Comparative Study on Costs and Benefits of Types of Rubber Products in Mudon Township

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Abstract

This study was attempt to compare costs and benefits of rubber firms on product type products in Mudon Township, Mon State. Sample firms chosen were 36, 46 and 47 of Field latex (FL), Un-smoked sheet (USS 2) and Un-smoked sheet (USS 1) rubber products produced by farmers from six villages and one ward in Mudon Township by using purposive random sampling method. Analysis of descriptive data and costs and returns of three types of rubber products were compared by per hectare basic on one-year activities of respective firms. According to the nature of product types producing and descriptive analysis, USS 2 product firms obtained the highest annual yield (1,484 kg/ha), followed by FL product firms (1,247 kg/ha) and USS 1 product firms (1,221 kg/ha). In order to compare rubber products prices, USS 1 product firms received annual selling price, 2,057 MMK/kg was the highest compared to 1,915 MMK/kg and 1,763 MMK/kg of USS 2 and FL products firms. Regarding costs and returns analysis, benefits costs ratios were 2.20, 1.98 and 1.86 in USS 2, USS 1 and FL products firms, respectively and all of three different rubber firms can earn more profit over their total variable costs. As a conclusion, USS 2 product firms got the better profit than both USS 1 and FL products firms.

Key words: rubber firms, product types, costs and returns, Mudon Township.

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Introduction

Natural rubber (*Hevea brasiliensis*) is a tree native to the tropical rain forests of Amazon and introduced on a commercial scale to the Far East during the last century (Anuja, J. R., 2012). Rubber trees can produce rubber latex by a process called tapping. Rubber latex is converted to a storable and marketable form by sheeting and shaping. It provides the principal raw material required for manufacturing a wide variety of rubber products such as toys, balloons, tyre, medical instruments and etc. The market demand of natural rubber is increasing over the world which leads area expansion and increasing in production. The majority of the world natural rubber is produced from ASEAN countries (Zar Ni Zaw and Hla Myint, 2016). Myanmar has so many potentials for rubber cultivation such as favorable climate, abundance of labor and etc. Rubber has been cultivated in Myanmar since the British colonial period in the early 20th century mostly in Mon State (Keong, 1973). In the early period, rubber was planted only in the Southern Myanmar contributing Mon and Kayin States and Taninthari Regions. Over the past two decades, the plantation of rubber trees has expanded to non-traditional rubber growing areas in Myanmar contributing Shan, Kachin and Rakhine States as well as Bago, Ayeyarwady, Yangon and Sagaing Regions. Myanmar played the six largest place of world natural rubber exported countries and more than 90% of the rubber produce was exported to other countries accounted USD 260 million, 2% of world rubber-export in 2018 (www.statista.com).

Rubber area expansion in Myanmar was increased as a result of the government push to intensify and modernize agriculture through cash crop production, to alleviate poverty and encourage rural economic development. After adopting market-oriented economic policy, natural rubber industry had gradually developed by entering of new growers especially 90% of smallholders (Zaw and Myint, 2016). Consequently, rubber sown area, tapping area and production were increased from 226,139 hectares, 108,170 hectares and 64,238 metric tons in

2006 to 657,190 hectares, 311,476 hectares and 238,030 metric tons in 2018 as shown in figure 1 (Department of Agriculture, 2018). Rubber yield was also increased from 594 kg per hectares in 2006 to 777 kg per hectare in 2018 as shown in figure 2 (DOA, 2018). Mon State contributed the largest rubber producing area in Myanmar and its rubber sown area and harvested area were 200,340 hectares and 131,972 hectares, respectively in 2018 as shown in Ffigure 3 (DOA, 2018).

Most of rubber firms produced their rubber products by family members which led to increase their firm income by receiving family labour opportunity costs. Rubber is often the major income source of rubber producing households in Mon State. Thus, rubber was important to create job opportunities and to improve livelihood of rural people in this State. However, rubber growers in Myanmar mainly depended upon China rubber market, leaving them vulnerable to fluctuations in prices, evidenced by the crash of rubber prices since 2012 (Kenney-Lazar et al., 2016). Rubber production in Myanmar has little to no effect on the country's rubber prices, processing factories set rubber prices based on international market prices and international demand (Assets et al., 2017). Thus, price differentials between primary rubber products were highly volatile and mainly depended on raw materials requirements of rubber processing factories. These conditions led unstable rubber income and rubber producers were complicated for decision making in producing which type of rubber products produce. In these conditions, cost and return analysis on different rubber product types was important for rubber firms how to allocate efficiently their resources to maximize profit. In these regards, this research was carried out to examine current conditions of costs and benefits on three primary product types (FL, USS 1 and USS 2) of rubber firms in Mudon Townships.

