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First testing of the double cut alternative tapping system on rubber tree clone RRIM600 in marginal area, northeast Thailand

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Abstract

The purpose of this investigation was to test the efficiency of double cut alternative tapping system (DCA) on latex yield and growth of rubber tree. The experiment was conducted in a farmer's rubber plantation (on farm research) on clone RRIM600 at Khane Dong district, Buriram province, northeast Thailand during June 2013 to January 2015. Seven years old rubber trees planted in 2006 (spacing 7 X 3 m) were selected. The sampled trees were started to tap at maturity stage in 2013. This experiment comprised by two treatments: single panel tapping system as control (S/3, 2d/3, farmer's method) and double cut alternative tapping system (DCA, 2×S/3 2d/3). The result showed that the DCA tapping system increased of latex yield by 9%, but the bark consumption was slightly higher than in control. The girths in both tapping system were not significantly different, but the farmer's method had higher girth increment than DCA tapping system in the second year. DCA system might be suitable to the marginal area and it should be the alternative system to improve yield without using ethylene stimulation. Further studies are needed to confirm that result in Northeast area of Thailand.

Keywords : *Hevea brasiliensis, DCA tapping system, marginal area, northeastern Thailand*

1. Introduction

Natural rubber is key product for many countries in the tropical zone, as well as ASEAN countries. Nowadays, the world harvested area of rubber is about 9.9 million ha, in which Thailand represent about 21 per cent. The natural rubber production was about 11.57 million tons in 2012, in which Thailand represented about 31.33 per cent (1).

Generally, the tapping system in northeast Thailand is a half-spiral (S/2) or a one third-spiral (S/3) downward cut with frequency of 2 days in tapping followed by one day of tapping rest in three days (2d/3). However, the price of rubber products nowadays was continued decreasing. The rubber farmers need to find out of more income from rubber plantation by increase of productivity.

By the other hand, double cut alternative (DCA) may provide an alternative to intensive tapping system in increasing the time available for latex regeneration by splitting the tapping into two different tapping cut panels and to improve latex yield without stimulation (2). The principle of DCA tapping system was applied by alternate two cut panels to optimize high tapping frequencies. The both panels are cut on opposite panels at different levels. The results of previous studies on the spatial extend of the latex regeneration area recommend us to open the first tapping cut on panel (P-1) at 75 cm from the ground and the second tapping cut on panel (P-2) at 150 cm from the ground (3,4,5). Also, this tapping system can increase the production of the rubber tree approximately 9 percent (8). However, all previous research on DCA was done in the suitable area for rubber tree in eastern and southern part of Thailand. Nowadays, there was no data from the northeast Thailand where the annual rainfall is less than 1,500 mm with more than 5 moths of dried period.

This investigation was to evaluate the efficiency of double cut alternative tapping system (DCA) on latex yield and growth of rubber tree in the marginal zone. The result would be the alternative tapping system for the farmer to increase the production of the rubber tree in the non-traditional area.

2. Materials and Methods

2.1 Experimental design

This study was conducted in the farmer's rubber plantation clone RRIM600 at Khaen Dong district, Buriram province, northeast Thailand during June 2013 to January 2015. The annual rainfall in this area was less than 1,200 mm. The age of rubber trees was 7 years old. Trees were planted in 2006 and tapping started in 2013. The rubber trees were planted in spacing 7 x 3 m. This experiment comprised two treatments (3 replications): single panel tapping system (farmer's method, control) and double cut alternative-DCA tapping system. The number of trees per plot was 20. The detail of tapping systems is shown in Figure 1. The farmer's method was the downward cut with one third spiral (S/3 2d/3) in only one panel (started tap at 120 cm above ground), while the DCA (2×S/3 2d/3) was the downward cut with one third spiral in two panels. The DCA tapping started at 120 cm above ground for panel 1 and 60 cm above ground for panel 2 (Table 1). The example of tapping schedule is expressed in Table 2.

