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AAR Jacket System: A Promising Improved System of Extracting Latex from Rubber Trees

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Early results of the AAR Jacket System are promising. The method involves tapping short cuts once in three to four days combined with application of a stimulant enclosed in a jacket attached to the bark. Marked increase in yield per tapper was obtained on most ages of rubber. Other benefits of the system are significant reduction in tapper requirement and extension of economic life of trees.

The system appears to be able to solve the current woes of the rubber industry subject to evaluation of its long-term effects on trees.

In mid-1990, Dr. M.M. Guha announced over television a new exploitation system termed 'Hypodermic latex extraction" which promised very high yields using a comparatively low labour input for harvesting latex. This has recently been published (Guha M M, Guha P R, Mathews J & Guha A, 1992).

The Rubber Research Institute of Malaysia also revealed their 'RRIMFLOW' (Sivakumaran, 1991; Sivakumaran, Chong Kewi & Ahmad Zarin, 1992) technique of extracting latex wherein latex flow is considerably prolonged leading to very high yields. 'RRIMFLOW' also uses a low labour input.

These research efforts reflect the urgency in the search for a breakthrough system for extracting rubber in the face of mounting difficulties encountered by the rubber industry.

With the rapid industrialisation in the country particularly in the last few years, the plantation industry, in particular the rubber sector has been facing an increasing shortage of labour due to the migration of workers to factories and urban centres for better wages.

Wages in the estates are computed on yield levels and price of commodity. Under the current system of exploiting rubber trees, yields have not progressed to levels which are high enough to offer workers competitive wages *vis a vis* other industries, thereby resulting in the outward movement of workers from estate.

Another problem faced by the rubber industry is the high capital cost of bringing trees into maturity. This problem however, can be alleviated by extending the economic life of the tree so that the high capital cost can be spread over a greater number of years. With a longer replanting cycle, the percentage of immature trees would also be lower, thereby giving a higher percentage of trees in production. Unfortunately the current system does

not allow trees to be exploited for much longer than 25 years.

The AAR jacket system has been developed to provide an improved method of extracting latex wherein most of the above mentioned problems faced by the rubber industry can be overcome through marked improvement in yield, reduced labour required for tapping and extension of economic life of the trees.

METHOD

The method involves tapping short cuts once in three to four days combined with application of a stimulant enclosed in a jacket attached to the bark. Stimulation at regular intervals is with improved ethephon whereby an amendment is mixed with commercially formulated ethephon, before application.

The jacket may be made of plastic or PVC. The jacketed area on the bark remains unchanged for about four to eight months or slightly longer. Repair of jacket is carried out periodically to minimise leakage.

Yield is collected in the normal manner as the conventional system of tapping.

DETAILS OF EXPERIMENTS

Details of seven experiments are given in *Table 1.* Stimulant was applied monthly in experiment E7 and four monthly in the other experiments for the jacket treatments. For the control in experiments E4 to E7, stimulant was applied monthly for eight months per year excluding the wintering months.

Experiments E2 and E7 were based on a 10 tree per plot basis replicated twice while the other experiments were based on commercial tasks which were not replicated.

RESULTS

Mean yield per tapper and yield per ha are given in *Table 2* and illustrated in *Figures 1* and *2.*

Yield per tapper

Mean yield per tapper for all jacket treatments exceeded their respective controls.

The highest percentage increase was obtained on panel HO-1 in experiments E6 and E5 where the jacket treatment was higher than their respective control by 175 and 117 per cent respectively.

The lowest response was obtained on panel BO-1 in experiment E1 where increase was only 3 per cent higher than control.

Except for panel BO-1, the increase in yield per tapper was higher for virgin bark than renewed bark.

Yield per hectare

Jacket treatments in all experiments except E1 and E3 exceeded their controls in yield per ha.

The largest increase in yield per ha was obtained on panel HO-1 in experiment E5 at 81 per cent more than control and the lowest at 4 per cent, on panel HO-2 in experiment E7.

