A SURVEY ON THE EXTENT OF ADOPTION OF SCIENTIFIC TAPPING AND PROCESSING TECHNIQUES BY RUBBER GROWERS OF VAIKOM TALUK.

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DISSERTATION
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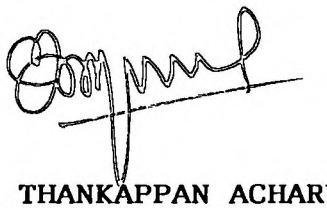
1993

DECLARATION

I hereby declare that this dissertation entitled **"A survey on the extent of adoption of scientific tapping and processing techniques by rubber growers of Vaikom Taluk"** is a bonafide record of research work done by me and that this dissertation has not formed the basis for award to me, of any degree, diploma, associateship, fellowship or other similar title of any other University or Society.



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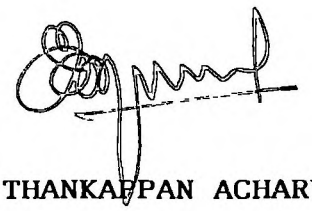

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CERTIFICATE

We, the undersigned members of the Advisory Committee of Shri M.K. Thankappan Achary a candidate for the Postgraduate Diploma in Natural Rubber Production, certify that this dissertation entitled "A survey on the extent of adoption of scientific tapping and processing techniques by rubber growers of Vaikom taluk" is a record of research work done independently by Shri M.K. Thankappan Achary under our guidance and supervision and that it has not previously formed the basis for award of any degree, diploma, associateship or fellowship to him.

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INTRODUCTION

1. INTRODUCTION

Natural rubber is nature's most versatile vegetable product, and it has multifarious uses. There is hardly any segment of life which does not make use of rubber based materials.

Natural rubber has been found in the latex of over 895 species of plants belonging to 311 genera of 79 families. Hevea braziliensis is the most important commercial source of natural rubber. It is a native of Brazil and was introduced to tropical Asia in 1876 through Kew Botanical gardens, with the seeds brought from Brazil by Sir Henry Wickham. The tree is now grown in the tropical regions of Asia, Africa and America.

Rubber as a plantation was introduced to India only in 1902. Natural rubber was until recently grown mainly in the State of Kerala and Kanyakumari district of Tamilnadu. Together these States form the traditional rubber growing region in the country. Owing to the concerted efforts in stepping up production, rubber is now grown in the States/Union Territories of Karnataka, Tripura, Assam, Meghalaya, Mizoram, Nagaland, Manipur, Goa, Maharashtra and Andaman and Nicobar Islands. Recently rubber has been introduced to Orissa, Andhra Pradesh, Madya Pradesh and West Bengal.

Rubber plantations in India are predominated by small holdings of an extent not more than 20 hectares numbering over six lakhs and they share about 83 per cent of total rubber area, and 82 per cent of the total production. Average size of a small holding is only around half a hectare.

Since the introduction of various developmental schemes by the Government of India to promote rubber plantation industry, this industry has gained remarkable achievements, unlike many other cash crops. The development made during the last five decades enabaled the country to boost up the productivity many folds. One of the main reasons attributed to this success has been the

adoption of scientific methods of cultural operations and harvesting procedures. Unlike other crops, the harvesting and post-harvest operations in rubber (here processing) determine the extent of return considerably. The quality of goods manufactured from natural rubber mainly depends upon the quality of raw rubber. A lower grade of raw rubber will degrade the manufactured goods. Therefore the manufacturers will always prefer to have only high grade sheets, though it is a bit costlier than the low grade ones. It is not in a distant future, when rubber will be in a "buyer's market" and the low grade rubber will be thrown out from the venue. Here comes the significance of high grade raw rubber.

The Rubber Board has introduced several modifications and new techniques in the case of tapping and processing. The majority of the growers have already given heed to the advice disseminated through the wide net work of the extension activities of the Rubber Board. Eventhen, a small section of growers has not yet deviated from the conventional type of harvesting and processing and has not adopted modern techniques. Therefore the inference is that there may be some bottle-necks in the modus operandi of the Rubber Board to transfer modern techniques to the planters.

This study will facilitate to bring out the extent of adoption of scientific practices and the reasons for non-adoption of the same by planters. The findings of the study are expected to help the Rubber Board and other agencies, engaged in the development of rubber among small holders, in formulting schemes and concentrating their extension efforts more effectively.

REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

Adoption of recommended package of practices is an important factor in improving production, productivity and quality of different crops. However, various other factors also influence these aspects. This has been brought out by different studies conducted on various crops.

Rajendran (1978) reported that majority of the small farmers were either low adopters or medium adopters of improved rice technology. Surendern (1982) studied the "Impact of operational research project on agriculture production" and observed that educational status and age of the farmers did not have any relation with the extent of adoption. In another study, the adoption of drought management practices in rice and coconut, Aziz (1985) observed that a majority of the respondents belonged to medium level.

