A STUDY ON THE PROCESSING OF LATEX PRODUCED BY THE SMALL RUBBER FARMERS OF KIDANGOOR VILLAGE

BY

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DISSERTATION

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D E C L A R A T I O N

I hereby declare that this dissertation entitled "A study on the processing of latex produced by the small rubber farmers of Kidangoor Village", 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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CERTIFICATE

We, the undersigned members of the Advisory Committee of Shri K.G. Mohanan, a candidate for the Post Graduate Diploma in Natural Rubber Production, certify that this dissertation entitled "A Study on the processing of latex produced by the small rubber farmers of Kidangoor Village", is a record of research work done independently by Shri K.G. Mohanan 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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A remarkable feature of the Indian rubber plantation industry is the existance of small holdings and big estates side by side. A small holding is statutorily defined as a plantation having an area upto 20.23 hectares. But the average size of an Indian small holding at present is only about 0.50 hectares. Due to various socio-economic reasons rubber plantation is fast becoming a small farmers' business; something like a backyard cultivation in India. Small growers account for 82.5 per cent of the total

440,000 hectares of rubber area. Small growers play a very vital role in the production of natural rubber and so it is essential that simultaneous with quantitative improvement, qualitative improvement of the rubber marketed by them should also be ensured.

Latex obtained from Hevea brasiliensis can be processed into various marketable forms like ribbed smoked sheet, ammoniated field latex, latex concentrate, crepe rubber and technically specified block rubber or it can be sold as field latex itself. Small rubber growers in this country usually process their latex into ribbed sheets as this happens to be the easiest process. These sheets are of different grades fetching varying prices. For grading of sheets, they are visually examined, by holding against light, for any of the defects like bubbles, specks, blisters, dirt, stickiness, mould growth or rust and discolouration. The various grades of sheet rubber in India are RMA 1, 2, 3, 4 and 5 (Rubber Board, 1991). A mixture of these different grades of rubber is purchased by the dealers as ungraded sheet rubber or what is locally known as 'lot rubber', at a lower price than RMA-5.

The present study is aimed at finding out the various methods adopted by the small rubber farmers of Kidangoor village for processing the latex produced in their holdings into a marketable form. The conventional method adopted by small farmers in general, is to process their latex into sheet rubber and the quality of sheets produced by them is generally inferior to those produced by large estates. It is also proposed to study whether the small farmers of Kidangoor village are following the various steps in the production of sheet rubber, as recommended by the Rubber Board or how far they are deviating from the standard recommendation. The problems faced by them in this regard will also be studied and possible solutions suggested.

The study would give an insight into the various processing operations undertaken by the small farmers of Kidangoor village and the required corrective steps can be taken to improve the quality of sheets produced by them.

The findings of this study is expected to help the Rubber Board and other agencies engaged in the development of rubber small holder sector, in formulating schemes and concentrating their extension efforts more efficiently in this field.

REVIEW OF LITERATURE:

Processing of latex into ribbed smoked sheets involves various interconnected operations. The important steps are:

1) mixing of latex from different fields before preconguletion sets in

2) straining the field latex

3) determination of dry rubber content

4) dilution of latex to bring down the dry rubber content to 12.5% and keeping for some time for the sediments to settle

5) transfer of 4 litres each of the diluted latex into aluminium coagulating pans which are kept on a level surface

6) addition of specified amount of dilute acid with stirring and removal of froth

7) sheeting the coagulum by passing through smooth and grooved rollers

8) washing the sheets in pure water

9) dripping the sheets under shade for 3-4 hours and then drying in a smoke house

10) after drying, the sheets are examined visually and graded according to accepted standards and then packed into bales of known weight (Rubber Board, 1991).

Generally the quality of rubber sheets produced by the Indian small holders is not so good and they are sold usually as 'ungraded' sheets at a relatively low price. By improving the quality of sheets, the growers would get a better price thereby increasing the net return from the plantations. Unny and Jacob (1972) have reported that most of the small holders market their produce in the form of smoked sheets and the price realised by them therefore depends mainly on the quality of sheets produced. In Malaysia, Thailand and Sri Lanka also most of the small holders make their latex into sheets, some are dried in smoke house and sold as ribbed smoked sheets; but most of them are sold off as unsmoked sheet. The quality of sheets produced by small farmers usually fall below that of estates. Down-grading of the product starts from collection of latex using contaminated spouts, cups and other vessels (Blencowe, 1989). Due to the presence of dirt, fungus and other impurities, small holder

rubber in India fetches a low price and most of it goes to the market as low grade rubbers. To achieve uniformity in processing and to improve the quality of rubber, small holders should be advised to follow standard procedures (Gopalakrishnan et.al. 1977).

Coagulation of latex by the addition of acid is due to neutralisation of charge on the rubber particles. The latex proteins carry negative charge and have an isoelectric point near 4.7. Hence the p^H has to be brought to this level for smooth coagulation (Le Bras, 1957). The use of Bromo Cresol Green indicator which changes colour according to p^H has been reported from Sri Lanka. The Bromo Cresol Green (B.C.G.) paper is best used by skimming the surface of the paper strip over latex. Only one side will be coated with latex and the colour indicating the p^H, will be visible on the other side (Heinisch, 1959).

Many defects in sheet rubber in Sri Lanka were traced to precoagulation of latex, too long a dripping time, worn out and hand operated machinery or inadequate smoking and drying (Karunaratne, 1967).

Occurrence of bubbles of different types like pin head bubbles to large bubbles of upto 2.5 cm

dimeter is a defect noticed in rubber sheets. This can be due to the activity of microorganisms, acidity of the serum in coagulation of latex, high drying temperature and low initial drying humidity (RRIM,1962).