Objectives

The objectives of this study were:

1. To describe socio-economic characteristics of sample rubber farmers in Mudon Township
2. To compare firm profitability of three primary rubber product types (FL, USS1 and USS 2) in the study area.

Research Methodology

The Study area was Mudon Township located in Mon State, the lower part of Myanmar. It was the center of rubber sown and marketing area in Myanmar. It is situated at 16.26^{o} North latitude and 97.72 ^{o} East longitude and 19 meters elevation above sea level. The total land area was 96,774 hectares and rubber were sown 24,304 hectares under 45,725 hectares of cultivated area. There was 33 villages and 9 wards in Mudon Township. Among them, six villages and one ward were selected on the basis of rubber product types producing. This study used both primary and secondary data. For primary data, the survey was done by using purposive random sampling method with a structured questionnaire from November to December in 2018. The total 129 rubber firms were selected as 36, 46 and 47 samples of FL, USS 2 and USS 1 products firms for each product type with their respective villages as shown in Table 1. The questionnaire was prepared on information about rubber production including demographic characteristics, productive and price figures, revenues and detail costs on three different rubber firms were collected. Secondary data were collected from various sources including Department of Agriculture (DOA), Department of Planning (DOP) and Mudon Township office under Ministry of Agriculture, Livestock and Irrigation (MOALI). Descriptive analysis was used to describe socio-economic characteristics of three different rubber firms. To compare costs and benefits of three different product types**,** enterprise budget analysis was used.

Results and Discussion

Demographic characteristics of sample firms

Table 2 presented the demographic characteristics of sample firms. The average age of all product types of rubber farmers was about 50 years. Among three different groups of farmers, their ages were ranged from 36 to 80 years in FL product farmers, 20 to 72 years in USS 2 product farmers and 23 to 71 years in USS 1 product farmers. The working experience of household head were nearly 30 years in USS 1 product firms with ranging from 5 to 56 years, 26 years in FL product firms with ranging between 7 and 60 years and 23 years in USS 2 product firms with ranging between 3 and 53 years. The education level of sample firm household head was displayed their schooling years attended. The average schooling years of rubber firm household heads were 4, 5, 6 years in FL, USS 2 and USS 1 products firms, respectively. The ranges of sample firm heads schooling years were varied from illiterate to graduate level. According to the results, the average education level of the sample firm household heads was middle school education level (5.25 schooling years). The average family size per household was about 4 members in all three different rubber firms. Their average family sizes were ranged from 2 to 10 persons in FL product firms, 2 to 8 persons in USS 2 product firms and 2 to 7 persons in USS 1 product firms. The average number of family labors in rubber plantation was 2 people per firm in all sample rubber firms. It was ranged from 0 to 7 persons. There were very few firm households which family members couldn't participate in their field activities. The results of F test showed mean values of working experiences were statistically significant at 5% level among three different rubber firms. The mean values of farmer's ages, schooling years, family sizes and family farm labors were not significantly difference among them.