Prasannan (1987) evaluated the "Extent of adoption of messages by contact farmers in T & V System" and found that more than half of the contacted farmers adopted the technical messages on paddy. He reported that the economic motivation as well as scientific orientation depicted a negative relationship, with regard to the adoption of messages on paddy cultivation. Kunchu (1989) reported that lack of proper and timely information about the schemes of the developmental agencies was a major constraint in the utilization of developmental schemes. The study also revealed that a majority of the cardamom growers (51.33 %) had medium level of awareness about the developmental schemes.

Mohanan (1991) in his "Study on the processing of latex produced by the small rubber farmers of Kidangoor village" reported that preference for planting material RRII-105 was 95 percent among the small holders. He added that majority of the small growers adopted alternate daily tapping. He also found that small farmers were unaware of the chemicals used to prevent pre-coagulation, surface darkening and mould growth and 32.7 percent of the planters were not seiving the latex before coagulation. He again found that 88 percent of farmers resorted to sun-drying

followed by kitchen drying. Nair (1992) in his study on "Adoption of scientific methods of cultivation of rubber by small growers in Mavelikkara taluk" found that the growth of rubber was quite satisfactory in the area; but indicated that the growers required more familiarisation with the package of practices of the crop. He reported that most of the rubber growers were not fully aware of scientific cultivation practices of rubber. He further added that most of the planters adopted alternate daily tapping.

Scientific method of tapping include marking the trees that have attained the required girth, at the recommended height and angle and controlled wounding of the bark. Modern methods of tapping were evolved after the invention of excision tapping in 1889 by Ridley who showed that Hevea can be continuously exploited by removing a thin shaving of tissue from the surface of a slopping groove made into the bark at regular intervals. In the present system, the shavings remove the cut end of the latex vessels that are plugged with coagulated latex from a previous tapping, thus reopening them and permitting a fresh flow of latex from the vessels; down the slopping cut and into a container. For a given clone and exploitation system, the yield of latex from a tapping mainly depends on the turger pressure in the latex vessels. After sun rise, the turgor

pressure normally falls as a result of withdrawal of water under transpirational stress reaching a minimum at 13.00 - 14.00 hours and slowly recovering. In consequence, delay in starting tapping after sun rise results in lower yield. For this reason it is usual to begin tapping at 06.00 hours (Paardekooper, 1989).

The essential steps involved in the processing of latex into ribbed smoked sheets are: (Thomas et al.,1980, Kuriakose and Sebastian 1980, Morris 1989).

1. Mixing the latex from different fields
2. Sieving the field latex
3. Determination of d.r.c
4. Standardisation of latex to 12.5 percent d.r.c and keeping the diluted latex, for 10-15 minutes to allow sediments to settle.
5. Addition of chemicals to prevent surface darkening
6. Transfer of 4 litres each of the diluted latex into clean coagulation pans.
7. Addition of specified quantity of diluted acid with stirring.
8. Removal of froath
9. Sheeting the coagulum by passing through smooth and grooved rollers.
10. Washing the sheets in pure water
11. Dipping the sheets for 15-20 minutes in a solution of paranitrophenol to prevent mould growth.

12. Dripping the sheets under shade for 1-2 hours and drying in smoke house.

13. Visual examination of the dried sheets and grading according to the standards.

MATERIALS AND METHODS

3. MATERIALS AND METHODS

Vaikom taluk in Kottayam district was chosen as the location for the study. This taluk is bounded on the West by the Vembanadu Lake and on the East by Meenachil taluk, which is considered to be the cradle of rubber plantation industry in Kerala. Vaikom taluk lies between the low land area and mid land area. The farmers of this taluk joined the rubber planting community only by the middle of this century. The majority of the population was engaged in the cultivation of coconut and seasonal crops, and only by 1960s, most of them have been attracted to rubber. Being late-comers, the planters may not be expected to know much on the scientific methods of tapping and processing.

A survey was conducted using a structured interview schedule (**Annexure-I**) for which 100 units were

selected as the sample. The units that had been planted from 1980 to 1984 were selected representing the rubber growing villages of Vaikom taluk (**Annexure-II**). All the holdings selected were planted under financial aid from Rubber Board and the planting materials used were only high yielding varieties. The details required for the selection of holdings were collected from the Regional Office of the Rubber Board at Kottayam. One hundred planters were interviewed as the respondents for the study.

To record the details on the method of tapping, the units were visited and the details regarding processing were collected either from the tapper or from the owner. The data obtained through survey were tabulated and critically analysed for drawing up conclusive results.

Details on the following aspects were collected:

1. Size of holdings
2. Planting material
3. Marking for tapping
4. Tapping system
5. Accessories for tapping
6. Panel protection
7. Time of tapping
8. Latex collection

9. Processing
10. Sheeting
11. Drying
12. Marketing

RESULTS AND DISCUSSION

4. RESULTS AND DISCUSSION

4.1 Size of holdings

The maximum number of holdings belonged to the size group of 0.51 to 1.00 hectare as could be observed from the results presented in **Table-1.** The average extent of the holdings was 0.59 hectare. The farmers in Vaikom taluk were still found to stick on to the cultivation of seasonal crops like tapioca, ginger and vegetables. The proximity to the famous vegetable markets of Vaikom taluk such as Thalayolapparambu, Kuruppanthara, Kaduthuruthy and Peruva might be the attraction for the farmers to produce vegetables. Therefore they usually set apart a portion of their land for vegetables and only the balance portion is used for rubber planting. The fragmentation of land necessitated as a result of partition among the members of the families also paved the way for formation of small sized rubber holdings.