Another defect noted on rubber sheets is rust. The word rust is used to describe a brownish deposit or more usually a thin invisible film which breaks and becomes visible when the sheet is stretched or scratched. The colour of rust varies from dark to white or light yellow. Hellendroon (1919) showed that rust is formed due to the action of microorganisms. Small holders' rubber are often heavily coated with rust due to loose stacking or hanging of wet sheets in confined spaces for long periods. Rust formation can be prevented by maintaining drying conditions which do not allow microorganisms to grow and also by killing the microbes using chemicals like Paranitrophenol (RRIM 1962). Paranitrophenol (PNP) also prevents mould growth on stored sheet surface. The quantity of PNP required is 0.1 per cent on d.r.c. and it has to be added to latex as a 1 per cent solution (Barney, 1968).

Even though colour of sheets is not known to have any influence on the technological properties

of rubber, so long as the visual system of grading prevails, discoloured sheets fetch a lower price. The various types of colour variations found in rubber sheets are due to yellow pigmentation, enzymic darkening, deposition of fuel combustion products, temperature effects during drying, contamination by foreign matter and microbial discolouration (RRIM, 1962). Discolouration or surface blackening of coagulum is observed in curtain cases. Enzymes of the polyphenol oxidase type catalyses the oxidation of phenols and aminophenols present in latex by oxygen from the air to orthoquinons which react with amino acids and proteins present in latex to form a product resembling Melanin which on oxidation imparts a black colour to the coagulum. This discolouration can be prevented by the use of Sodium bisulphite which undergoes preferential oxidation (Peries, 1970).

An island wide survey carried out in Sri Lanka to identify the problems in the processing of sheets experienced by small holders has revealed that those are:

1) the presence of dirt
2) uneven thickness
3) defects in smoking
4) the presence of air bubbles, blisters etc.
5) the formation of mould
6) unsatisfactory marketing facilities.

Precoagulation is one of the reasons for lowering the quality of sheets especially during rainy season. Very few small farmers in Sri Lanka use sodium sulphite and sodium carbonate as anticoagulants (Tillekeratne and Coomaraswamy, 1983).

The standard thickness of sheets is fixed at 3 mm. A 20 per cent reduction in thickness of rubber sheets reduces the drying time by about 35 per cent. Thinner sheets produced by more intense machining are not only easier to dry but also less susceptible to bubble and blister formation (RRIM, 1960).

Water used in the preparation of sheets influence their quality to a great extent. It is estimated that 30 to 50 litres of water is required for processing 1 kg of latex into sheet. Generally it is stated that pure clean water is required which should be without colour and bad smell, and should not contain too high a concentration of salts especially those of Fe, Mn and Ca. The water used for rinsing and cleaning however can be slightly coloured or opalescent, but it should be free of any suspended matter (Heinisch, 1959).

Drying of sheets in a smoke house has definite advantages. It is quicker than sun drying and does not cause oxidation by ultraviolet radiation. (Thomas, 1971). A survey conducted by Nair (1984) revealed that only about 10 per cent of the small holdings have smoke house facilities and the rest of the farmers resort to sun drying and kitchen smoking of sheets. A survey conducted in Madapolly village has revealed that sheets are mostly sold as lot i.e. without grading to local private dealers (Nair, 1988).

In the pattern of marketing small holder rubber in Sri Lanka, approximately 85 per cent sell their rubber to private dealers. However, the average prices received from private dealers were lower than those from Group Processing Centres (GPC) and Commodity Purchase Depots (CPD). Sometimes the difference in the average price received from the CPD and private trade was as high as Rs.2.90 per kg (RPM de Zoysa, 1983).

MATERIALS AND METHODS

Kidangoor village of Meenachil taluk, Kottayam District, Kerala was chosen for the study. Altogether there are 2846 rubber units in the village comprising an area of 2097 ha. The average extent of a holding comes to 0.736 ha. The map of Kidangoor village is given in Appendix I. With a view of getting proper geographical representation from all areas, the village was divided into 5 regions as shown below:

a) Kidangoor, Kunnamoor region
b) Kondalloor region
c) Kadaplamattom, Maridam region
d) Champileva region
e) Charpunkal region.

Samples at the rate of 12, 20, 15, 9 and 4 respectively were selected from all the five regions said above. From regions having more extensive geographical area and more number of rubber holdings, more samples have been selected. Thus, a total of 60 units (2.1%) have been visited. Selection of samples has been done in such a way as to represent different size groups.e Of the sampled holdings, 31.67 per cent represented holdings having an area of less than 0.50 hectare, 43.33 per cent between 0.51 and 1.00 hectare 23.33 per cent between 1.01 and 2.00 hectares and 1.67 per cent > 2.00 hectares. The processing conditions of all the 60 units have been studied in detail by personally visiting the holdings and interviewing the owners and tappers. For proper and systematic assessment of the processing methods adopted, a detailed questionnaire was prepared including all aspects of processing from the collection of latex to marketing. A sample questionnaire is given in appendix 2. Details such as type of planting material, method of tapping, different steps adopted in processing, storage of processed product, marketing etc. were collected. The data obtained from the questionnaire were critically analysed and tabulated for drawing up conclusive results.

RESULTS AND DISCUSSION

I. SALIENT FEATURES OF THE HOLDINGS:

I.1 SIZE OF HOLDINGS:

The extent of the holdings selected for the study ranged from 0.12 to 3.87 hectares. Out of the 60 units selected, the maximum number of 26 i.e. 43.33 per cent belong to the size group of 0.50 to 1.00 hectare. Nineteen units amounting to 31.67 per cent were having a size $\leq$ 0.50 hectare. Holdings between 1.01 to 2.00 hectares numbered 14, accounting for 23.33 per cent. There was only one holding having an extent >2.00 hectares. The average extent of the holdings studied

comes to 0.78 hectare (Table 1). The average land availability in India at present is about 0.20 hectare per head only and it is likely to go down to 0.15 hectare by 2000 A.D. The high pressure on land which necessitated fragmentation of estates has resulted in the smaller size of holdings in the area.