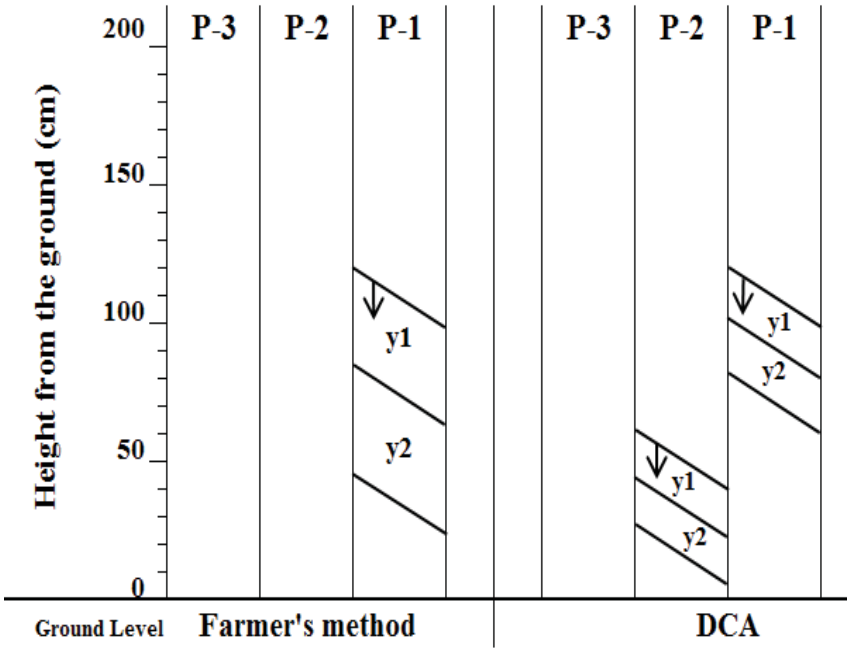

Figure 1. Tapping panel management of both tapping systems. Farmer's method was located 120cm from the ground and was tapped with one third spiral downward cut. DCA was opened on panel P-1 and P-2 at 60cm and 120cm from the ground, respectively.

Table 1. Detail of 2 tapping systems

Treatments	Opening
Farmer's method	P-1, 120cm
1/3S 2d/3 7d/7	
DCA	P-1, 60cm
1/3S 2d/3 7d/7	P-2, 120cm

Table 2. Tapping schedule of 2 tapping systems

Days	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Farmer's method	T	T		T	T		T
DCA	T-low	T-high		T-low	T-high		T-low

T indicates tapping, T-low indicates tapping on low panel P-1, and T-high indicates tapping on high panel P-2.

2.2 Data collection and data analysis

The latex yield (fresh rubber) was recorded by weighing the coagulated rubber of each sampled tree in each day when the farmer tapped the tree. The girth at 170 cm above ground of and bark consumption were measured every month. Latex yield, girth and bark consumption were analyzed by Statistix version 8 (Analytical Software, Tallahassee, Florida, USA).

3. Results and Discussions

3.1 Latex yield

The comparison of latex yield between farmer's method and DCA (Table 3) showed that the DCA produced 9% of latex yield per tapping (g tree^{-1} tapping^{-1}) and total yearly yield (Kg tree^{-1}). These results were similar to the previous studies that the DCA increases the latex yield (6,7,8,9,10,11,12). This increasing latex productivity, under DCA system, may be related to longer latex regeneration time of two alternative panels in a tree, as well as food reserve such carbohydrate reserves around the latex regeneration area (11). The monthly latex yield (g tree^{-1} tapping^{-1}) of DCA system was higher than the farmer's systems more in the rainy season (August – October) than in the dry season (November-December) in first year 2013 (Figure 2). For both treatments, there was a seasonal variation on latex yield showing in the dry season (November-December 2013) the yield increased around 1.5-2 times more than yield in rainy season. Contrary in 2014, the yield in rainy season and dry season showed a stable value, maybe it caused from the amount of rain and rainy days in 2014 (1,206 mm and 98 days) were lower than in 2013 (1,348 mm and 109 days).

Table 3. Effect of tapping systems on latex per tapping (g/tree) and yearly yield (kg/tree)

Treatment	Latex per tapping (g/tree)				Yearly yield (kg/tree)			
	Year 1	%	Year 2	%	Year 1	%	Year 2	%
Farmer's method	131.11	100	112.19	100	14.16	100	13.01	100
DCA	144.18	110	120.33	107	15.57	110	13.96	107
F-test	**		**		**		**	
CV%	12.83		9.12		12.83		9.12	

Year 1 tapped from June to December 2013. Year 2 tapped from June to October 2014. ** indicates significance at P<0.01, respectively.