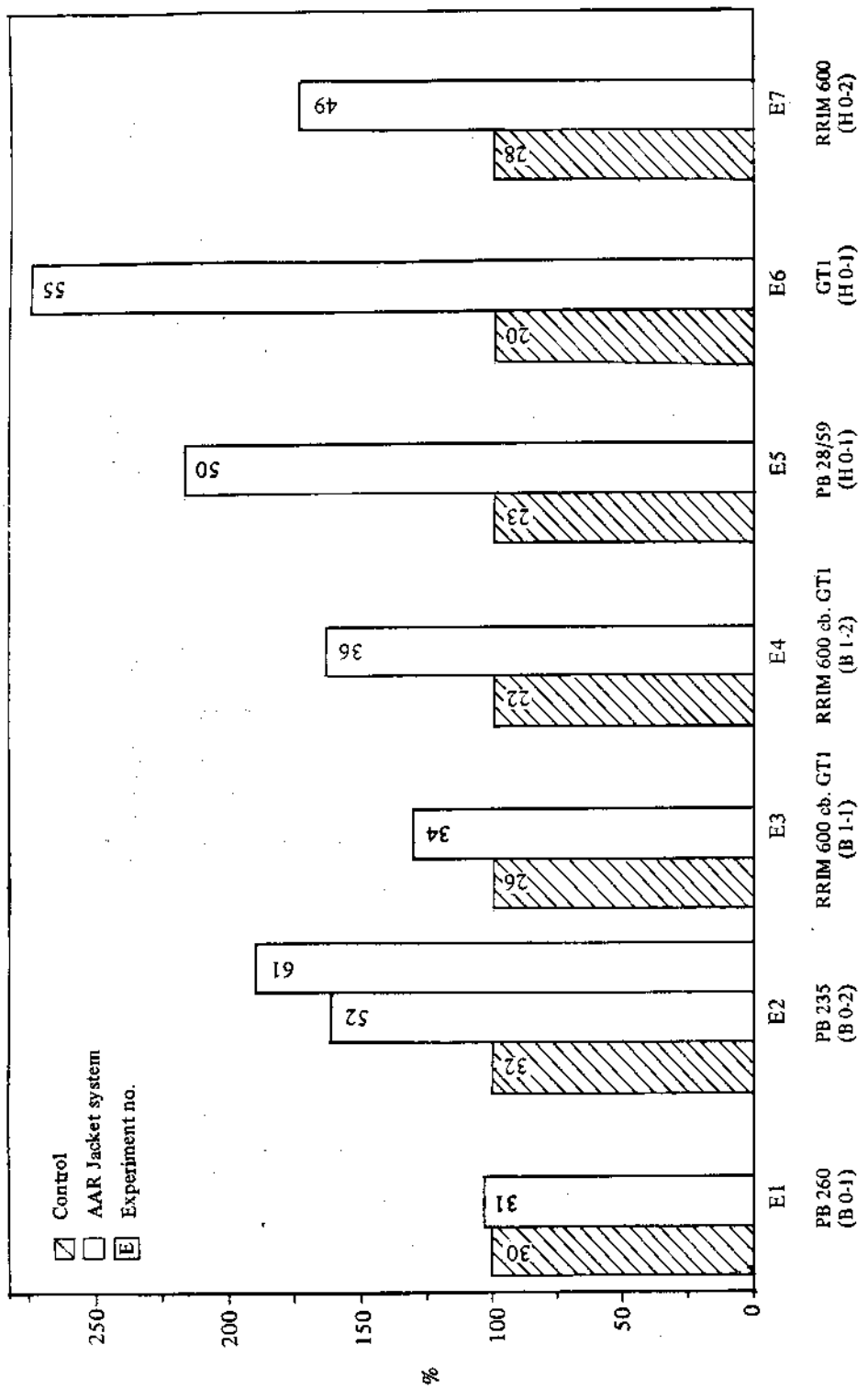
The increase in yield per ha over the control however, was much lower than in yield per tapper for the same jacket treatment.

TABLE 1.
DETAILS OF EXPERIMENTS

Experiment no.	*Cultivar*	*Year plted*	*Trees/ha*	*Treatment*			*Panel*	*Trees/task*	*Period (months)*
E1	PB 260	1986	385	Jacket system	–	1/4 Sd3 + 100 mg a.i. eth.	BO-1	650	4
				Control	–	1/2 Sd3	BO-1	580	
E2	PB 235	1981	345	Jacket system	–	1/8 Sd3 + 400 mg a.i. eth	BO-2	650	8
				Jacket system	–	1/4 Sd3 + 400 mg a.i. eth	BO-2	650	
				Control	–	1/2 Sd3	BO-2	550	
E3	RRIM 600 c.b. GT1	1973	280	Jacket system	–	1/2 Sd4 + 200 mg a.i. eth	B1-1	550	4
				Control	–	1/2 Sd3 + 2.5 % E	B1-1	550	
E4	RRIM 600 c.b. GT1	1972	280	Jacket system	–	1/2 Sd4 + 400 mg a.i. eth	B1-2	550	4
				Control	–	1/2 Sd3 + 2.5% E	B1-2	550	
E5	PB 28/59	1974	290	Jacket system	–	1/8 Sd3 + 400 mg a.i. eth	HO-1	600	12
				Control	–	1/2 Sd3 + 2.5% E	B1-1	500	
E6	GT1	1969	290	Jacket system	–	1/8 Sd4 + 400 mg a.i. eth	HO-1	600	14
				Control	–	1/2 Sd2 + 2.5% E	B1-2	500	
E7	RRIM 600	1966	265	Jacket system	–	1/8 Sd4 + 400 mg a.i. eth	HO-2	600	14
				Control	–	1/4 S + 5% E + 1/2 Sd4	HO-1/ B1-2	290	