I.ii. PLANTING MATERIAL:

The study revealed that the most popular planting material among the selected planters of Kidangoor village is RRII 105. Out of the 60 units studied, 48 numbers were planted exclusively with RRII 105. This accounts for 80 per cent. Preference for RRII 105 was found to be the highest among the smallest size group of planters. About 95 per cent of planters in the ∠ 0.50 hectare group, planted RRII 105. Preference for RRII 105 as the planting material was decreasing with the increase in size of the holding (Table 2). This may be because farmers having larger areas give more consideration to Brown bast resistance, wind sway and drought resistance etc. of other varieties.

I.iii. TAPPING SYSTEM:

Half spiral alternate daily (S/2 d/2) is the recommended system of tapping rubber trees.

TABLE 1. SALIENT FEATURES OF SAMPLE HOLDINGS

Size Group	No. of holdings.	Percentage.	Total rubber area.	Tappable area.	Average size of a holding.
∠ 0.50 ha.	19	31.67	6.02 ha.	5.20 ha	0.32 ha.
0.51 to 1.00	26	43.33	18.91 "	15.05 "	0.73 "
1.01 to 2.00	14	23.33	18.19 "	11.49 "	1.30 "
>2.00 ha.	1	1.67	3.87 "	2.46 "	3.87 "
Total	60	100	46.99	34.20 "	0.78 "

TABLE 2 : PLANTING MATERIAL USED

Sl.No.	Size group of holding.	Total No.of holdings.	Holdings where RRII 105 is planted.	Percentage
1	$\leq$ 0.50 ha.	19	18	94.74
2	0.51 to 1.00 ha	26	21	80.77
3	1.01 to 2.00 ha	14	9	64.28
4	$>$ 2.00 ha.	1	-	-

Majority of planters in the size groups ∠ 0.50 hectare and 0.51 to 1.00 hectare, followed S/2 d/2 system. In spite of constant advice from the Rubber Board to tap the trees only once in 2 days, a certain percentage of farmers still resort to daily tapping (S/2 d/1). Contrary to expectations, it was observed that as the size of the holding increases, the number of farmers who follow S/2 d/1 system of tapping also increases. Percentage of farmers who follow S/2 d/1 system of tapping is given in table 3. In the size group above 2.00 hectares only one unit has been studied and there the tapping system followed is S/2 d/2.

Considering the high susceptibility of RRII 105 to the incidence of brown bast, the Board is now recommending tapping of such trees, only once in 3 days. So, concerted efforts have to be made to persuade the farmers to follow the recommended system of tapping.

I.iv. TYPE OF PROCESSING:

Of the 60 units studied, 48 numbers, i.e. 80 per cent processed their latex into ribbed sheets, 3.33 per cent sold latex as such and the remaining 16.67 per cent resorted to both sheet production and sale of latex as such.

TABLE 3 - TAPPING SYSTEM FOLLOWED, USE OF PARANITROPHENOL, WASHING OF SHEETS AND D.R.C. ESTIMATION IN DIFFERENT SIZE GROUPS OF HOLDINGS

Sl. No.	Size group of holdings	Percentage of farmers who follow		Percentage of farmers who use Paranitro-phenol	Percentage of farmers who wash their sheets	Percentage of farmers who follow D.R.C. estimation of latex
		S/2 d/1 system of tapping	S/2 d/2 system of tapping			
1.	∠ 0.50 hectare	15.79	84.21	0	0	0
2.	0.51 to 1.00 hectare	23.08	76.92	0	0	0
3.	1.01 to 2.00 hectare	57.14	42.86	0	0	0
4.	2.00 hectare	0	100.00	0	0	0

Generally people preferred to sell latex as such because it fetches more price than the ungraded sheet rubber and needs no processing. But this would be possible only if the latex collection centre is near to the plantation. Distance from the holdings to the collection centre which increases the transportation expenditure is the limiting factor for sale of latex by small farmers.

II. PRE-COAGULATION:

Pre-coagulation denotes the partial coagulation of latex that takes place on the tapping channel, inside the collection cup or in the collection bucket etc. before it is actually desired. This is also called spontaneous coagulation which takes place due to the action of fatty acids formed as a result of the activity of bacteria which feed on the carbohydrates present in latex. Pre-coagulation is not a desirable phenomenon because it results in loss of rubber as scrap and also it deteriorates the quality of sheets produced.

In the present study, the holdings have been classified into 3 groups viz. (1) units where

latex is collected 1 to 2 hrs. after tapping (2) between 2 and 3 hrs. and (3) more than 3 hours after tapping. Maximum pre coagulation (29.4%) was observed in the case of holdings where the time lapse between tapping and collection of latex is 2 to 3 hrs. Whereas in the case of holdings where latex is collected 1 to 2 hrs. after tapping, pre coagulation is observed only in 25 per cent cases (Table 4).

Normally it could be expected that incidence of precoagulation would be more in the case of units where latex is collected 3 hrs. after tapping. But in the present study no correlation has been found between time taken for collection of latex after tapping and precoagulation. It appears that cleanliness of collection cups, spouts etc. is an important factor that causes precoagulation.

Precoagulation can be prevented by addition of chemicals like sodium sulphite, ammonia, formalin etc. None of the farmers interviewed in the study were found to use any chemical to prevent precoagulation. This is due to ignorance about the use of these chemicals. Tillekaratne and Coomaraswamy (1983) have reported that in

TABLE 4 : PRE COAGULATION

Sl. No.	Time lapse between tapping and latex collection.		Units in which Pre coagulation			
			Observed		Not observed	
	Period	No.of Units	No.of units	%age	No.of units.	%age
1	1 to 2 hours	36	9	25	27	75
2	More than 2 hrs but upto 3 hrs.	17	5	29.41	12	70.59
3	Above 3 hours	7	1	14.28	6	85.72

Sri Lanka non use of anticoagulants is one of the reasons for lowering the quality of sheets as it results in precoagulation especially during rainy seasons. Only a small proportion of small holders in Sri Lanka use sodium sulphite.

III. SIEVING OF LATEX:

The purpose of sieving latex is to remove foreign matters and small clots of latex coagulum. Sieving is done first through a 40 mesh sieve and then through a 60 mesh sieve.