Productive assets of sample rubber firms

Table 3 presented the productive assets of sample firms such as rubber roller machine, grass cutting machine, rubber sheeted house, labor hut, power tiller and tractor. The majority 94 percent of USS 2 product firms had rubber roller and the remaining six percent of them made USS 2 products in rubber-sheeted houses of their neighbors with payment or their relatives without payment. Payment based on the portion of total rubber sheets. In the case of USS 1 product firms, 88 percent owned rubber roller and the rest 12 percent of them made USS 1 rubber sheets with or without payments like USS 2 product firms. Only 53 percent of FL product firms possessed rubber roller indicated that they can also produce USS 1 or USS 2 sheets based on the condition of attractive rubber products prices. Rubber sheeted house possessed by USS 1 product firms was 75 percent and it was 74 percent in USS 2 product firms, whereas the figure is only 31 percent in FL product firms. It can be seen that some firms owned rubber roller although they had no rubber sheeted houses. Grass cutting machine was important for rubber producers not only to protect fire from adjacent fields or forests especially in summer season but also for weeding the grass and bushes along the row rubber tree so that the tappers can enter into the rubber field easily and safety. It can be seen that 72 percent, 46 percent and 31 percent of USS 1, USS 2 and FL products sample firms possessed grass cutting machine for weeding and fire protection. USS 1 product sample firms had the highest percentage of labor hut possessing accounted 47 percent compared to 42 percent of FL and 26 percent of USS 2 products firms. It was also found that all less than half of sample firms still possessed labor hut as their productive assets. As the possession of farm machineries, the assets of power tiller were 7 percent in USS 2, 3 percent in FL and 2 percent of USS 1 products firms while 3 percent of FL product firms and each 2 percent of USS 1 and USS 2 products firms owned tractor. It was also found that less than 8 percent of all rubber firms possessed those farm machines. The results of F test showed that possessing of rubber roller machine, grass cutting machine and

rubber sheeted house among three different rubber firms were statistically significant at 1% level. There was no significantly difference in possessing of labor hut, power tiller and tractor among them.

Rubber sown and tapping area of sample firms

On rubber firm, the first tapping occurs 5-6 years after planting and the tree will productive until 30 years old (Dewi T. G., 2013). Rubber firms had different plantation periods depended on the amount of un-planted area, own capital investments and requirements of replacing old rubber trees, etc. These different plantation periods led some of sample farmers possessed both mature and immature rubber trees in the same time. Table 4 presented the productive figures of sample rubber firms. Average farm sizes were 5 ha, 2.4 ha and 2.2 ha in USS 1, USS 2 and FL products sample firms. It was ranging from 0.4 to 81 ha in total rubber firms. Tapping areas were 4.2 ha, 1.9 ha and 1.5 ha in USS 1, FL and USS 2 products firms, respectively. USS 1 firms had the largest rubber tapping area while USS 2 firms were the lowest one. Numbers of average tapping years were around 9 years in all three different rubber firms. Tapping years were ranging from 1 to 30 years in all sample rubber firms. The average numbers of tapping plants per hectare were 550 plants with ranging from 346 to 1,235 plants in USS 2 product firms, 508 plants with ranging from 247 to 1,098 plants in USS 1 product firms and 482 plants with ranging from 326 to 865 plants in FL product firms. Therefore, the highest numbers of tapping plant can be seen in USS 2 products sample firms. The results of F test showed numbers of tapping plants per hectare were statistically significant at 10% level among three different rubber firms. There were no significantly difference in farm size, tapping area and tapping year among them.

Annual tapping days, yields and prices of sample rubber firms

Dewi (2013) stated that rubber profit function was engaged with rubber yield, its input price and output price. Although rubber plants can be tapped every day in the study area the

sample firms tapped based on the season and product price conditions. Sample rubber firms usually tapped their trees every day or tapped three days continuously and then one day rest during tapping period. Table 5 presented annual tapping days, rubber yields and prices of rubber firms. Annual tapping days and yields were calculated based on total tapping days and farmers' actual yields from September, 2017 to May, 2018. Annual price was based on average monthly prices from September, 2017 to August, 2018. The annual tapping days were 133, 130 and 121 days in FL, USS 1 and USS 2 products firms, respectively. It was ranged from 60 to 176 days in total rubber firms. In the case of average annual yield comparison, USS 2 product firms obtained 1,484 kg/ha was the highest yield compared to 1,247 kg/ha of FL product firms and 1,221 kg/ha of USS 1 product firms. Annual yields of all sample firms were ranged from 384 to 2972 kg/ha. It was also found that USS 2 product firms obtained the highest annual yield although they had the lowest tapping days. With respective to product quality, USS 1 product firms obtained the highest annual selling price, 2,061 MMK/kg with ranging from 1,545 to 2,350 MMK/kg and it was 1,920 MMK/kg with ranging from 1,668 to 1,992 MMK/kg in USS 2 product firms and 1,771 MMK/kg with ranging from 1,416 to 1,996 MMK/kg o FL product firms. The results of F test showed annual selling prices were statistically significant at 1% level among the three different rubber firms. The mean values of annual rubber yields were also statistically significant at 10% level and but tapping days were not significantly difference among them.

