THE

INDIAN RUBBER BOARD BULLETIN

Vol. II. Nos. 1 & 2. JANUARY—JUNE 1952

CONTENTS

THE

INDIAN RUBBER BOARD BULLETIN

Vol. II. Nos. 1 & 2. JANUARY—JUNE 1952

CONTENTS


nature, man and
machine make the sho
Bata
The famous name in footwear

THE
INDIAN RUBBER BOARD
BULLETIN

Vol. II Nos. 1 & 2. JANUARY—JUNE 1952

EDITORIAL

The use of chemical stimulants for increasing the yield of rubber trees has been one of the principal topics of discussion among South Indian rubber planters in recent months. Two articles on this subject—"Plant Hormones and Yield in Hevea brasiliensis" by Dr. Chapman and "Injection of Trace Elements, Especially Copper in the form of Sulphate, into Hevea brasiliensis Tree" by Dr. Tixier—which were presented at the Latex Symposium held at the Rubber Research Institute of Malaya in February, 1951, and published in the Journal of the R. R. I., Malaya, are reproduced in this issue of the Bulletin. These articles give interesting authentic information on the subject.

In the first article Dr. Chapman describes the results of experiments carried out in Malaya with Stimulex, a preparation of synthetic hormones in a palm oil base. Yield responses varied considerably between different clones on the same estate and between the same clone on different estates. With clones as well as seedlings the best response was obtained in the case of the lowest yielding groups of trees. Late dripping is a characteristic of the hormone treatment at the yield peak and the increased yield is largely due to a longer dripping period. In the second article, Dr. Tixier gives the results of experiments undertaken in Indo-china with injections of Copper Sulphate and a few other chemicals. In these experiments also the yield responses varied with different clones and the same clones have not reacted in the same way in different localities.

Besides Stimulex another preparation, probably of hormones in a palm oil base, called Stimulatex, is also available in Malaya. A sample of this which was forwarded to this Board through the Government of India was found, in a preliminary test on a small number of buddings of clone B. D. 10, to increase the yield appreciably during the 3 months tested.

Rubber latex is a physiological product of the rubber tree. In tapping, a proportion of cell sap containing plant food assimilated by the leaves and distributed to the various tissues for their normal growth and proper functioning, also flows out with the latex. Therefore, it is well known that tapping retards the growth of the tree compared to untapped trees. The exact nature of the reaction of the latex producing and neighbouring tissues of the tree to these chemical stimulants and whether the increased yield is the result of a corresponding increase in the rate of rubber synthesis in the tissue or only the result of stimulated flow of what the tree is normally capable of producing, are not definitely known. Hence it remains to be proved as to how the stimulation of yield would, in the long run, affect the growth and health of the tree.

At the present stage, therefore, we would advise caution in the use of yield stimulants to obtain increased yields. General application of any of the stimulants should be restricted to old rubber trees earmarked for replanting in the next few years. It may be discontinued if and when the treatment is found to be uneconomical. In the case of young and high yielding budded and seedling rubber it is necessary to carry out a preliminary test on a small number of trees of each clone and family with the stimulant before applying it on any large scale, because, as already mentioned, yield responses have been found to vary considerably not only between different clones on the same estate but also between the same clone on different estates.

REVIEW OF PRICES OF RAW RUBBER

Text of speech delivered by Dr. B. V. Narayanaswamy Naidu, Member, Tariff Commission, in opening the inquiry into the review of prices of raw rubber on Friday, the 22nd August, 1952, at the Tariff Commission's Office, Bombay.

Gentlemen,

On behalf of the Tariff Commission I have great pleasure in welcoming you to this inquiry into the review of prices of raw rubber and thank you for the trouble you have taken in coming over here to assist us with your advice.