Table-1

Size group of rubber holdings in Vaikom taluk

(N = 100)

Size group (In hectare)	Number of units	Percentage
Upto 0.25	22	22
0.26 - 0.50	26	26
0.51 - 1.00	38	38
1.01 - 1.50	11	11
1.51 and above	3	3
Total	100	100

4.2 Tapping system

It could be observed from the findings that, alternate daily tapping was more prevalent among the growers (**Table-2**). Advice from Rubber Board to tap the budgrafted trees in alternate daily system had been found accepted by 92 percent of the growers contacted. This conforms with the findings of Mohanan (1991) and Nair (1992). The Rubber Board has recently suggested to tap the high yielding clones that are succeptible to brown bast, only once in three days. But this message had been accepted only by two percent of the growers. The financial strain of the small holders and the difficulty in getting tappers for third daily tapping might be the problems that stand against adoption of the recommendation.

In spite of the constant advice from the Rubber Board, a certain percentage of planters still run to daily tapping. They are either low paid employees or belonged to financially weaker groups. Those who were adopting third daily tapping were well-to-do farmers and they had at least three tapping blocks to facilitate third daily tapping.

4.3 Marking for tapping

The results presented in **Table-3** indicated that, standard of tappability, height of opening and slope of

Table-2

Percentage of adoption of various tapping systems

(N = 100)

Tapping system	No.of units	Planting material	Percent
Daily tapping	6	BG *	6
Alternate daily tapping	92	BG	92
Third daily tapping	2	BG	2
Total	100		100

* BG. Bud grafts

Table-3

Adoption of scientific marking for tapping

(N = 100)

Particulars	Practices recommended by the Rubber Board	No.of units adopted the recommendations
Standard of tappability	50 cm girth at a height of 125 cm from the bud union	100
Height of opening	At a height of 125 cm	100
Slope of tapping cut	30°	100

tapping cut were fully in accordance with the recommendations. The reason might be that, the marking for opening of tapping is generally demonstrated by the Rubber Tapping Demonstrators of the Rubber Board, before the area is brought under tapping.

As girth of the tree is one of the factors influencing the yield per tap, it is necessary that a satisfactory rate of growth should be maintained to obtain sustained yield for a number of years. The basic aim of a good exploitation system is to extract maximum latex with minimum retardation of growth. Budded plants are regarded as tappable when they attain a girth of 50 cm at a height of 125 cm from the bud union. There is, however, no harm if the trees are opened at a higher level, i.e. 150 cm if the tapper can easily reach the height. (Sethuraj and George, 1980)

4.4 Panel protection

A perusal of the findings presented in **Table-4** would reveal that, only 22 percent of the growers were adopting panel protection measures in conformity with the recommendations. It could also be noticed that various types of panel protection measures were put to use. Some of the methods resorted to were conservative type and a few others were found to be harmful for the crop. The use of Bordeaux

Table-4

Measures of panel protection taken by the planters

Measures taken	No.of units	Percent
Fungicide + wound dressing compound	22	22
Fungicide alone	5	5
Wound dressing compound alone	21	21
Mud	2	2
Bordeaux paste	6	6
China clay	30	30
Fungicide + china clay	3	3
Lime	2	2
Non adopters	9	9
Total	100	100

paste on tapping panel is harmful as it paves the way for contamination of copper in latex. The advice to use Bordeaux paste on the branching region of the tree for the control of pink disease may be mistakenly taken as a curative measure for panel disease.

4.5 Time of tapping

Tapping in 76 percent of the units was started as early as 06.00 hours. The commencement of tapping varied from 04.00 hours to 07.00 hours as detailed in **Table-5.** To facilitate tapping before sunrise headlights were used by 16 percent of the planters. The high cost of tapping light makes the farmers to abstain from its wider use. According to Paardekooper (1989), delay in starting tapping after sun rise results in lower yield and for this reason it is usual to begin tapping at 06.00 hours. Large scale studies conducted indicate that yield decreases when trees are tapped after 7 a.m (Sethuraj and George, 1980).

These findings emphasize the need for early commencement of tapping.

4.6 Latex collection

The findings given in **Table-6** shows the details of various accessories used for the collection of crop. All of

Table-5

Time of commencement of tapping

Time	No.of units	Percent
04.00 hrs	8*	8
05.00 hrs	8*	8
06.00 hrs	60	60
06.30 hrs	11	11
07.00 hrs	13	13
Total	100	100

* Tappig in these units are done with the help of headlight.