Costs and returns analysis of sample rubber firms

Enterprise budget was analyzed to find out costs and returns of rubber firms as presented in Table 6. Annual average yield of USS 2 product firms 1484 kg/ha was obviously higher than 1227 kg/ha of FL and 1221 kg/ha of USS 1 products firms. USS 1 product firms obtained the maximum annual average price 2061 MMK/kg was followed by 1920 MMK/kg of USS 2 and 1771 MMK/kg of FL products firms. Thus, USS 2 product firms obtained the

maximum average gross revenue, 2,850,390 MMK/ha was followed by 2,516,053 MMK/ha of USS 1 and 2,208,639 MMK/ha of FL products firms. Average total material costs were 231,113 MMK/ha, 215,930 MMK/ha and 203,247 MMK/ha in USS 2, FL and USS1 products firms, respectively. The highest average total family labour costs 819,825 MMK/ha in FL product firms was followed by 784,806 MMK/ha of USS 2 and 763,805 MMK/ha of USS 1 products firms. USS 1 product firms incurred 233,616 MMK/ha was the highest average hired labour costs compare to 221,500 MMK/ha in USS 2 and 99,554 MMK/ha in FL products firms. Interest on cash costs were 45,261 MMK/ha, 43,686 MMK/ha and 31,549 MMK/ha in USS 2, USS 1 and FL products firms, respectively. USS 2 product firms incurred average total variable cash cost, 497,873 MMK/ha was the highest compared to 480,549 MMK/ha of USS 1 and 347,032 MMK/ ha of FL products firms. Similarly, the highest average total variable costs, 1,282,680 MMK/ha in USS 2 product firms was followed by 1,244,354 MMK/ha of USS 1 and 1,166,859 MMK/ha of FL products firms. USS 2 firms obtained the return above of total variable cash costs, 2,352,516 MMK/ha was the highest compared to 2,035,504 MMK/ha in USS 1 and 1,861,605 MMK/ha of FL products firms. Similarly, USS 2 product firms obtained the maximum return above total variable costs 1,567,711 MMK/ha was followed by 1,271,699 MMK/ha of USS 1 and 1,041,780 MMK/ha of FL products firms. It can be seen that USS 2 firms obtained the maximum return above total variable costs and cash costs while they incurred the highest in these costs. Benefits costs ratios were about 2.21, 1.99 and 1.86 in USS 2, USS 1 and FL firms, respectively. According to benefits costs ratio, USS 2 product firms were more profitable than USS 1 and FL products firms. It was also indicated that all of three different rubber firms can earn more profit over their total variable costs.

Summary and Conclusion

In the study area, the sample rubber firms had enough age and rubber planting experiences among the three types of rubber products. However, the average education level

of sample household head is just over the primary schooling year. They have average number of 4 family members per household which included 2 family labors in rubber plantation among these three products types. The majority of rubber firms possessed a range of rubber productive implements depended on types of products they produced. Among these three products types, the results of F test showed significantly differently in their working experience, possessing of rubber roller, grass cutting machine and rubber sheeted house. In productive and price figures, their sown and tapping area, number of tapping years and annual tapping days were not much difference among the three sample firms. But their annual yields, selling prices and numbers of tapping plant per hectare were obviously different among them. It can be seen that USS 2 product firms had the maximum number of tapping plants per hectare with the highest rubber yield than USS 1 and FL products. The results of benefit cost analysis indicated that BCR obtained by USS 2 sample rubber products per hectare was higher than the other two types. Although USS 1 product firms obtained the highest annual selling price, USS 1 product faced more weight losses during the production and marketing than USS 2 product. In these contexts, USS 1 firm was obtained the medium benefit although their rubber quality and price were higher than those of USS 2 product firms. Among the three types of rubber products, USS 2 firms obtained the maximum return above total variable costs and total variable cash costs due to their highest yield which led the maximum total revenue less those costs.