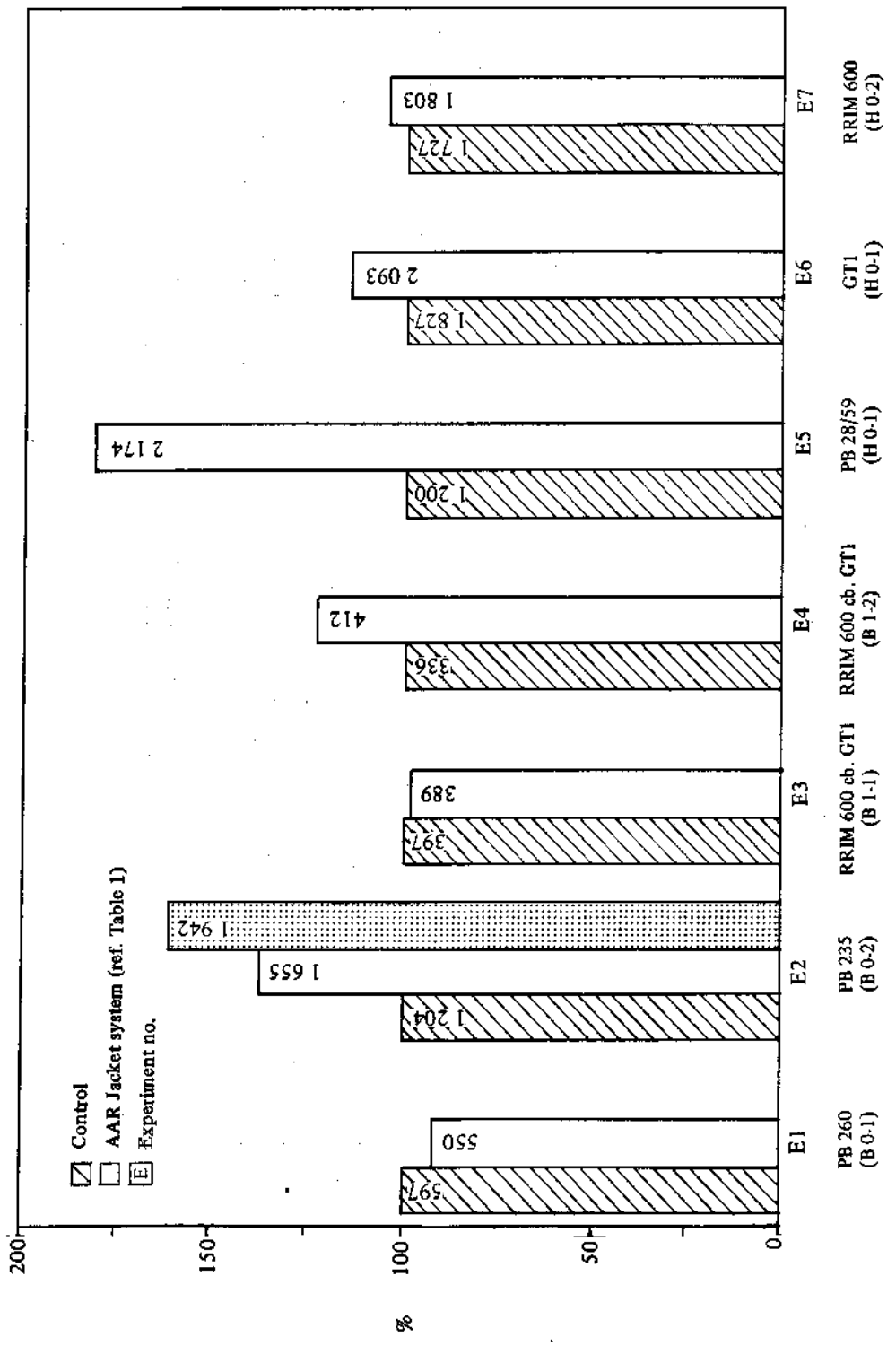
TABLE 2.
MEAN YIELD PER TAPPER AND PER HA (KG)