The first inquiry into the prices of raw rubber was undertaken by the Tariff Board in pursuance of the Government of India, Ministry of Commerce Resolution dated 27th November, 1950, in which the Board was asked to examine the cost of production of raw rubber and determine fair prices for various grades. This reference was made by Government as a result of representations made by the Indian Rubber Board, Kottayam, which at its meeting held on 7th October, 1950, resolved that the question of fixation of fair prices for raw rubber should be referred to the Tariff Board for necessary examination. While the Board was making the necessary investigations in respect of fair prices, the Government of India, at the instance of the Indian Rubber Board, extended the Board's terms of reference in the Ministry of Commerce and Industry Resolution dated 10th February, 1951, to cover the claim of the rubber plantation industry for protection and assistance. After a thorough investigation of the different aspects of the industry, the Board submitted a detailed and exhaustive Report to Government on 28th March, 1951. The Board recommended that the fair price of raw rubber Group I should be Rs. 128/- per 100 lbs. while the price for other grades should be as stated in paragraph 16 of its Report. The Board also suggested that if it was found at the end of the year that the rubber growers were not utilising the amount allowed by the Board for rehabilitation of their estates and holdings in their estimates of fair prices, Government should consider whether the fair selling price fixed for the rubber growers should not be reduced to that extent. As regards the question of protection, the Board was of the opinion that as the world prices of raw rubber were likely to remain higher than the estimated fair selling prices for indigenous rubber for sometime to come, the question of protecting the indigenous rubber against foreign competition by levying a protective duty or by restricting imports was not likely to arise. The Board was further of the view that should such an occasion arise, it would be in the interest of the indigenous rubber growers in the long run to continue the then existing system of protection and assistance, namely, fixation of statutory prices and making such prices effective through import control if and when required. The Board also made a number of subsidiary recommendations relating to the development of the industry, such as, the creation of a separate development fund, establishment of an All-India Rubber Research Institution, marketing organisation for raw rubber, etc. All these recommendations were accepted by Government.

The fair prices for different grades of rubber as recommended by the Board were fixed by Government under the Ministry of Commerce and Industry, Notification No. 759 dated 21st May, 1951, for a period of one year. As Government decided to continue control on price and distribution of rubber, it was considered necessary by Government to fix prices for rubber after 20th May, 1952. The Tariff Commission was accordingly requested by Government on the 15th March, 1952, to conduct necessary inquiries in regard to the cost of production of rubber and to submit to Government its recommendations as to the fair prices to be fixed. Owing to the pre-occupations of the Commission, inquiry into this case could not be held earlier. Therefore, pending determination of fair prices by the Commission, Government have, in the Ministry of Commerce and Industry Order dated 19th May, 1952, continued for a further period beyond 20th May, 1952, the prices for different grades of raw rubber as were fixed under the Ministry of Commerce and Industry Notification No. 759 dated 21st May, 1951.

Gentlemen, you will observe that while the terms of reference to the Tariff Board were very comprehensive, the present terms to the Commission are very much limited. We have been asked to examine questions relating only to costs of production and determine fair selling prices.

After Government announced their decisions on the Tariff Board's Report (1951), the Indian Rubber Board appointed an ad hoc Committee to examine the Board's Report and to prepare a memorandum thereon. This Committee, after examining the Report, drew up a memorandum which was submitted to the Government of India on 11th April, 1952, wherein questions relating to (i) return on capital, (ii) depreciation (i.e. rehabilitation), (iii) machinery for the revision of prices, (iv) marketing of raw rubber, (v) research and (vi) rubber control were raised and certain suggestions in respect of each one of these items made for consideration of Government. We have also received a copy of the memorandum which will be considered by us during the course of our examination.

In their replies to our questionnaire as well as in their memoranda, producers as well as their Associations have strongly pleaded for an upward revision in the prices of raw rubber. One of the main reasons advanced by them is that the provision for return on capital and depreciation made by the Tariff Board at the last inquiry was inadequate and that enhanced rates for these items should be allowed. Further, it is stated that the costs of labour have gone up since the fixation of statutory minimum wages by the Government of Travancore-Cochin State and that they will still further rise with the implementation of the Plantation Labour Code in the near future. Certain interests have also in their replies touched upon questions relating to control on prices, production, distribution etc. As I have already said earlier in my speech, the scope of the present inquiry is limited and well defined inasmuch as we have to examine only those questions which relate to the costs of production and fair selling prices. Questions relating to the cost aspects will be examined with the representatives of producers separately. We will, however, discuss in a general way questions other than those relating to prices, such as production, demand, quality, etc.

At its last inquiry the Tariff Board estimated the demand for raw rubber in the country at 23,500 tons in 1951, 25,300 tons in 1952 and 27,630 tons in 1953. According to the figures furnished by the Indian Rubber Board the actual consumption in the country in 1951 and the first half of 1952 were 22,427 tons and 10,862 tons respectively. We would like to know whether in the light of these figures and your experience the above estimates call for any revision.