In Mon State, traders and local collectors determined the quality and price of rubber only by visual inspection and collected all grades of rubber from farmers led low-quality products and provide uncertain premium price at farm gate level. Although quality of rubber products can be improved by using formic acid at coagulating stage but nearly all of rubber firms used sulphuric acid with cheaper price to save their production costs. These conditions led lower rubber quality and price in this State compared to other neighbouring rubber producing countries. In these regards, the current rubber quality improvement and becoming

certain premium price are also another important criterion to obtain the higher benefit for rubber firms. According to enterprise budget analysis, it can be seen that most of rubber firms had been running with profitable condition in the study area. As a conclusion, rubber firms have to emphasis on increasing their yield by using improved verities with proper rubber production technologies.

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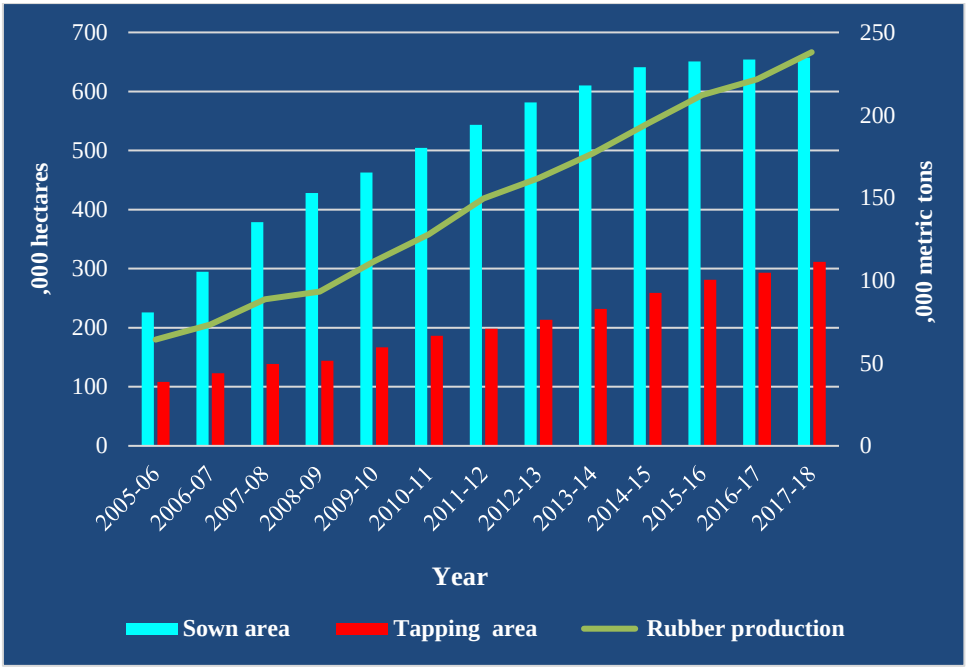

Figure 1. Sown area, harvested area and rubber production in Myanmar from 2005 to 2018 (DOA, 2018)