Table-6

Accessories used for collection of latex

Particulars	No.of planters adopted the techniques	Percentage of adoption
G.I.spout	100	100
G.I.wire cup-hangers	100	100
Plastic cup	24	24
Coconut shell cups	38	38
Plastic cup + coconut shell	38	38

the planters were found using spouts made of galvanised iron sheets. The cup hanger used by them were made of G.I wire. The receptacle used was either coconut shell cups or plastic cups. Coconut shells were found used by 38 percent of the growers, while plastic cups were used by only 24 percent. In 38 percent of the cases both plastic cups and coconut shells cups were used. Although coconut shells are very cheap, they have some disadvantages; being porus they are difficult to clean, which may result in pre-coagulation also. They are generally too small to accommodate high yields.

4.7 Processing

The observations presented in **Table-7** reveal that 65 percent of the growers were in the practice of processing the latex into ribbed smoked sheets. The proximity to the latex collection centres of the Societies attracts the farmers to sell latex as such, and 35% of the growers practised it. Moreover, it eliminates problems related to processing and drying. This also helps to reduce pollution. The various steps involved in processing and findings thereon based on the study are detailed in **Table-8.**

4.7.1 Use of anti-coagulants

None of the planters was using anti-coagulant to prevent precoagulation of latex, as indicated from the results shown

Table-7

Details on the mode of post harvest handlings of crop

(N = 100)

Total number of growers processing the latex into sheets	-	65
Total number of growers selling the latex as such	-	35
Total	-	100
Percent of growers processing the latex into sheets	-	65
Percent of growers selling the latex as such	-	35
Total	-	100

Table-8

Extent of adoption of various steps of scientific method for processing

(N = 65)

Particulars	Practices recommended by the Rubber Board	No.of units adopted the recommendations	Percent of adoption
1. Prevention of pre-coagulation	Use of anticoagulant	Nil	0.0
2. Sieving	Using 40 mesh sieve	18	27.7
3. Bulking	Blending of latices from various fields	Nil	0.0
4. Determination of drc	Using metrolac	Nil	0.0
5. Standardisation of latex	To bring down the d.r.c 12.5 percent	5	7.7
5.1. Sedimentation	Keeping the diluted latex for 10-15 minutes to settle the sediments	Nil	Nil
6. Addition of chemical to prevent surface darkening	Sodium bisulphite	1	1.5
7. Transfer of 4 litres each of diluted latex to clean coagulation pans	Coagulation pans made of Aluminium kept in very hygenic condition.	25	38.5
8. Coagulation	Acid coagulation	65	100.0
8.1. Addition of acid	Formic acid @ 4 ml per kilogram of sheet for same day sheeting.	47	72.3
8.2. Dilution of acid	One percent concentration (Formic acid)	Nil	0.0
9. Washing of coagulum	Washing in water	Nil	0.0
10. Sheeting	With smooth and grooved rollers	65	100.0
11. Washing of wet sheets	In clean water	22	33.8
12. Prophylatic treatment against mould growth	Dipping in 0.05 percent solution of Para Nitrophenol for 10-15 minutes.	Nil	0.0
13. Drying	Drying in smoke house	6	9.2

in Table-8. The use of anti-coagulant was not essential as the small growers probably got time to process the latex before it got precoagulated.

4.7.2 Sieving of field latex

Sieving of latex is necessary to remove the dirt and extraneous matter in the latex either from collection cup or from atmosphere. Dirt is not permissible in high grade sheets and hence this has to be removed before processing. It is recommended to sieve the latex with a sieve of 40 mesh. Majority of the planters were not using the appropriate strainers. Sieves of 40 mesh were found used only by 27.7 percent of the farmers while another 55.4 percent were using 20 mesh (**Table-9**) and the rest 16.9 percent were not in the practice of sieving. Most of the planters who managed to produce RMA-4 sheets were found using sieves of 40 mesh. While 61.1 percent of the users of 40 mesh got higher grade sheets, only 30.6 percent was the result when sieves of 20 mesh were used. The larger the mesh size, the higher the size of dirt particles present in the sheet. Presence of large dirt particles will degrade the sheet. Therefore it is clear that sieves of higher mesh (smaller holes) are essential for the production of higher grade sheets.

Table-9

Use of various standards of sieves and effect on production of high grade sheets

Mesh number	Number of units where sieves were used/not used	Percent of units where sieves were used/not used	Percent of units using sieves out of the total no.of users	Number of units getting RMA-4	Percent of units getting RMA-4
20	36	55.4	66.7	11	30.6
40	18	27.7	33.3	11	61.1
Non-users	11	16.9	-	Nil	
Total	65	100.0	100.0	22	--

4.7.3 Bulking

Bulking of latex; which is the mixing of latex collected from various fields, was not done by the farmers. Bulking is required to get uniformity in the physical properties of dried sheets. Large size utensils or tanks are required for this process and this difficulty might have led the farmers not to adopt this practice.

4.7.4 Determination of Dry Rubber Content (d.r.c)

Dry rubber content or d.r.c is defined as the number of grams of dry rubber present in 100 grams of latex. The dry rubber content in the latex varies from 30-40 percent according to variety, season, age of trees, time of tapping and intensity of extraction. Usually in plantations d.r.c is determined in hydrometric method using metrolac. Determination of d.r.c is necessary to calculate the requirement of water for standardisation of latex, quantity of acid for coagulation and the quantity of chemicals to be added to prevent surface darkening and mould growth. But the growers of Vaikom taluk were not following this practice.