Experiment no.	*Clone*	*Panel*	*Treatment*	*Yield/ tapper*	*(%)*	*Mean yield/ ha*	*(%)*	*Period (months)*
E1	PB 260	BO-1	AAR Jacket system	31	(103)	550	(91)	4
			Control – 1/2 Sd3	30	(100)	597	(100)	
E2	PB 235	BO-2	AAR Jacket system	56	(162)	1 655	(137)	8
			AAR Jacket system	61	(190)	1 942	(161)	
			Control – 1/2 Sd3	32	(100)	1 204	(100)	
E3	RRIM 600 c.b. GT1	B1-1	AAR Jacket system	34	(130)	389	(97)	4
			Control – 1/2 Sd3 + 2.5% E	26	(100)	397	(100)	
E4	RRIM 600 c.b. GT1	B1-2	AAR Jacket system	36	(163)	412	(122)	4
			Control – 1/2 Sd3 + 2.5% E	22	(100)	336	(100)	
E5	PB 28/59	HO-1	AAR Jacket system	50	(217)	2 174	(181)	12
			Control – 1/2 Sd3 + 2.5% E	23	(100)	1 200	(100)	
E6	GT1	HO-1	AAR Jacket system	55	(275)	2 093	(115)	14
			Control – 1/2 Sd3 + 2.5% E	20	(100)	1 827	(100)	
E7	RRIM 600	H0-2	AAR Jacket system	49	(175)	1 803	(104)	14
			Control – 1 1/4 S + 1/2 Sd4 + 5% E	28	(100)	1 727		



Panels are indicated in bracket

Figure 1: Mean yield per tapper (kg) in the various experiments



Panels are indicated in bracket

Figure 2: Yield per ha (kg) in the various experiments

Dry rubber content (drc)

DRC values of jacket treatments were marginally lower than control *(Table 3)*. However, values were mainly above 30 units and may be considered acceptable. DRC values were generally uniform throughout the periods under review.

Comparison of cost per kg rubber, tapper's wages and labour requirement between jacket system and conventional system

Based on yield per tapper obtained and other statistics given in *Table 1*, the above was computed and results are presented in *Table 4*.

Tappers' wages were increased for jacket treatments in all experiments, the highest being experiment E2 at $23.80. Wage increase ranged from 2 to 90 per cent higher.

Owing to the high yield per tapper, cost per kg rubber for jacket treatments was below 50¢ in all experiments except E1 which was marginally higher at 50.80¢. Cost per kg rubber for jacket treatments were 1 to 31 per cent lower than for conventional tapping.

Labour for tapping was reduced for all jacket treatments due to their larger task size and lower frequency of tapping than conventional systems. The largest reduction was obtained in experiments E6 and E7 where 41 and 48 per cent respectively of conventional requirement was needed.

DISCUSSION

The major benefits of the AAR jacket system are the very high yield per tapper, marked reduction in tapper requirement and reduced bark consumption.

TABLE 3.
MEAN DRC

Experiment no.	*Clone*	*Panel*	*Treatment*	*Drc*
E1	PB 260	BO-1	Jacket system	31
			Control	30
E2	PB 235	BO-2	Jacket system	34
			Jacket system	32
			Control	35
E3	RRIM 600 c.b. GT1	B1-1	Jacket system	32
			Control	33
E4	RRIM 600 c.b. GT1	B1-2	Jacket system	33
			Control	32
E5	PB 28/59	HO-1	Jacket system	34
			Control	34
E6	GT1	HO-1	Jacket system	30
			Control	32
E7	RRIM 600	HO-2	Jacket system	31
			Control	34

TABLE 4.
COMPARISON OF COST PER KG RUBBER, TAPPERS' WAGES AND LABOUR REQUIREMENT BETWEEN JACKET SYSTEM AND CONVENTIONAL SYSTEM