It is understood from the Indian Rubber Board that the total area under rubber as on 30th June, 1952, was 171,578 acres as against 169,425 acres towards the end of 1949. The actual indigenous production during the last two and half years was 15,599 tons in 1950, 17,148 tons in 1951 and 7,762 tons during January-June, 1952. The tappable rubber area has increased from 136,940 acres in 1950 to 148,739 acres in 1951. The average yield per acre in the country which stood at 282 lbs. in 1949 dropped to 255 lbs. in 1950 and 258 lbs. in 1951. Similar figure for the first half of 1952 is not available. As against this unsatisfactory position of the industry, the average yield realised by four of the five estates costed in 1951—'52 was higher than that in 1949—'50. As a matter of fact one of these estates has registered as high an increase as 46 per cent in its average yield. We would, therefore, like to know from those present here the reasons for the decline in the yield of the industry as a whole.

As regards the areas planted during the last three years, we find from the data furnished by the Indian Rubber Board that this has been declining. The area planted has dropped from 1465 acres in 1950 to 1026 acres in 1951. We may also examine the reasons for the fall in the rate of planting during the course of our discussions to-day.

In the last Report the Tariff Board expressed the feeling that after a year or so the price of rubber in the world markets might decline. We have now been informed that since Government of the United States lifted almost all controls on the use of natural and synthetic rubber in April, 1952, the prices of rubber in the different markets dropped to seek their natural levels. As a matter of fact, from the figures given below the declining tendency is noticeable from January, 1952. In the London market the price of raw rubber dropped from 3 sh. 4·17/32 d. per lb. to 2 sh.

WEEDS AND COVER PLANTS IN RUBBER PLANTATIONS

By

K. N. KAIMAL

(Text of a paper read at the U. P. A. S. I. Scientific Conference held on 28th August 1952 at Coonnoor)

Introduction

Ever since man began to undertake cultivation of plants he learnt by experience that weeds occurring among growing crops reduced or completely destroyed the yields of his crop. Therefore, the control of weeds received the greatest attention in the evolution of the traditional pattern of agricultural practices.

With the development of scientific agriculture and the science of plant ecology the manner in which weeds cause injury to the crop has been explained. They compete with the latter for space, sunlight, water and nutrients. The growth and finally the yield of the crop decreases in proportion to the severity of competition from the weed for the above essential necessities of plant life. A detailed description of the natural phenomena of competition between weeds and cultivated plants is beyond the scope of this short paper. However, as some of them are specially applicable to the subject of cover plants they are briefly described below.

8·5 d. in May, 1952. During the same period the decline in other markets was as follows: from 52.00 U.S.cents to 38.25 U. S. cents in New York, from 140.17 Straits cents to 109.25 Straits cents in Singapore, and from 173.5 Rupee cents to 135.0 Rupee cents in Colombo. According to the data furnished by one of the leading consumers of raw rubber, the c. i. f. price of Malayan rubber imported in August, 1952, works out to Rs. 131-7-0 per 100 lbs. of R. M. A. I. During the course of our inquiry to-day we will discuss the trend of prices in the foreign markets as well as of the c. i. f. prices furnished to us by diifferent parties.

Before concluding I may observe that the raw rubber industry is of strategic importance and as such every effort should be made to improve the conditions of the industry and to place it on a sound footing. Since the world prices are showing a downward trend and have almost come to the level of the indigenous raw rubber, it is imperative in the interests of the industry that the industry should take every possible step to produce rubber as cheaply as possible and to increase its yield per acre.

Root Competition

If the roots of the weeds and the crop plants grow in and tap their requirements of water and nutrients from the same level or region in the soil, then competition between the two may be very keen. If, on the other hand, they tap different regions of the soil for their above mentioned requirements, competition may be small or negligible. In the end the stronger of the two wins in this struggle and the weaker one suffers. Root competition will be much more keen and the results more pronounced if the demand for water and nutrients is greater than what the soil can supply, for example, when the fertility of the soil is poor. In very fertile soil where the demands of both can be met the results of competition may not be so serious.

Shoot Competition

Competition between shoots of weeds and crop plants is mainly for space for expansion and for light which is essential for the ordinary green plants to manufacture food by photosynthesis. Competition will be very great if both belong to the same class, for example, between herbs and herbs, shrubs and shrubs, trees and trees, .etc. If either of the two belongs to a weaker class then that will suffer most.

Many of the short term closely grown cultivated plants like the Cereals, for example, are very sensitive to weeds while many semi-perennial and perennial crops like tea, coffee, rubber, etc. which are more widely spaced, are more sociable and live in association with other species of plants. In this case the demands of the weed or secondary crop may be quite different from those of the main crop and each of them may be tapping different regions of the soil for its requirements of water and nutrients. Shade trees over tea and coffee, and cover plants under rubber trees are well known examples of these. These shade trees and cover plants are noxious weeds in many other crops but in these cases, the benefits derived from them are greater than any injury done to the crop.