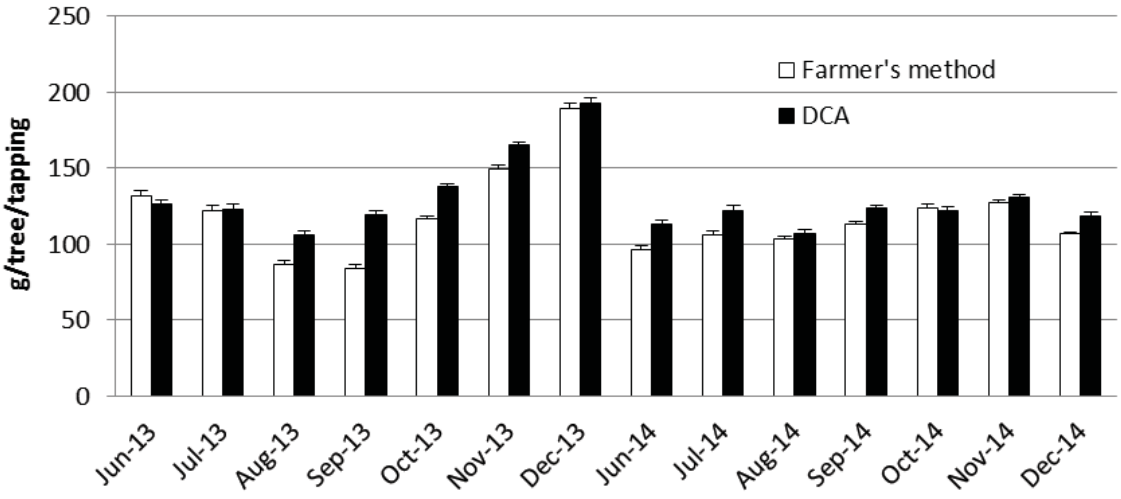

Figure 2. Effect of 2 tapping systems on the average monthly latex yield (g/tree/tapping).

Table 4. Effect of 2 tapping systems on bark consumption (cm)

	Year 1 (2013)			Year 2 (2014)		
Treatment	Total 1	Total 2	%	Total 1	Total 2	%
Farmer's method	34.53	34.53	100	47.03	47.03	100
DCA		40.92	118.48		53.93	114.67
P-1	19.25			19.76		
P-2	21.67			34.17		
F-test		**			**	
CV %		3.01			3.88	

Year 1 measured bark consumption from June to December 2013. Year 2 measured bark consumption from June to December 2014. Total 1 is total bark consumption (cm) of each cutting panel. Total 2 is total bark consumption (cm) of cutting panel P-1 and P-2. ** indicates significance at $P<0.01$, respectively.

3.2 Bark consumption

Bark consumption with the DCA tapping system showed higher bark consumption than farmer's system (18% and 14%) in 2013 and 2014, respectively (Table 4). It indicates that DCA tapping system consumed more bark than farmer's method. Similarly, Chantuma et al. (11) and Sdoodee et al. (12) reported that the total bark consumption was slightly increase due to reducing of tapping frequencies of DCA compared to the single cut intensive tapping system.

3.3 Growth

The girths in both farmer's method and DCA were not different after 1 year and half of tapping (Figure 3), but the girth increment of DCA was lower than farmer's method in the second year of tapping (2014) (Figure 4). It might be due to the competition of biomass between the growth and latex regeneration sinks (7,12); because, the DCA produced more latex than farmer's method.