From the present study it was found that 32.75 per cent planters did not sieve their latex at all. Out of the 39 planters who strained latex, no one was found to have been using 2 sieves of 40 and 60 mesh size. Only one planter used a 40 mesh sieve. Majority of the farmers (87.18%) were using strainers of mesh size 10-20. One planter has resorted to sieving the latex through coconut husk kept in a coconut shell with a hole at the bottom (Table 5).

It appears that by properly straining the latex through sieves of the specified mesh size alone, the quality of small holder sheets could be improved to a great extent. So the small

TABLE 5: SIEVING OF LATEX PRIOR TO PROCESSING

Material used for sieving	No.of Units	Percentage
10-20 mesh sieve	34	87.18
25 "	2	5.13
30 "	1	2.56
40 "	1	2.56
Coconut husk	1	2.56

farmers should be encouraged to use at least 40 mesh sieves. The Rubber Board is now taking steps in this direction by issuing stainless steel sieves to small farmers through Rubber Producers' Societies at subsidised rates.

IV. D.R.C. ESTIMATION:

Dry rubber content or D.R.C. is defined as the number of grams of rubber present in 100 gms of latex. DRC of field latex is usually in the range of 30 to 40 per cent. It may vary according to season, age of trees, tapping intensity etc. There is a standard laboratory method for determining the drc. But usually in plantations a rapid hydrometric method using a metrolac is employed for determination of drc. In processing latex into sheet rubber, drc estimation is important for diluting the latex to the specified level of drc (12.5%) before coagulation. But none of the farmers covered in the study were found to have been following the practice of estimation of drc (Table 3). This is mostly due to ignorance about the technique and in a few cases non availability of the instrument to measure drc.

V. DILUTION OF LATEX:

Dilution of latex before coagulation is aimed at (1) standardisation of drc (2) increase in the rate of sedimentation of heavier impurities (3) production of a soft coagulum easier for rolling and (4) removal of water soluble non rubber constituents like carbohydrates, protein decomposition products, mineral matter etc. The drc of the diluted latex is to be maintained at 12.5 per cent.

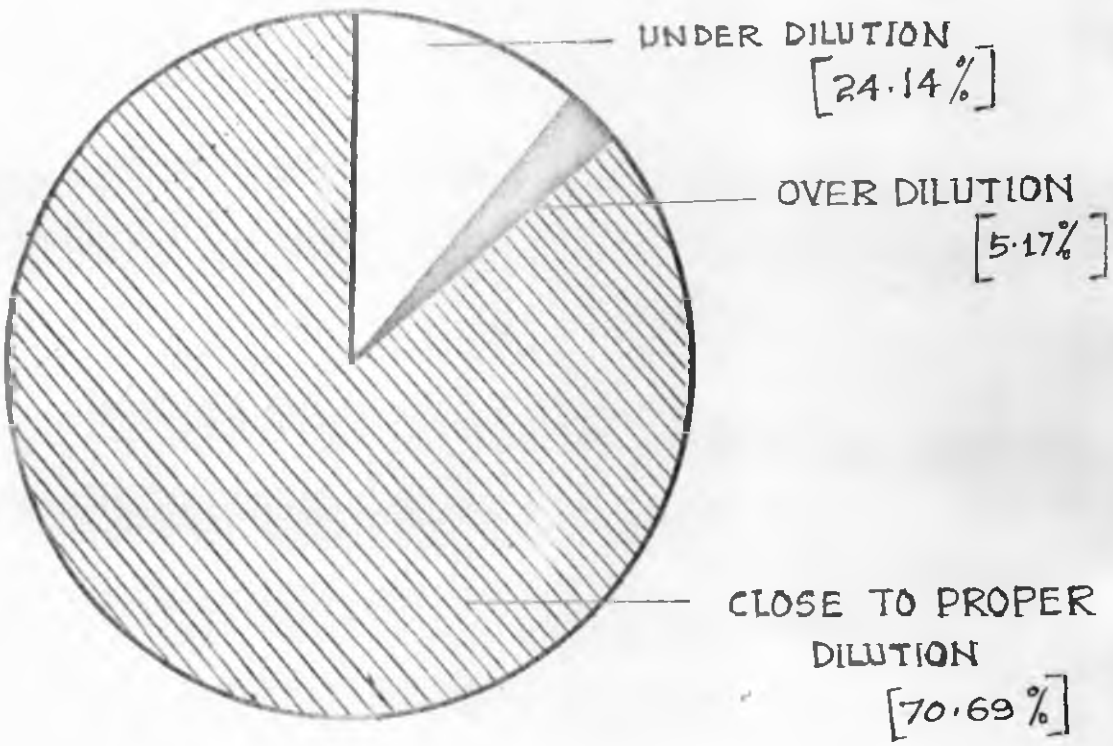
The present study shows that invariably in all the units dilution of latex is being practised. It is found that 70.69 per cent of the planters follow 1:1 dilution which is close to the recommended practice (12.5% drc). Farmers who follow less than 1:1 dilution i.e. under dilution, comes 24.14 per cent. Over dilution i.e. more than 1:1, is practised by 5.17 per cent of the farmers (Fig. 1)

VI. SURFACE BLACKENING:

Surface blackening of the coagulum is caused by enzymic oxidation of phenolic compounds present in latex and this can be prevented by the use of sodium bisulphite. The use of this chemical imparts good colour to the sheets.

FIGURE .1

A Schematic Representation of the Dilution of Latex Adopted by Small Holders



In the present study the holdings have been classified into 2 depending on sheeting of the coagulum i.e. whether sheeting is done the same day of tapping or on the next day. In cases where same day sheeting is practised surface blackening was observed on sheets in 18 units amounting to 45 per cent. In the next day sheeting group, surface blackening is observed in 6 units i.e. 33.33 per cent (Table 6). None of the farmers interviewed was found to use sodium bisulphite to prevent surface blackening. This is because they do not know about it. The use of this chemical has to be popularised.