The traditional methods of weed control consist of destroying them by fire before planting the crop, and eradication by manual labour, afterwards. With the development of mechanised agriculture, mechanical hoes are employed for weed eradication on large farms particularly in highly industrialised countries where labour is costly and difficult to obtain. In more recent years chemical weed-killers or weedicides as they are also called, are being used for the purpose. They are mainly of two types—general and selective. The former are highly poisonous, or caustic or dangerous in other ways and may kill all the plants on which they are applied. Selective weed-killers on the other hand, are selective in their action. Those which are already being used in growing crops at present kill soft, broad-leaved dicotyledonous weeds and species of soft grasses and sedges without causing appreciable damage to hardy monocotyledonous crops like sugarcane, wheat, oats, etc. The selective action is due to the differences in the physical structure of the weed and the crop plant.

So far, no satisfactory weedicide which would kill monocotyledonous weeds growing in dicotyledonous crops without causing damage to the latter has been discovered.

Earlier methods of rubber cultivation and their lessons.

Rubber planting on plantation scale was undertaken in South-East Asia since about the beginning of the present century. Agricultural practices prevalent at the time were generally those which were being employed in the cultivation of short term closely planted crops like cereals, tubers, vegetables, etc. These were naturally employed for rubber cultivation also. For planting the former varieties of crops in jungle land, it is essential that the land should be well-cleared of all plant growth, felled timber and other plant debris. This is achieved by felling the jungle, allowing the plant debris to dry completely and then by burning them. The burning operation besides serving the above object, converts the organic matter into ash which is a more concentrated form of plant-food elements. Most of these elements being soluble in water is more readily absorbed by the growing crop. Further, the fire destroys most of the seeds and spores present in the surface soil and reduces the chances of their regeneration as harmful weeds in the growing crop. In the ploughing or digging up operations which follow, the ash gets mixed up with the soil somewhat evenly. Within a comparatively short period after planting, these crops grow very vigorously forming a dense cover which protects the soil against the impact of rain and sun. The shallow root system also develops rapidly and spreads all over absorbing the nutrient elements present in the top soil including those in the ash. Thus the crop plants themselves, by their dense stand, prevent soil erosion in a considerable measure. All other species occurring among the growing crops are carefully weeded out.

Let us now consider the results of employing the principles of this method for rubber cultivation. After burning the felled jungle material the ash residue lies on the surface of the soil. This is not ploughed into the soil. Rubber used to be planted at distances of about 20 feet, that is, one tree to 400 sq. ft. of land, compared with the few square inches in the case of many short term crops. It takes about six to seven years for the rubber trees to form a closed leaf canopy above and about half that period for the feeding roots to spread over the area. During most of the period from burning to the formation of a leaf canopy, the ground which used to be rigorously clean weeded is exposed to the scorching action of the tropical sun and the impact of heavy monsoon rains. As a result of this the ideal soil conditions which existed in the jungle condition undergo many changes. The porous top soil becomes harder and less absorbent. The larger proportion of water, particularly on sloping land, runs off carrying with it the fertile top soil including the valuable ash residues. Even after the formation of a closed leaf canopy soil erosion of the already eroded land will continue to take place probably at a reduced rate. When the monsoon rain water is not absorbed by and conserved in the soil, the effects of the drought, which follows in a few months in our country, on the crop may be very injurious.

Methods undertaken to check soil erosion

From the early experiences gained by rubber planters it became quite evident that the pattern of land cultivation methods which are good for short term crops have proved to be not so for perennial tree plantations like rubber. When the disastrous effects of soil erosion began to be realised in their true perspective, measures to check and prevent it as well as for conserving rain water, were undertaken. These, at first, consisted of earth works like silt or catchment pits, contour drains or bunds and contour terraces which appeared to be more or less satisfactory for the purposes aimed at. But the difficult problems of rebuilding the soil of the badly eroded earlier plantations and of maintaining the fertility of new plantations still remained.

Leguminous Cover Crops

Rubber is one of the few agricultural crops which has been and is being well served by science. New scientific research stations were started and researches in all branches of its cultivation and preparation were undertaken in the various rubber growing countries after the first World War. This has resulted in great progress being made and brought about revolutionary changes in the old methods of cultivation.