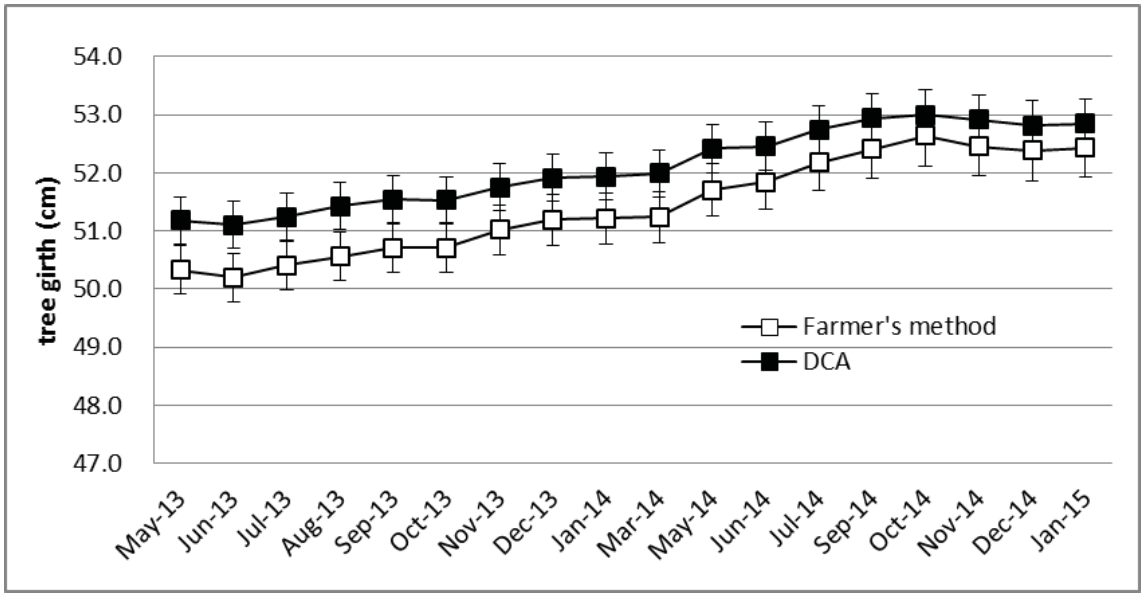

Figure 3. The changing of tree girth (cm) in 2 tapping systems.

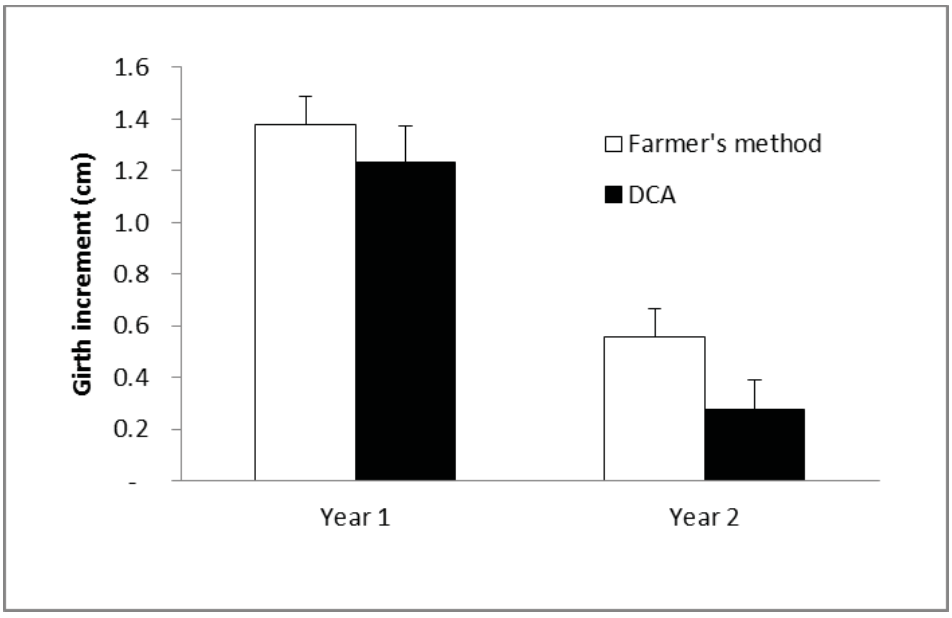

Figure 4. The trunk girth increment (cm) divided into year 1 (2013) and year 2 (2014). The error bar indicates the standard error.

4. Conclusion

In conclusion, after one and half year of tapping, DCA tapping system tested on farmer plantation, DCA tapping system can give around 9% of yield than the farmers tapping system. . A longer period of investigation is needed to assess the long term effect of DCA on yield sustainability of rubber tree before recommendation in this quite marginal area of rubber tree cultivation.

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