VII. COAGULATION:

All except one farmer covered by this study used Aluminium pans to coagulate the latex. The volume of diluted latex taken in one coagulation pan by the farmer was sufficient enough to produce a sheet of around 750 gms dry weight, even though Rubber Board advises to produce sheets of 500 gm dry weight which are easy to dry.

For coagulation of latex many acids like Formic Acid (HCOOH), Acetic acid (CH_3COOH) and Catalyst Ac (Sulphamic acid) could be used. In all the sample holdings studied, the acid used

TABLE 6 - SURFACE BLACKENING ON COAGULUM

Same day shooting				Next day shooting			
Surface blackening observed		Surface blackening not observed		Surface blackening observed		Surface blackening not observed	
No. of units	Percentage	No. of units	Percentage	No. of units	Percentage	No. of units	Percentage
18	45	22	55	6	33.33	12	66.67

was found to be H COOH. This is because of the easy availability and the bactericidal property of Formic acid. Costwise also Formic acid is comparable to the other acids because the quantity required per sheet is less.

i) DOSAGE OF ACID:

For a sheet of 750 gms dry weight 3 ml of formic acid is required for same day sheeting and 2.25 ml for next day sheeting. Majority of the holdings surveyed resorted to same day sheeting. The quantity of acid used ranged from 0.8 ml to 9.13 ml per sheet. Based on the quantity of acid used, the holdings have been classified into 3 as shown below:

a) Those who use acid in a range close to the recommended dose.

b) Those who use acid below the range.

c) Those who use acid above the range.

Table 7(a) shows that only about 17 per cent of the farmers use acid close to the recommended range. Majority of the planters (about 52%) used acid at a lower dose.

ii) DILUTION OF ACID:

For uniform mixing of acid in the entire latex in the coagulation pan, HCOOH should be

TABLE 7(a) - DOSAGE OF ACID

Quantity of Formic acid used per sheet of about 750 gms dry weight	No. of units	Percentage
Close to the recommended range i.e. 2.5 to 3.5 ml per sheet	10	17.24
< 2.5 ml	30	51.72
> 3.5 ml	18	31.04
Total:	58	100.00

diluted at 0.5 per cent concentration. But only 1.73 per cent of the planters were found to have been using acid at a concentration below 1 per cent. Percentage of farmers who used acid at a concentration between 1.01 to 3 per cent was 6.89 and 91.38 per cent of the planters used acid at a concentration above 3 per cent. (Table 7(b)

From the above, it is clear that small rubber farmers still do not have a clear understanding about the quantity of acid to be used per sheet and also the extent of its dilution. They dilute the acid in convenient bottles and test the concentration by tasting. Addition of acid also is not uniform on all days. If water is not available in plenty, people resort to a lower dilution of latex and in such cases proportionate reduction in the quantity of acid was not made.

Too much acid given rise to a hard coagulum which is difficult for machining and drying and too little acid results in a milky serum entailing a loss of rubber and sheets of inferior quality. Stickness of sheets is also observed if the acid used is more. So, both extremes should be avoided to get a final product of good

TABLE 7(b) - CONCENTRATION OF ACID

Sl.No.	Concentration of HCOOH	No. of units	Percentage
1	Upto 1 per cent	1	1.73
2	Between 1.01 to 3 per cent	4	6.89
3	More than 3 per cent	53	91.38
	Total:	58	100.00

quality. Occurrence of bubbles on sheets is very much dependent on the amount of acid used for coagulation; the criterion is not the actual amount of acid used but the final acidity of the serum. If latex is coagulated at p^H 4.5 to 4.8, fewer bacteria survive and there is much less possibility of continued bacterial activity in the wet coagulum giving rise to bubble formation (RRIM, 1962).

The study shows that efforts have to be intensified to educate the farmers on the correct dosage and concentration of acid.

VIII. SHEETING:

Out of the 38 sample farmers who produced sheet rubber, 21 persons, accounting for 36.21 per cent own sheeting rollers of their own. The remaining 63.79 per cent rely upon other farmers for sheeting their rubber. This is a better picture when compared with Vakathanam village where it is reported that only 4 per cent rubber farmers possess own rollers of their own (Nair, 1984). It is believed that the subsidy scheme for purchase of rollers, introduced by Rubber Board in recent years has helped more farmers to acquire their own rollers.

IX. WASHING OF SHEETS:

Washing of freshly machined sheets is very essential to remove the serum, excess acid and other water soluble impurities. Providing piped water supply above the rollers will enable washing of the coagulum along with sheeting. But this arrangement was not found existing in any of the rollers in the surveyed holdings. None of the farmers covered by this study practised washing of their sheet even after machining (Table 3). The importance of this step in the production of good quality sheets is not found to have been clearly understood by the farmers. Oily appearance of dry sheets can also be avoided by washing the sheets. Washing of sheets is not very expensive; but at the same time it will improve the quality of sheets to a great extent (Kurialose et.al. 1980). This point has to be impressed upon planters through intensive efforts.

X. PARANITROPHENOL TREATMENT:

Presence of paranitrophenol in the sheets prevents mould growth occurring on dry sheets exposed to humid conditions. Although the usual practice is to soak the sheets in a 0.1 per cent solution of Paranitrophenol (PNP) for about 20-30

minutes, before dripping and drying, it could conveniently be added to the diluted latex at a dose rate of 0.1 per cent on d.r.c. added as 1 per cent solution. None among the farmers interviewed for this survey used PHP (Table 3). This is mostly due to ignorance about the chemical and its uses. Education of the farmers on this aspect is needed to improve the quality of small holders' sheets.

XI. DRIPPING:

Freshly milled sheets exude water by a process called 'syneresis' and this will continue for about 2 hrs. This is to be done under shade, (Kuriakose et.al. 1980) All the farmers were found to have been dripping their sheets under shade.