The establishment and maintenance of leguminous cover crops were advocated for the rebuilding of the soil of old plantations and for maintaining the fertility of new plantations. Further, it afforded effective protection against soil erosion. The role of leguminous cover crops in rubber plantations is so well known to you that I need not describe them here.

A large number of species of the leguminosae family, erect, semi-erect, and creeping types, were planted and tested in newly planted and young rubber areas. Many of them established themselves and functioned quite satisfactorily in the beginning, under sunlight, but none of them survived in a satisfactory manner under the shade of the rubber leaf canopy. It was also found to be difficult or impossible to establish any of them under the shade of old rubber, in countries like Malaya. Therefore, the solution of these major problems which seemed at first to be so near still remained far from it.

Natural Covers

In Malaya the search for a shade tolerant leguminous cover, or a non-leguminous substitute, resulted in the evolution of what is called the indigenous or natural covers. In this method, various species of naturally occurring plants, which were so far considered to be and treated as weeds, were allowed to develop both in the newly planted areas as well as under old rubber. In the former case, numerous species of plants, mostly sunloving, establish themselves and form a dense mixed cover within about six months to one year. But, in the older plantations, the process is found to be rather slow, as only shade tolerant plants will colonise there successfully. Strict control is exercised over the development of these covers, first by slashing them down to a height of about 3 ft. from ground level when they attain a height of about 6 ft., and then, by a regular process of selective weeding. Species of plants which possess the following habits are treated as weeds:—

(1) Plants which spread by means of underground stems like lallang (Illuk) grass. Ferns with somewhat similar habits, like bracken, Gleichenia etc., are also treated as harmful weeds.

(2) Creeping plants, mainly grasses, which develop a mesh of matty roots in the top soil.

(3) Tufted grasses and ferns which may, in course of time, develop conditions as in 2 above.

(4) Climbing plants which spread over and smother other more desirable species and other species of exclusive habits.

(5) Thorny plants.

Eradication of even some of these types of plants is generally undertaken only if this will not result in soil erosion on steep land, because in the long run, the harmful effects of such weeds are considered to be less disastrous than heavy soil erosion.

Natural covers with soft stems, broad leaves and deep growing root system are considered to be the most desirable types. Practically all the functions of a leguminous cover crop, with the exception of nitrogen fixation by root nodules characteristic of that family, are believed to be fulfilled by natural covers also.

The traditional conception of weeds has thus undergone revolutionary changes and clean weeding is rarely done in rubber plantations.

Natural covers in rubber areas planted without a burn.

Another revolutionary departure from the pattern of earlier methods of new planting on jungle land and subsequent maintenance of a natural cover, which also originated in Malaya, is the 'no-burn' method. In this method the felled jungle is not burned. Paths 6 to 8 ft. wide are cleared along planting lines which may be in straight lines on flat and slightly undulating land or in contour lines on sloping land. Timber and other plant debris are laid and pressed down as far as possible, in the space between the paths and allowed, in course of time, to decompose there and incorporate with the soil. From the time of felling until a satisfactory plant cover develops, this dead plant material protects the soil from the direct impact of rain and sun. Sooner or later, particularly after a few rains, the stumps of many of the original jungle plants produce secondary shoots. Seeds, spores etc., which were lying dormant on the floor of the jungle also begin to develop. Thus a fairly dense secondary growth is formed in a comparatively shorter time than under the normal or light-burn systems. Clean-weeding of the paths along planting lines or contour terraces is undertaken regularly. The development of secondary growths is controlled and selective weeding carried out as already described. The natural process of elimination of the unfit species of plants proceeds as the conditions of the habitat gradually change. When the leaf canopy closes in and shuts off sunlight, the sunloving plants become weak and eliminated. As this type of secondary growth, or natural cover, as it is called, is practically a regeneration of the original jungle flora, which consisted of numerous shade tolerant or shade loving species as well, such species together with any other similar plants newly colonised, expand and fill up the gaps. Thus in the experiments which the Rubber Research Institute of Malaya has been conducting for the last nearly 17 years a very satisfactory association of natural covers is reported to be surviving. The soil under it is also said to be in very good condition. The growth and yield of rubber appear to be quite satisfactory compared to other methods of cultivation. It has, however, been reported that there has been a small retardation in the rate of growth of the young rubber during the first 1 to 3 years owing to root competition from the vigorous growing species of natural covers but that they make up the loss during the next 2 or 3 years. The natural habitat of the rubber tree is the tropical rain forest regions in South America where it thrives in association with different strata of vegetation like trees, shrubs, herbs, etc. Therefore, this method of cultivation, which, in some small measure, restores some of the natural conditions of its habitat, should not be disagreeable to it.