4.7.5 Standardisation of latex

Field latex that may contain 30 to 40 percent of d.r.c has to be diluted by adding water to bring down the d.r.c to 12.5 percent for processing into ribbed smoked sheets.

Dilution of latex to this level, not only helps to reduce the hardness of coagulum but also removes certain amount of water soluble non-rubber substances present in the latex. Hard coagulum results in increased thickness of sheets. The non-rubber particles, if present in the sheet, will provide favourable environment for microbial growth, which in turn, degrade the sheets. Over-dilution of latex may result in formation of porous coagulum. Out of the 65 farmers contacted for this study only five of them were found diluting the latex to the recommended level (12.5 percent d.r.c) and this would work out to 7.7 percent (**Table-10**). Majority of the rubber growers were settled down in the midland area where they have to depend upon well water for processing. The difficulty in drawing large quantity of water for processing might have discouraged them to use sufficient quantity of water. The use of less quantity of water also helps to reduce the number of coagulation pans. Moreover in 72.3 percent of the cases, processing was done by paid tappers. They may not be much interested to strictly follow the recommended package of practices; as their remuneration was alleged to be insufficient. This was evidenced from the production of RMA-4 sheets. Where processing was done by paid tappers only 27.6 percent units produced RMA-4 sheets as against the figure of 50 percent where processing was done by owners themselves (**Table-11**). Keeping the latex for 10-15 minutes for sedimentation was not

Table-10

Dilution of latex - practices followed

(N = 65)

Dilution	No.of growers following the practice	Percent of growers following
Over dilution	4	6.1
Correct dilution	5	7.7
Under dilution	56	86.2
Total	65	100.0

Table-11

Details of RMA-4 sheets obtained when processing was done by owners/tappers

Processing done by	Total number of units where processing is done	Percent units where processing is done	No.of units getting RMA-4	Percent of units getting RMA-4
Owner	18	27.7	9	50
Tapper	47	72.3	13	27.6
Total	65	100.0	22	

in practice in all the units surveyed (Table-8). They may be in a hurry to finish up the work at the earliest and thus they are not adhering this aspect.

4.7.6 Addition of chemicals to prevent surface darkening

Sodium bisulphite is recommended to prevent surface darkening. But this practice was found adopted by only one planter out of the 65 contacted. Same day sheeting (which had been followed by 87.6 percent) was more prevalent among the planters (Table-8), and hence the chance for surface darkening was average; even when sodium bisulphite was not used. Surface darkening was noticed on sheets machined on the next day. And this may be the reason why the growers do not adopting this practice. The findings of Mohanan (1991) was in line with this.

4.7.7 Coagulation pans

All the growers contacted for the study were using coagulation pans made of Aluminium. Aluminium utensils are preferred as they are comparatively cheap, easy to clean and do not have any chemical action with diluted acid or any other chemicals used for processing.

High level of cleanliness of the utensils and hygenic condition of the surroundings were insisted to avoid

contamination with dust and prevent microbial growth which may lead to degradation of sheets. Only 38.5 percent of the farmers who came under the purview of this study were maintaining such conditions (Table-8).

Though the quantity of diluted latex taken was more or less four litres, the weight of sheets produced ranged from 500 grams to 800 grams, as against the advice of the Rubber Board to produce sheets of 500 grams, which are easy to dry. However, 20 percent of the planters had given heed to the advice as had been evidenced from the findings given in **Table-12.** It could also be noted that a large number of the farmers were making sheets of 600 grams. The probable factor that encourages the planters to produce sheets of higher weight is that they can reduce the number of coagulation pans and minimise use of water.

4.7.8 Coagulation

Coagulation is the de-stabilisation of latex by some means with a view to recover rubber from it. Coagulation of latex can be done using coagulants like acids, metalic salts and alcohols. Though sulphuric acid and phosphoric acid are used in certain cases, the popular ones used for ribbed smoked sheet production are acetic acid and formic acid; because they produce slow and uniform coagulum and the residue removed by washing the coagulum during sheeting or are volatalised during

Table-12

Average weight of sheets produced by the planters

Weight in grams	No.of units	Percent
500	13	20.0
600	27	41.5
700	22	33.9
800	3	4.6
Total	65	100.0

drying. Formic acid is preferred as its action is quick and possesses light antiseptic properties. The action of acetic acid is slower and therefore it may lead to bubble formation in sheets due to bacterial action. Catalyst AC (Sulphamic acid) also could be used.

Coagulation of latex by the addition of acid is due to neutralisation of charge on the protective layer of proteins, surrounding the rubber particles. The rubber particles that exist in a colloidal suspension, surrounded by negatively charged protein layer, loose colloidal nature when the protective layer gets neutralised by the possitively charged ions of the coagulant, and form a coagulum comprising a network of rubber particles with a certain amount of entrapped serum.