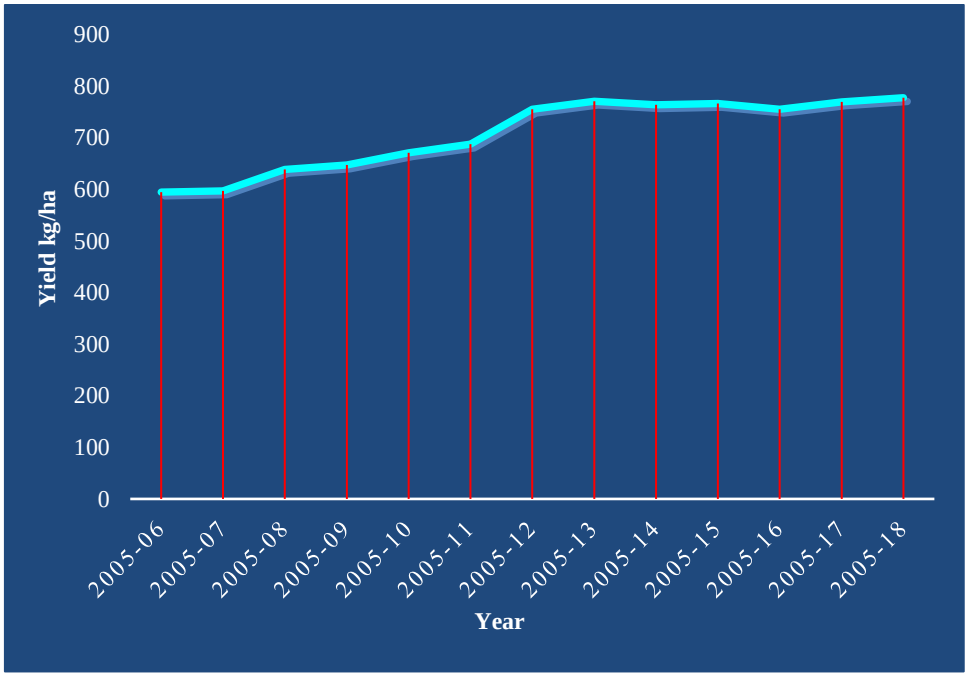

Figure 2. National average yield of rubber production in Myanmar from 2005 to 2018 (DOA, 2018)

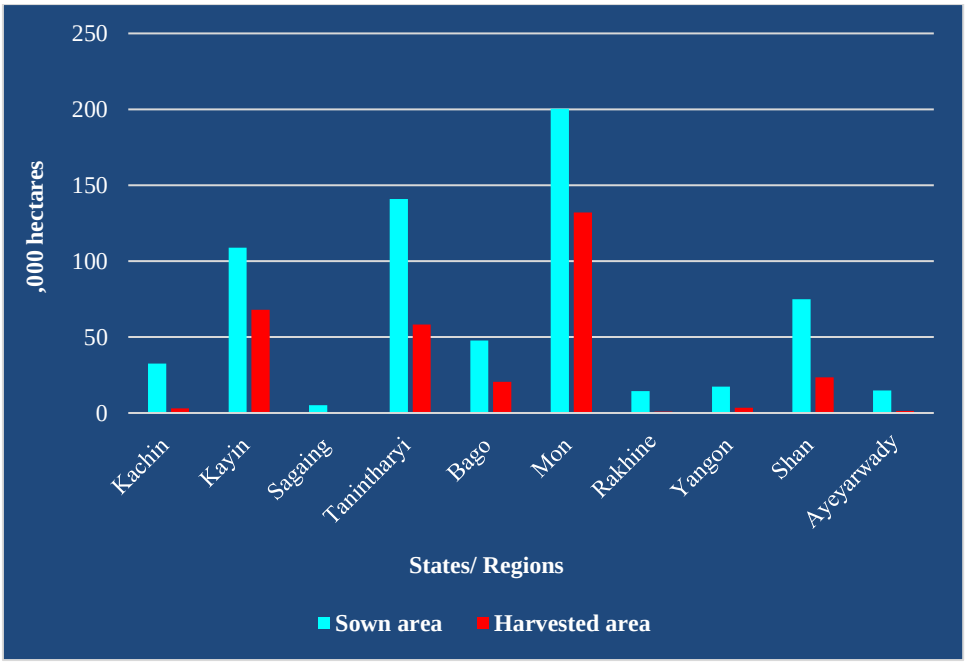

Figure 3. Sown area and harvested area by States and Regions in Myanmar in 2018 (DOA, 2018)

Table 1. Differentiation of sample firms based on types of rubber products in the sample villages

Sampled Village	Rubber firms			
	FL	USS 2	USS 1	Total
Kunlar	19	7	11	37
Nhepadaw	-	12	6	18
Kalawthaut	6	24	4	34
Satthwe	-	1	11	12
Yaungdaung	7	-	3	10
Kamarwat	4	2	10	16
Myoma (4)	-	-	2	2
Total	**36(28)**	**46(36)**	**47(36)**	**129(100)**

Note. Figures in parentheses represent percentage.

Table 2. Socio-economic characteristics of the sample rubber firms

Items	Units	Rubber firms			*f value*	Total (n=129)
		FL (n=36)	USS 2 (n=46)	USS 1 (n=47)		
Average farmer's age	year	52.33	50.06	52.32	0.21^{ns}	51.84
Range	year	36-80	20-72	23-71		20-80
Average working experience	year	25.78	22.72	29.57	3.29**	26.07
Range	year	7-60	3-53	5-56		3-60
Average schooling year	year	4.39	5.11	6.04	2.03^{ns}	5.25
Range	year	0-11	0-16	0-15		0-16
Average family size	No.	4.22	4.02	3.77	1.09^{ns}	3.98
Range	No.	2-10	2-8	2-7		2-10
Average family farm labour	No.	2.19	2.41	2.30	0.21^{ns}	2.31
Range	No.	0-5	0-7	0-7		0-7

Note. *, ** and *** are significant difference at 10%, 5% and 1% levels. ns = not significant.