Experiment no.	*Treatment*		*Yield/ tapper*		*Tappers wages*		*Cost of tapping/ kg rubber*		*Task size*		*Frequency of tapping*		*Labour for 1 000 ha.*		
	Code	*Tapping system*	*Kg*	*%*	*$*	*%*	*Cts*	*%*	*Trees*	*%*	*Daily*	*%*	*Trees /ha*	*Tapper requirement*	*%*
E1	Jacket:	1/4 Sd3	31	103	15.75	102	50.8	99	650	112	3rd	100	385	197	89
	Control:	1/2 Sd3	30	100	15.38	100	51.3	100	580	100	3rd	100	385	221	100
E2	Jacket:	↑1/8 Sd3	56	175	23.80	148	42.5	84	650	118	3rd	100	345	176	84
	Control.	1/2 Sd3	32	100	16.12	100	50.3	100	550	100	3rd	100	345	209	100
E3	Jacket.	1/2 Sd4	34	130	16.66	115	49.0	88	550	100	4th	75	280	127	75
	Control:	1/2 Sd3	26	100	14.44	100	55.5	100	550	100	3rd	100	280	169	100
E4	Jacket:	1/2 Sd4	36	163	17.40	135	48.3	83	550	100	4th	75	280	127	75
	Control:	1/2 Sd3	22	100	12.82	100	58.3	100	550	100	3rd	100	280	169	100
E5	Jacket.	↑1/8 Sd3	50	217	21.78	165	43.6	76	600	120	3rd	100	290	161	83
	Control:	1/2 Sd3	23	100	13.20	100	57.4	100	500	100	3rd	100	290	193	100
E6	Jacket:	↑1/8 Sd4	55	275	23.43	190	42.6	69	600	120	4th	75	290	120	41
	Control:	1/2 Sd2	20	100	12.28	100	61.4	100	500	100	2nd	100	290	290	100
E7	Jacket:	↑1/8 Sd4	49	175	21.41	144	43.7	82	600	206	4th	100	265	110	48
	Control:	↑1/4 S + 1/2 Sd4	28	100	14.84	100	53.0	100	290	100	4th	100	265	228	100

Note: Two latex collections when yield is high.
Mean scrap % = 25%
Price of RSS 1/kg = 241 cts.

Owing to the high yields obtained, tappers' wages were increased substantially. Average wage increase in the experiments was 43 per cent. With the higher wage level existing tappers would hopefully be induced to continue working in the estate where they may also enjoy other benefits *e.g.* free housing *etc.* which other industries may not offer. Ex-tappers may also be attracted to return to the estates.

Estate owners and the rubber industry as a whole would also benefit from the lower cost of tapping, marked reduction in labour requirement and extension of economic life of trees.

Cost of tapping per kilogram rubber was reduced by 1 to 31 per cent. If a similar yield per ha can be maintained, profitability of rubber would increase.

The most significant contribution of the system to the industry appears to be marked reduction in labour requirement. Higher labour requirement for rubber *vis a vis* oil palms has always been the bane of the rubber industry. With a potential reduction in labour to 50 per cent, of conventional requirement, a much leaner and more efficient rubber industry would emerge from its current doldrums of low rubber price and labour shortage. Substantial savings on intangibles such as lower housing, lower medical care *etc.* would be the unseen benefits from a reduction in labour force.

Bark conservation is markedly enhanced in the new system due to the short length of cut. The reduction of tapping cut length from one half to one quarter or one eighth would theoretically extend economic life of trees by two to four-fold or from 25 years to 50 years and 100 years respectively. This would reduce cost of replanting considerably. In addition, a lower percentage of the estate would be in the immature (unproductive) phase in view of the longer replanting cycle, thereby increasing the productivity of the estate as a whole.

Finally, the tapping process is less arduous, also requiring less skill because of the shorter length of cut.

In summary, the benefits of the AAR system may be enumerated as follows:—

- marked increase in yield per tapper
- significant increase in tappers' wages
- marked reduction in labour
- extension in economic life of trees
- increase in task size
- less arduous tapping process.

Whilst early results of the system are promising, long-term effects of the system on trees have to be evaluated before the system can be exploited on a large scale. Long-term trials are being carried out.

Some adverse effects and practical problems encountered are:

- apparent damage to bark in the jacket area if the same site is stimulated over a prolonged period.
- bark splitting around the jacket area due to normal bark expansion.
- periodic repair to the jacket to minimise leakage.
- damage to jackets by monkeys, squirrels, *etc.*

Currently both installation of jackets and their constant repair thereafter are likely to mobilise substantial labour. This would negate some of the advantages in respect of labour saving offered by the system. However, with refinements to the technique, labour involved in the fixing and repair of jackets would reduce.

CONCLUSION

Early results of the AAR jacket system are promising.

However, long-term evaluation of the system to study its effects on trees would be required before large scale exploitation of the system can be undertaken.

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