XII. DRYING OF SHEETS:

Drying of sheets is done by smoking in specially designed smoke houses whose inside temperature is controlled in the range of 45 to 60° c. It takes 4 to 5 days for drying of the sheets in a smoke house. Apart from drying of sheets, smoking has the additional advantage that the creosotic material present in the smoke get deposited on the sheets and prevent mould growth.

In actual practice none of the small farmers interviewed own a smoke house nor they use a hired

smoke house. However, 88 per cent of the farmers resorted to partial smoking by keeping the sheets after partial sun drying in kitchen hearth thereby exposing to smoke (Table 8). Even though this practice partially improves the quality of sheets they would be far inferior to the sheets dried in a smoke house. In 7 holdings even partial smoking was not done. They resort to complete sun drying which gives chances for surface oxidation of sheets due to exposure to ultraviolet radiation.

It was also observed that while sun drying, 8 farmers exposed the sheets to sun by laying them on ground. This practice makes the sheets very dirty and contaminated, thus down grading the quality.

An awareness has to be created among the small farmers to keep the sheets clean and dry them properly.

XXII. GRADING AND MARKETING:

Grading of sheets is not done by the growers because they lack the expertise to undertake grading. Some small holders are not even aware of the practice of grading. In the present survey it was found that only in 3.33 per cent cases the dealer has graded the sheets brought to

TABLE 8 - DRYING OF SHRIMP

Type of drying	No. of units	Percentage
Complete sun drying	7	12.07
Partial sun drying followed by kitchen smoking	51	87.93

him for sale by the farmers. About 93 per cent of the farmers sold their sheets as ungraded rubber (figure 2). This may be due to the fact that the farmers are unaware of the importance of grading and require creating awareness about this.

XIV. PRICE REALISATION:

The price furnished in newspapers was fully realised in the case of 12 farmers accounting for about 21 per cent. Fortytwo units (72.42%) realised price at a rate less than what is published in papers, by 10 to 30 ps per kg. Four farmers got more than paper price (table 9). Paper price or more than that is given by a dealer when he feels that the sheets brought by the farmers contain more percentage of RSS 4 or higher grades. Here, the benefit of grading goes to the dealer only and not to the grower who produces good quality sheets. It has been observed that about 28 per cent of the farmers who produced a higher proportion of better quality sheets and obtained paper price or more than that could achieve this, simply by undertaking all the processing operations in a clean atmosphere and also by drying the sheets without being contaminated by dirt etc.

XV. TYPE OF LABOUR:

In rubber plantations tapping and processing are either done by family members themselves or

Figure - 2. Grading of Rubber sold by small farmers

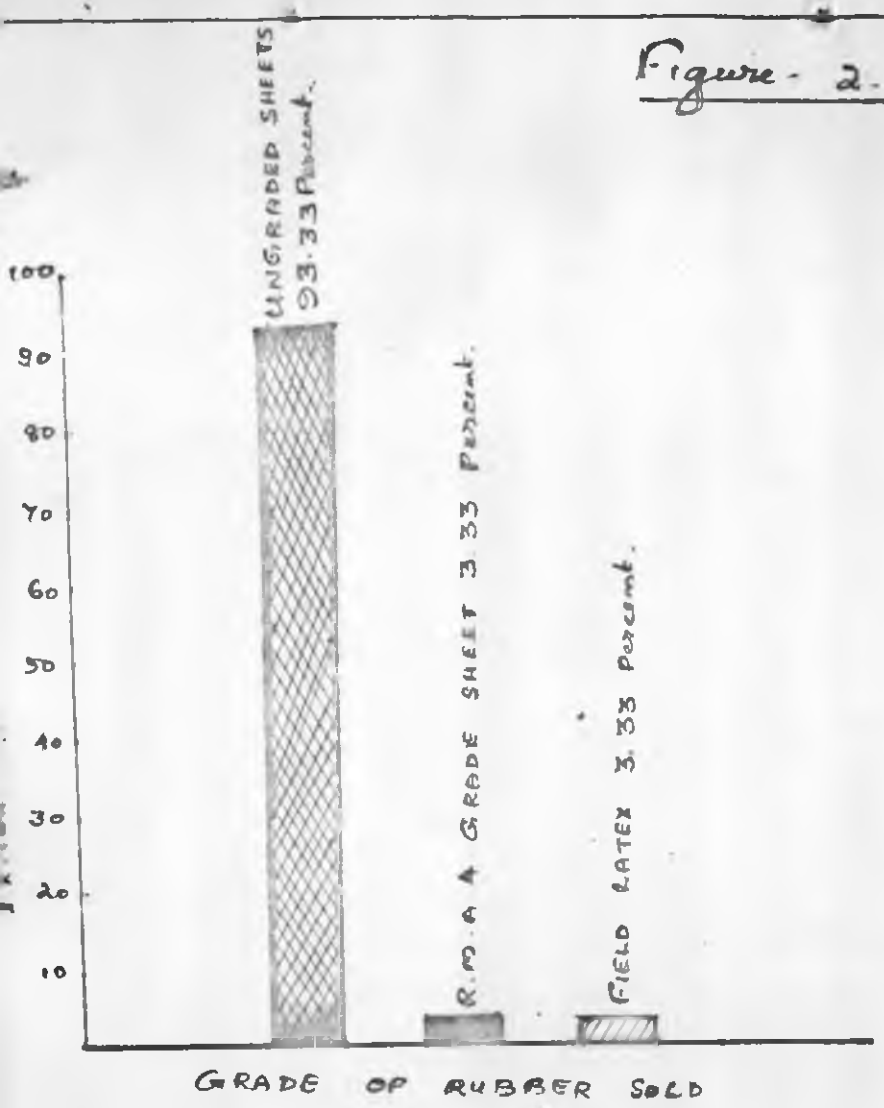


TABLE 9 - PRICE OF RUBBER OBTAINED TO THE FARMERS

Price obtained for sheets	No. of units	Percentage
Paper price	12	20.69
More than paper price	4	6.89
Less than paper price	42	72.42

by hired labour. Engagement of family labour for tapping and processing was found to be the maximum (42.1%) in the case of the smallest size group of planters who own ≤ 0.50 ha (Table 10). This may be because the number of trees to be tapped in their case is very less and the owner may not be financially sound enough to employ a tapper. Non availability of a tapper for tapping small areas on alternate daily basis which does not provide him full time employment may be another reason why small farmers have to do tapping and processing by themselves.