Table 3. Productive assets of sample rubber firms

Items	Rubber firms			*f value*	Total (n=129)
	FL (n=36)	USS 2 (n=46)	USS 1 (n=47)		
Rubber roller machine	19 (53)	43 (94)	41 (88)	13.89***	103 (80)
Rubber sheeted house	11 (31)	34 (74)	35 (75)	9.82***	80 (62)
Grass cutting machine	11 (31)	21 (46)	34 (72)	8.36***	66 (51)
Labour hut	15 (42)	12 (26)	22 (47)	1.63^{ns}	35 (27)
Power tiller	1 (3)	3 (7)	1 (2)	0.60^{ns}	5 (4)
Tractor	1 (3)	1 (2)	1 (2)	1.29^{ns}	2 (2)

Note. *, ** and *** are significant difference at 10%, 5% and 1% levels. ns = not significant and figures in parentheses represent percentage.

Table 4. Rubber sown and tapping area, tapping year and numbers of plants per hectare of sample firms

. Items	Units	Rubber firms			*f value*	Total (n=129)
		FL (n=36)	USS 2 (n=46)	USS 1 (n=47)		
Average sown area	ha	2.2	2.4	5.0	1.9^{ns}	3.3
Range	ha	0.4-12.2	0.4-15.4	0.4-81.0		0.4-81.0
Average tapping area	ha	1.9	1.5	4.2	2.2^{ns}	2.6
Range	ha	0.4-12.2	0.4-4.0	0.2-72.9		0.2-72.9
Average tapping year	year	9.0	9.0	8.4	0.9^{ns}	8.8
Range	year	1.0-30.0	1.0-25.0	1.0-26.0		1.0-30.0
Average tapping plants	No./ha	482	550	508	3.0*	516
Range	No./ha	326-865	346-1,235	247-1,098		247-1,235

Note. *, ** and *** are significant difference at 10%, 5% and 1% levels. ns = not significant.

Table 5. Average annual tapping days, yields and prices of sample rubber firms

Items	Units	Rubber firms			*f value*	Total (n=129)
		FL (n=36)	USS 2 (n=46)	USS 1 (n=47)		
Annual tapping days	day/year	133	121	130	2.15^{ns}	128
Range	day/year	80-176	60-176	66-167		60-176
Annual rubber yield	kg/ha	1,247	1,484	1,221	2.59*	1,322
Range	kg/ha	511-2,327	468-2,972	384-2,958		384-2,972
Annual rubber price	MMK/kg	1,771	1,920	2,061	46.31***	1,928
Range	MMK/kg	1,416-1,996	1,688-1,992	1,545-2,350		1,416-2,350

Note. *, ** and *** are significant difference at 10%, 5% and 1% levels. ns = not significant.

Table 6. Annual costs and returns of sample rubber firms

Items	Unit	Rubber firms		
		FL (n=36)	USS 2 (n=46)	USS 1 (n=47)
Annual average yield	kg/ha	1,247	1,484	1,221
Annual rubber price	MMK/kg	1,771	1,920	2,061
Gross revenue (GR)	MMK/ha	2,208,639	2,850,390	2,516,053
Total materials costs (a)	MMK/ha	215,930	231,113	203,247
Total family labour costs (b)	MMK/ha	819,825	784,806	763,805
Total hired labour costs (c)	MMK/ha	99,554	221,500	233,616
Total interest on cash cost (d)	MMK/ha	31,549	45,261	43,686
Total variable cash costs (TVCC) (a+c+d)	MMK/ha	347,033	497,874	480,549
Total variable costs (TVC) (a+b+c+d)	MMK/ha	1,166,859	1,282,680	1,244,354
Return above variable cash costs (GR-TVCC)	MMK/ha	1,861,605	2,352,516	2,035,504
Return above variable costs (GR-TVC)	MMK/ha	1,041,780	1,567,711	1,271,699
Benefit cost ratio (BCR=GR/TVC)	-	1.857	2.208	1.982
Break-even yield (TVC/price per unit kg)	kg/ha	659	668	605
Break-even price (TVC/yield per ha)	MMK/kg	936	864	1,019