4.7.8-1 Quantity of acid required for coagulation

All of the planters interviewed were using formic acid as it was easily available. The recommended dozage of formic acid for the same day sheeting is 4 ml per kilogram of dry rubber. Even then, a few percentage (6.2) of the planters were using less than the required doze and 21.5 percent were adding overdoze. As per the findings noted in **Table-13**, majority of the planters (72.3 percent) were using the recommended quantity. Under dozage of acid gives way for bacterial growth resulting in the formation of pinhead bubbles

Table-13

Dosage of acid used by the growers

Dozage	Number of units	Percent
Under doze	4	6.2
Over doze	14	21.5
Recommended doze	47	72.3
Total	65	100.0

on the dried sheets, and loss of rubber due to incomplete coagulation. Overdoze gives rise to formation of hard coagula which are difficult for machining and drying. Tackiness of sheets can also be due to over dozage of acid.

4.7.8-2 Dilution of acid

The acid is recommended to be added to the diluted latex in one percent concentration, as it is helpful for even distribution in the latex. But the planters who were contacted for this study were using acid at varying concentration from 2.5 percent to 8 percent as had been observed from the findings given in **Table-14.** Generally adopted method for dilution was to make up 30 ml of formic acid to 750 ml by adding water (which will give 4 percent concentration) and use for 7.5 kilograms of sheets (for same day sheeting). The probable reason may be that it can avoid the use of large containers required to prepare and keep diluted acid.

4.7.9 Washing of coagulum

The coagula after drawing out the serum are washed with water before feeding to sheeting rollers to remove the excess acid and chemicals. But this step was not practised by any of the planters (Table-8). This might be because of the non-availability of enough water.

Table-14

Dilution of acid (Formic acid) used by the planters

Dilution (Percent)	Number of unit	Percent
2.5	2	3
4	42	65
6	5	7
6.6	6	10
8	10	15
Total	65	100

4.7.10 Sheeting

The washed coagula are passed through a set of smooth rollers to squeeze out the entrapped serum and finally passed through marking rollers. On the marking rollers grooves are set to imprint corrugation marks on the sheets for increasing the surface area to improve the rate of drying and to help easy separation of sheets from one another.

Though out of the 100 farmers interviewed, 32 had their own sheeting rollers; only 25 of them were processing the latex into sheets; thus the percentage is worked out to 38.5 (**Table-15**). This finding is in conformity with Mohanan (1991) who noted only 36.21 percent of the contacted farmers of Kidangoor village (Meenachil taluk) and Nair (1992) who observed only 18 percent of the growers in Mavelikkara taluk had their own rollers.

Majority of the planters have not procured sheeting rollers and this may be because of their high cost. As far as a small grower is concerned, it is convenient for them to use the neighbour's rollers on a levy of two days crop, rather than purchasing one set at a high price.

4.7.11 Washing of wet sheets in water

After sheeting, the sheets have to be thoroughly washed in clean water to remove the residual content of acid and

Table-15

Possession of rubber roller set

Number of growers interviewed	-	100
Number of growers in possession of roller set.	-	32
Percent of growers who possessed roller set.	-	32
Number of growers possessed roller set out of those who were processing latex.	-	25
Percent of growers possessed roller set out of those who were processing latex.	-	38.5

sodium bisulphite; failing which it will lead to hygroscopic sheets. This condition will favour microbial growth and delayed drying.

Only 34 percent of the growers contacted were in the practice of washing the sheets (Table-8). Reluctance to use much water might be the main reason for non-adoption.

4.7.12 Prophylatic measure against mould growth

The wet sheets are advised to be kept dipped in 0.05 percent solution of para nitrophenol for 10-15 minutes to prevent mould growth on sheets. None of the planters were following this practice. Either the unawareness about the chemical or the high price of the same might be the reasons for non-adoption. Mould growth was not seen where the sheets were sold once in a week. A perusal of the findings presented in **Table-16** would reveal that 50 percent cases of fungal growth were in cases where sheets were sold once in a month, 51.7 percent was the rate among the planters who used to sell sheets when requirement of money arose, and the maximum cases of mould growth observed among the planters who deferred sale for high price to come. But at any stages of transaction, fungal growth would spoil the sheets especially during wet season. Therefore educating of the farmers in this aspect is inevitable to improve the quality of sheets.

Table-16

Mode of sale of rubber and the extent of mould growth on dry sheets

Mode of sale	Number of units	Percentage of units	Number of cases where mould growth noticed	Percent of cases of mould growth
Weekly	16	24.6	Nil	Nil
Monthly	2	3.1	1	50.0
When requirement of money arises	29	44.6	15	51.7
When high price comes	18	27.7	10	55.5
Total	65	100.0	26	

4.7.13 Dripping and drying

After treating with para nitrophenol, the sheets have to be kept for dripping in shade for 1-2 hours before they are transferred to smoke house. Most of the planters contacted for this study were in the practice of hanging the sheets for dripping overnight and on the next day they were subjected to drying in open air. The various methods adopted by the planters for drying the sheets could be seen from the findings presented in **Table-17.** All of the planters who used to dry sheets in smoke house got RMA-4 sheets, whereas those who resorted to sun drying alone did not get any high grade sheets. Sun drying followed by smoke house drying and kitchen drying helped to produce 83.3 percent of RMA-4; whereas kitchen drying after sun drying gave only 22.7 percent high grade sheets. Therefore the inference is that sun drying alone is not helpful for high grade sheet production.

