farmers have already been reported in Indonesia. Herdiansyah (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, where 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.

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

Rahman (2015) suggested that the forward auction of rubber material provides the potential for transactions that are 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 become higher.

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 negatively influenced by the farmer's experi-

ence 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.

Sikawa & Mugisha (2012) found that the majority of farmers had ignored participating in the formal markets due to demographic, economic and dairy farm characteristics factors. Factors influencing farmers' choice of milk marketing channel in Uganda were the age of the household head, education, and total land owned, the source of market information, annual non-dairy income, mode of payment if farmer belonged to a co-operative and amount of milk sold. Kihoro et al. (2016) reported factors influencing farmers' choice of green gram marketing channels in Mbeere South sub-county, Kenya to be: age of the farmer, access to credit, price of green grams, selling as individuals, gender of the household head, production cost, and use of mobile phone to access marketing information.

Materials and Methods

The data were collected in 2017 from four regencies in South Sumatera Province that has the largest rubber-producing area in Indonesia. 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 regency that was selected 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. Some 60 samples of smallholders, consisting of 30 PMU and 30 non-PMU members, were randomly taken from a village selected from each targeted regency. Thus, the total sample size used in the study was 240 rubber smallholders.

Descriptive statistical analysis was conducted on data concerning farmer characteristics and a t-test 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 marketing system.

The equation was used to analyze the probability of oc-

currence 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:

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

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

Result and Discussion

The independent variables that were expected to determine a rubber smallholder's decision to be a member or non-member of a PMU as described in the methodology were the variables related to smallholder characteristics. Firstly, it will be discussed about smallholders' characteristics.

Different rubber smallholder characteristics in PMU and non-PMU members

Table 1 shows eight characteristics of rubber smallholders who are PMU and non-PMU members. The socio-economic conditions of PMU members seem to be better than non-PMU members. The PMU members showed advantages over non-PMU members in terms of three characteristics, namely 'formal education level', 'rubber price' and 'income'. Only in length of rubber farming experience did non-PMU members exceed 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. Truly on action is based on information held, and generally people with a higher level of education tend to have more information. Moreover, edu-

Table 1. 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	10a >	6a	7	8	8	9	9.29a >	8.43a
	SD	1	1	4	3	2	3	3	3	3.30	3.21
Age of Household Head (year)	Mean	43c <	47c	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	4.3a >	3.6a	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
Area of Rubber Cultivated Land (ha)	Mean	2.47	2.27	1.82b >	1.08b	0.93b <	1.32b	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
Rubber Farming Experience (year)	Mean	18a <	26a	24b <	31b	20	17	20	18	18.18a <	21.88a
	SD	6	8	11	13	5	4	10	11	8.65	11.16
Rubber Income (IDR million/year)	Mean	66.23a >	39.49a	49.47a >	17.22a	14.80	15.02	17.84b <	23.59b	37.09a >	23.83a
	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	27.53a >	17.89a	26.68a >	16.95a	18.21a >	12.88a	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	7038	7078	6946a >	3534a	1893a <	2708a	2615c <	3447c	4407	4623
	SD	1734	1310	4244	2403	842	1430	1117	2098	2970	3365
Production (kg/year/ha)	Mean	2920a >	1199a	3724	3313	2285	2313	1917 <	2391	2712	2804
	SD	407	322	747	1632	457	513	972	1226	965	1146
Price (IDR/kg)	Mean	10491a >	6179a	9471a >	7181a	8379	8000	8105	8190	9111a >	7400a
DRC (%)		62	50	53	50	50	50	50	50	54	50
Price by 100% DRC (IDR/kg)		17238 >	12357	17869 >	14362	16758	16000	16210	16480	17019 >	14800
Marketing System		Partnership		Auction		Auction		Auction			

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

cation 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.

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 is 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 greater, the greater their income will be. Probability productivity of PMU members is a higher than to non-PMU members. 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 in non-PMU members this was 22 years. The difference in the length of the experience was because of difference in age when starting rubber farming. PMU members started as rubber farmers 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 to farmers choosing a more profitable marketing system. This condition is related to the level of education. Some individuals continued their studies at university before becoming rubber farmers. After completing studies, they tried to find jobs outside the agricultural sector 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 farmers mostly did not continue their education at university. 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 almost no governmental rubber development programs, so that land ownership is 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 the food crops than perennial crops like rubber. This is because the government focuses more on the development of food crops.

Determinant factors 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 binary logistic regression analysis of data on the decision of farmers is presented in Table 2, 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 χ^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% are explained by other variables not included in the equation. The value of χ^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 2 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.

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

Table 2. Parameter estimates and odds ratio values of determinant factors for rubber smallholders' decisions in choosing PMU or non-PMU marketing channels

Variables	Parameter Estimate	Wald Value	Significant Level	Odds Ratio
Age of Household Head (AHH)	0.025	1.362	0.243 ^d	1.025
Length of Formal Education (LFE)	0.062	1.188	0.276 ^c	1.064
Area of Rubber Cultivated Land (AR)	0.850	5.110	0.024 ^b	2.341
Family Size (FS)	-0.311	4.167	0.041 ^b	0.733
Rubber Production (RP)	-0.003	22.732	0.000 ^a	0.997
Rubber Income (RI)	0.438	25.510	0.000 ^a	1.549
Rubber Farming Experience (RFE)	-0.033	2.824	0.093 ^c	0.967
Constant	-0.482	0.174	0.677	0.618
R ² = 0.596; χ^2 = 142.98; df = 7				

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

(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. There was a little difference between education of PMUs members and non-PMUs members. Only in Kabupaten Banyuasin was PMU members' education were different and higher than non-PMU members. Even in Ogan Komering Ilir and Ogan Ilir districts, the non-PMU members' education sample was higher than PMU members.

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 to the non-PMU channels vice ver-

sa, *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.

A negative and significant relationship was found between Family Size (FS) and the probability of choosing the PMU channel as compared to the non-PMU channel 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, namely 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 is related to family expenditure. A large number of family members require a large income, especially if there some family members are of school-age which leads to greater expenses. This situation encourages farmers to deal with middlemen.

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 productivity 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.

Conclusions

Education level of PMU members was higher than non-PMU members. Decisions taken by people who have a greater education would have been relied more on rationality rather than emotion. Being a member of a PMU was more beneficial, resulting in an increased rubber price. The increase of rubber price is due to the high quality of rubber material and applied 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.

In Indonesia, a large number of rubber-producing smallholders have not yet joined a PMU. The main factors are be-

cause 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.

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