TABLE 10 - TYPE OF LABOUR FOR TAPPING AND PROCESSING

Sl. No.	Size group	Total No. of holdings	Hired labour engaged for tapping and processing		Family labour engaged for tapping and processing	
			No. of units	Percentage	No. of units	Percentage
1.	< 0.50 Hect.	19	11	57.89	8	42.1
2.	0.51 to 1.00 Hect.	26	19	73.09	7	26.92
3.	1.01 to 2.00 Hect.	14	10	71.43	4	28.57
4.	> 2.00 Hect.	1	1	100.00	-	-

SUMMARY AND CONCLUSIONS

A study was conducted among the small rubber growers of Kidangoor village, in order to understand the various operations undertaken by them in processing their latex into marketable forms. Sixty holdings representing different geographical regions and different size groups were selected and the farmers and tappers were personally interviewed, with the help of a questionnaire. The observations and conclusions that emerged out of the study are summarised below.

Preference for the planting material RRII 105 was maximum (99%) among the smallest group of planters who own less than 0.50 ha. Tendency for

daily tapping was found to be maximum (57.14%) among the farmers having rubber area between 1.01 to 2.00 ha. Efforts have to be intensified to persuade the farmers to change the tapping system to once in 3 days in the case of clones like RRII 105 which are more susceptible to brown bast.

If a latex collection centre is opened near their holdings, most of the farmers prefer to sell their latex as it is, because it is easier and fetches a better price than ungraded sheet rubber.

Presently most of the small farmers are unaware of the use of chemicals like sodium sulphite which prevents pre-coagulation, sodium bisulphite in preventing surface blackening of sheets and para-nitrophenol in prevention of mould growth on stored sheets. The use of these chemicals has to be popularised among the small farmers.

Surprisingly it has been observed that 32.7 per cent small farmers did not sieve their latex before coagulation. Even in the case of those who followed the practice of sieving, the mesh size of sieve used is far from sufficient to retain smaller foreign particles present in latex.

Only a very small percentage of farmers are using coagulants near to the recommended concentration

and dosage. With regard to dilution of latex prior to coagulation, about 71 per cent of the farmers undertook this operation in a near satisfactory manner. About 64 per cent of the farmers do not own rollers for sheeting the coagulum and nobody owns a smoke house for curing the sheets. Washing of sheets during or after rolling is not done by anyone. Majority of the farmers (88%) resorted to sun drying followed by kitchen smoking for curing their sheets, while 12 per cent of the farmers did only sun drying. Engagement of hired labour for tapping and processing recorded an increasing trend with the increase in the size group of holdings.

The above factors together are responsible for the inferior quality of sheets produced by the small growers. Majority of the farmers sell their rubber as ungraded sheets and about 72 per cent get price at a reduced rate than what is published in news papers every day. About 28 per cent growers get paper price or more than that because their rubber contained a higher proportion of better quality sheets. Such farmers could achieve this, simply by maintaining cleanliness in all the processing operations and drying of sheets. The benefit of whatever small quantity of higher grade rubber produced by the small farmers now goes to

the dealers who in turn sell it gradewise to the actual consumers/large scale dealers.

Three reasons become evident from the study for the inferior quality of sheets produced by the small growers of Kidangoor village.

1) Proper cleanliness is not maintained in the tapping, collection and processing of latex and drying of sheets.

2) Lack of proper technical know-how in the case of farmers as well as tappers for producing high quality sheets.

3) Lack of a proper marketing system which ensures gradewise purchase of sheets produced by the small farmers at the village level.

It may be noted here that the Rubber Board has launched an intensive educational drive from 22nd April to 17th May, 1991 to train the small farmers and tappers on the correct techniques of production of quality rubber sheets by organising about 4000 demonstrations covering 100,000 growers and explaining to them stage by stage the various steps involved in the process.

Such educational efforts to inculcate quality consciousness among the small farmers have to continue for many years to come.

The education given to small farmers on quality improvement of sheets will have any impact, only if grademise purchase of sheets at the grass root level in all the rubber growing centres is ensured.

India is expected to attain self sufficiency with regard to natural rubber in a few years and rubber is slowly moving from the seller's market to the buyers' market. So the time is not far when quality of rubber will be an important factor in attracting the demand.