As sun drying results in surface oxidation and accumulation of dirt from atmosphere, the sheets get downgraded. Sun drying was found to be considered as a must among the planters, though the duration varied from unit to unit as indicated in the observations given in **Table-18.**

The percentage of high grade sheets was found to have a negative trend of relation with the number of days they are subjected to sun drying. Among the growers who practised sun

Table-17

Various methods adopted for drying of rubber sheets

Methods	Number of units	Percent	No.of units getting RMA-4	Percent of cases getting RMA-4
Sun drying + Kitchen drying	44	67.7	10	22.7
Kitchen drying alone	6	9.2	5	83.3
Sun drying alone	7	10.8	0	Nil
Smoke house	2	3.1	2	100.0
Sun drying + Smoke house	6	9.2	5	83.3
Total	65	100.0	22	

Table-18

Sun drying of sheets done by the planters with duration and percent of high grade sheets produced

Duration	Number of units followed sun drying	Percent of units resorted to sun drying	Number of units getting RMA-4 sheets	Percentage of success
1	7	10.8	7	100.0
2	16	24.6	6	37.5
3	20	30.8	Nil	0.0
4	9	13.8	Nil	0.0
5	4	6.2	Nil	0.0
Total	56		22	

drying , maximum percent of RMA-4 sheets was produced by those who resorted to sun drying only for one day. The growers who indulged in sun drying for 3-5 days could not produce high grade sheets.

4.8 Marketing

Out of the 65 planters those who were processing the latex into sheets, 44.6 percent of them were disposing the sheets when requirement of money arose (Table-16). Weekly disposal of sheets was followed by 24.6 percent of the planters and 3.1 percent were selling the sheets once in a month. The planters those who depended on rubber as their main source of income were not able to wait for higher price to come in the market due to financial strain.

Marketing of rubber sheets produced by the planters was done either through Rubber Producers' Societies or licenced dealers. Majority of the planters (92.3 percent) was selling the produce through licensed dealers as had been evidenced from the findings given in **Table-19**. The planters prefer the licensed dealers to societies as the latter is paying the price either weekly or monthly. Certain dealers are also in the habit of financing the planters in advance especially during lean period of production.

Table-19

Marketing of raw rubber

(N = 65)

Agency	No.of units	Percent
Rubber Producers' Society	5	7.7
Licensed dealer	60	92.3
Unlicensed dealer	Nil	-
Stragglers	Nil	-
Total	65	100.0

Out of the hundred units surveyed 35 units were disposing the crop as latex to the co-operative societies. Those who were selling the latex were getting the price of RMA Lot (ungraded sheets) plus Re.0.50 per kilogram of dry rubber content in the latex.

A perusal of the findings presented in **Table-20** would reveal that 49.2 percent of the planters were getting price for their produce according to the paper price, and another 44.6 percent were getting less than the paper price. However 6.2 percent were getting a higher price than the paper price. This is because of the reason that their consignment might have contained a certain percentage of higher grade sheets.

Table-20

Price at which the rubber is sold by the planters

(N = 65)

Price	No.of units	Percent
At paper price	32	49.2
More than paper price	4	6.2
Less than paper price	29	44.6
Total	65	100.0

SUMMARY AND CONCLUSIONS

5. SUMMARY AND CONCLUSIONS

A study was conducted among the small growers of Vaikom taluk to elucidate the extent of adoption of scientific tapping and processing techniques by the rubber growers. One hundred holdings, representing different geographicala regions in the taluk and different size groups were selected and the farmers as well as the tappers were interviewed, with the help of a structured interview schedule.

The average size of the holdings was 0.59 hectare. The cultural operations as per the scientific methods were fully adopted by the growers as these areas had been planted and maintained under the financial aid, technical advice and close watching of the Rubber Board up to the level of

harvesting.

As regard to tapping, cent percent adoption of modern techniques was observed in the case of standard of tappability, height of opening, slope of tapping cut and time of tapping. In the case of systematic panel protection measures, only 22 percent and in the case of rainguarding only six percent of farmers adopted the recommendations.

Alternate daily tapping was more prevalent. Efforts have to be intensified to persuade farmers to change over the tapping system to third daily, in the case of high yielding clones that are succeptible to brown bast. Adoption of modern practices like use of tapping head light and rainguarding is gradual eventhough the financial strain of the planters stands in the way of adoption.

The study further revealed that 24 percent of the planters have fully and 38 percent partially adopted plastic cups as receptacle for latex collection. This is a sign of good rate of adoption of modern techniques. But the postharvest operations were found to be done according to the will and wish of the planters. Therefore deviations from the scientific method of processing was evident at a higher rate.

Use of anti-coagulant was not much prevalent among the planters as revealed by this study. Pre-coagulation had

never been a problem for the small holders as they used to get sufficient time to process the latex before it got pre-coagulated.

The extent of adoption of scientific processing techniques was not seen to the extent of adoption observed in the case of tapping procedures. The percentage of adoption of certain important operations required for the production of high grade sheets like bulking, standardisation of latex, sedimentation, dilution of acid to the correct level, washing of coagulum and use of PNP was found to be zero. These lapses in processing stand in the way of production of high grade sheets by the small growers.

From the study it was found that majority of the contacted farmers were interested to produce high grade sheets if they were assured of a price according to the grade. So it is evident that the planters are satisfied by the ungraded sheets as they are not sure of getting higher price for higher quality sheets. Surprisingly it has been observed that, the percentage of grade sheets are more (50 percent) in cases where the processing is done by owners themselves, as against 27.6 percent, where processing is done by paid tappers. The reason for this difference is nothing but the careful handling of the crop and added cleanliness

when it is done by owners themselves. It has also been revealed that the minimum requirement for the production of at least RMA-4 sheets are cleanliness, sieving of latex with 40 mesh sieve, washing of wet sheets in clean water, drying of sheets either in smoke house or in chimney (kitchen smoking). Sun drying for one or two days prior to smoke house-drying or kitchen drying was found adequate. Sun drying for 3 or more days completely dilapidated the quality of sheets; as a result of which the sheets would fetch a low price. All these factors emphasize the need for more extension support in the case of postharvest operations in rubber plantations.

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ANNEXURES

ANNEXURE-1

Interview schedule for survey

1. Name and address of Grower :

2. Location of the Estate :

3. Date of Inspection :

4. Area owned by the Grower
   (a) Mature : .....Hect.
   (b) Immature : .....Hect.

5. The extent of the area came under tapping in each year : 19.. = ...Hect.
   19.. = ...Hect.
   19.. = ...Hect.

6. Tapping system :

7. Who tap trees : Owner/Relative/Paid tapper

8. If paid Tapper, the details of wages. :

9. Details of Production
   (a) Average daily production: during peak period.
   (b) Average daily production: during lean period.
   (c) Total production in Kg. : Sheet .....Kg.
   Sheet .....Kg.

10. Distance from the holding to the place of processing. :

11. Time taken to complete tapping. :

12. Time given for dripping :

13. Who does the collection of latex. : Tapper/Owner

14. Type of collection cup	:	Plastic/Coconut shell/ Any other.
15. Is there pre-coagulation	:	No/Yes
16. Details of panel protection measures taken.	:	
17. Type of processing being followed.	:	Sheet/Ammoniated field latex/field latex
18. Dilution of latex - Details of percentage of d.r.c.	:	
19. Nos.of sieve used (Mesh)	:	20/40/60
20. Time taken for bulking	:	.....hrs.
21. Type of coagulation Pan	:	Aluminium/Plastic/Any other
22. Who does the processing	:	Tapper/Owner/Relatives/ Children.
23. How much diluted latex is taken to make a sheet.	:	
24. Average weight of a sheet (Dry)	:	
25. What acid is used for processing.	:	
26. Details of concentration of acid and quantity added to per kg.of sheet.	:	
27. Does the grower own rollers	:	
28. Sheeting is done on the same day/next day.	:	Same day/Next day
29. Duration for dripping	:	
30. The dripping is done in	:	Shade/Open air

31. Does the planter use any chemicals to prevent

    (a) Pre-coagulation :

    (b) Fungal growth :

    (c) Dis-coloration :

32. If the answer is 'Yes' give details. :

33. Where the sheets are kept for dripping. : Roof/wirehanger/Coir hanger/wooden reaper.

34. Details of drying : In smoke house/kitchen

35. Duration of sun drying if followed. :

36. If the planter owns smoke house :

    a) Whether it is built according to the specifications of the Rubber Board. : Yes/No

    b) Capacity :

    c) Fuel used :

    d) Time taken for complete smoking (days). :

    e) The grade of sheets

    RMA 1 :

    2 :

    3 :

    4 etc :

37. Details of sale of Rubber To whom it is sold

    a) RPS

    b) Licensed dealer

    c) Unlicensed dealer

    d) Stragglers

38. The price at which Rubber is sold
    a) Paper price :
    b) More than paper price :
    c) Less than paper price :

39. Are you keeping the sheet for long periods? : Yes/No

40. If Yes, does storage affect quality of sheets? : Yes/No

41. Is the planter getting price according to grade? : Yes/No

42. From where the planter got the present method of processing.
    a) Traditional knowledge :
    b) Neighbouring Rubber growers. :
    c) Rubber Board :

43. Whether he is aware of the benefit of making quality sheets. : Yes/No

44. Has he ever attended processing campaign conducted by Rubber Board. : Yes/No

45. Main source of income of the grower. :

46. Does he think that Rubber is a beneficial crop. : Yes/No

47. If you are assured of a price according to the grade you make, are you interested in improving the quality of sheets. : Yes/No

48. Whether he is satisfied by the present rate. : Yes/No

49. What rate he finds it profitable. (per kg.) :

50. Mode of sale of Rubber

Daily/weekly/monthly/ whenever requirement of money arises/when high price comes. :

51. Does he wish to know more about scientific rubber cultivation. : Yes/No

ANNEXURE-II

Map of Vaikom taluk showing the rubber growing villages