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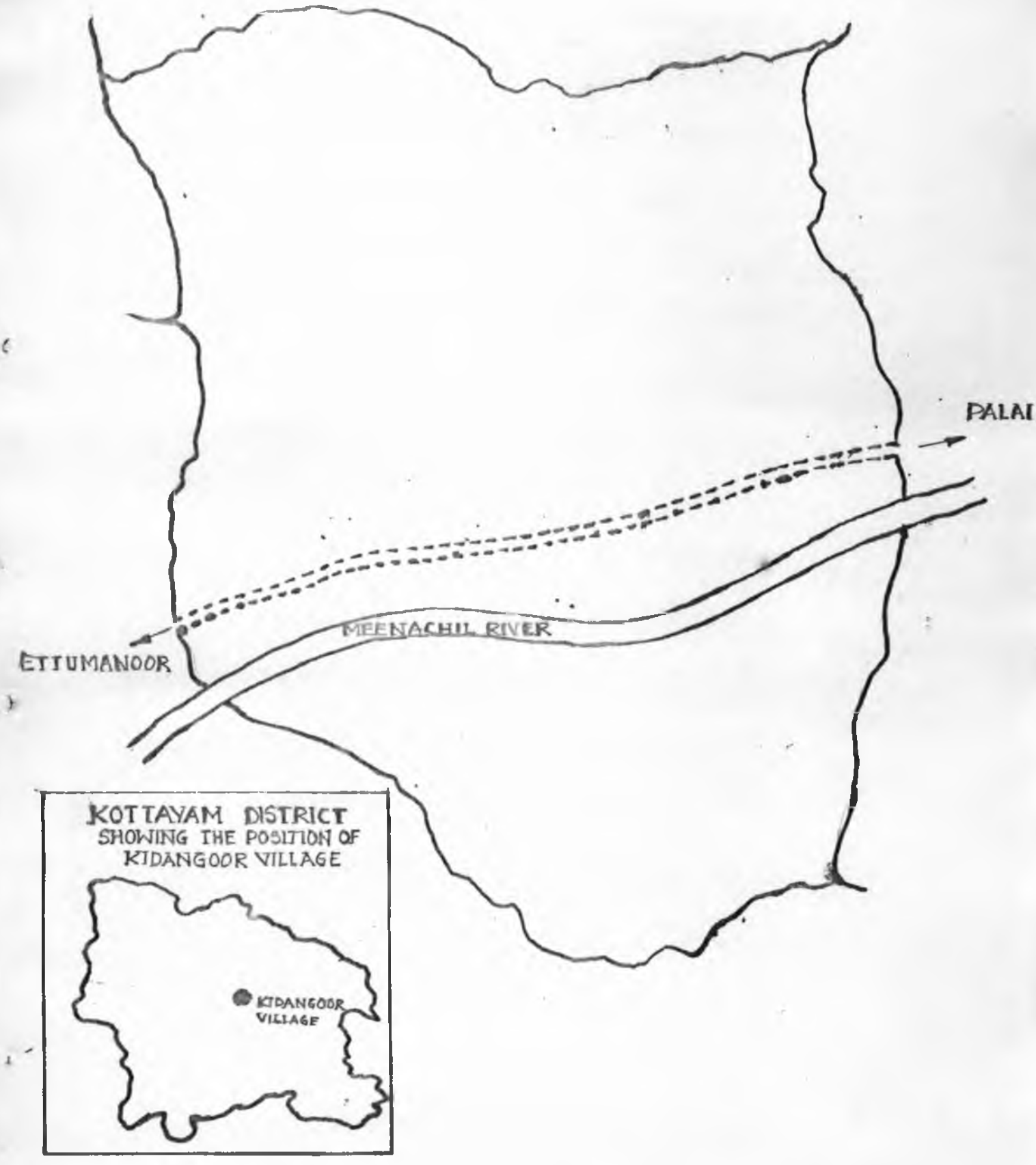
MAP OF KIDANGOOR VILLAGE



A CASE STUDY ON THE PROCESSING ASPECTS OF LATEX PRODUCED BY THE SMALL RUBBER FARMERS OF KEDANGOOR VILLAGE

QUESTIONNAIRE

1. Name and address of owner :
2. Register number of the estate :
3. Total area :
4. Mature/Immature area :
5. Clone/variety and year of
   a) Planting :
   b) Year of tapping :
6. Tapping system :
7. Family labour/hired labour :
8. Type of processing being followed :
   a) sheet rubber :
   b) Ammoniated field latex :
   c) Field latex :
   d) Any other form (Please specify) :
9. (a) How many hours after tapping is the latex collected? :
   (b) What is the type of collection vessel used? :
10. If latex is sold as such, do you face any problem in transportation? :
11. If sheet rubber is produced please furnish the following information :
    1. Whether pre coagulation of latex is observed if so, what preventive action is being taken?
    2. Whether dry of the field latex is estimated? If so, is it done by using the Metrolac or what other method is employed? If not, why?
    3. Whether the field latex is diluted before coagulation? If yes, what is the dilution?

       If not, why? :
    4. What type of collection cup is used? (Coconut shell, Plastic cup etc.) :

5. Whether sieving of diluted latex is done? If yes what is the mesh size of the sieve? If not, why? :

6. What is the type of coagulation pan you use? (Aluminium, plastic etc.) :

7. How much diluted latex is taken in a pan to make one sheet? :

8. Are you following same day sheeting or next day sheeting? :

9. What is the coagulant used and what is its concentration and quantity per sheet? :

10. Do you observe surface blackening of coagulum/sheet? :

11. Do you use Sodium bisulphite to prevent surface blackening of coagulum? If not, why? :

12. How the sheets are being dried :

i) Sun drying/partial sun drying (for how many days and also please specify how the sheets are exposed to sun)

ii) Kitchen smoking :
iii) Smoke house drying :
iv) Any other method (Pls. specify): :

13. How many days it takes to get the sheets ready for sale? :

14. Do you own a smoke house :

15. Periodicity of marketing of sheets :

16. Whether grading is done at the time of sales? If yes, what is the percentage of each grade of sheets obtained?

RSS I .....%
RSS II .....%
RSS III .....%
RSS IV .....%
RSS V .....%
Ungraded .....%

17. Do you get the price published in news papers for your sheets? If not what is the difference between the actual price you get and that published in newspapers? :

18. Specify the marketing channel/ channels :

i) Local private dealers
ii) Large dealers in the town
iii) Cooperative societies
iv) Rubber Producers' Societies

19. If you are assured of a price according to the grade you make are you interested in improving the quality of your sheets?

20. What is the percentage of scrap you get in relation to the sheet

21) In what way you think the quality of sheets can be improved?

22. Do you participate in Rubber Growers' Seminars?

23. Do you read 'Rubber' magazine? :

24. Are you a member of any RPS? :

25. What is your educational background :

26. Have you availed of subsidy from the Rubber Board, for construction of smoke house, purchase of rollers, latex collection cups, sieves, or chemicals? If not why? :

27. Which type of input subsidy do you consider as most useful? :

Observations of the investigation

1) General cleanliness of tapping equipments and collection utensils.

2) Whether piped water supply is available:

3) If the percentage of RMA 4 grade and above is less than 75%, what is the probable reason for that? (Lack of technical knowhow, small quantity of sheets produced, or lack of grading by the purchaser at the time of sale)