Some of the additional advantages of this new method of cultivation of rubber over more orthodox methods are:—

(1) The original structure of the soil is maintained nearly in the same condition.

(2) At no time is the soil exposed to the direct impact of rain and sun with the exception of the clean cleared planting lines. Soil erosion is checked more effectively.

(3) Most of the valuable plant material present in the original jungle floor together with the felled plant material is retained as organic matter and, in course of time, utilised by the rubber tree and the natural covers. This is returned to the soil again in the forma of naturally falling leaves, twigs, loppings etc. and utilised by the plants, repeating the natural cycle.

Serious incidence of mouldy rot, root diseases, damage by pests, greater risk of fire etc. were feared in the beginning and advanced as defects of this system. But experience has shown that if sufficient precautions are taken these can easily be guarded against, and any additional expenditure incurred on this account, may be more than compensated in the long run.

Local Problems.

Here, in South India, progressive planters have always been interested in the progress made in rubber cultivation methods in other countries and adopting them even though rather slowly. After many trials of the various well known leguminous cover crops *Pueraria phaseoloides* has proved to be the most successful here. This plant establishes itself quite well under rubber in most of the planting districts. In some districts where drought is very severe, however, difficulty is being experienced to establish it in young open areas. One interesting example of such a state of affairs is an area where there is a mixed cover of creeping grass and *Pueraria* under about 4 years old rubber. During the dry months the grass completely dries up. *Pueraria* also seem to be affected by the drought as it does not take this opportunity to spread over the dead grass. It simply survives without making much progress. As soon as the monsoon season sets in, the grass seeds lying dormant in the top soil sprout and grow up very vigorously. The cover crop also picks up. But the grass grows much more vigorously into a very dense mass up to a height of more than two feet and in the struggle for dominance suppresses and checks the growth of *Pueraria*. The same process is repeated during the following dry as well as rainy seasons. In patches of ground where some rubber trees have grown more vigorously and shade obtains, the grass has disappeared and *Pueraria* has established itself quite well, surviving in a fairly healthy condition during the dry months. There are definite signs of retardation in the rate of growth of the rubber trees present in the area which should be on account of root competition from the grasses. In this case the grass appears to have become predominant owing to insufficient care in weeding it in the earlier stages. It is possible that there may be other cases similar to this. The only remedy seems to be, eradication of the grass before it begins to seed, which may have to be repeated until the cover crop is well established. The grass will, of course, disappear when the rubber trees form a closed leaf canopy above but that prospect may be delayed owing to the retarded growth of the rubber trees.

rtunity to spread

In some districts this cover crop becomes weak and sparse under the dense shade of rubber, for example, under buddings of clone Tjirandji 1, in the 6th or 7th year. But it is remarkable that after about the tenth year, when the leaf canopy had risen to a higher level and some of the lower branches had died off, it could be re-established fairly easily and maintained in a satisfactory condition. Similarly it is heartening to find that it could be established easily in the older, badly eroded rubber areas as well. The greatest enemy of *Pueraria* in estates appears to be cattle. If it is allowed to graze it will consume the younger shoots and damage the whole cover. This has become a serious problem and proper measures to guard against this pest will have to be taken if the cover crop is to be established and maintained satisfactorily.

Generally speaking, from what has been observed in a few estates the art of maintaining a good, mixed, natural cover under rubber in South India does not seem to have reached the Malayan standard. The fact that a fairly satisfactory natural cover could be maintained at least in a few estates, indicates that the same may not, if desired, be impossible under favourable conditions elsewhere. Cattle, again, seems to be the problem in this case also

Suitable jungle reserves for new planting are very limited in the planting districts here. It is, however, suggested that the Malayan 'no-burn' method of planting rubber be given a more serious trial when opening up the available jungle reserves. The apparent disadvantages in respect of this method, already mentioned above, particularly the risk from fire in the initial stages, and damage by wild animals and pests, should receive proper attention and guarded against. If serious difficulties are encountered the natural cover may easily be replaced with *Pueraria*.

Large areas of old and uneconomic rubber, however, remain for future replanting. Early establishment and maintenance of a cover of *Pueraria* in areas proposed to be replanted is advocated. For replanting, the standing rubber trees may be killed by poison or felled along and piled up between the proposed planting lines without a burn. The results of analysis of a rubber tree carried out by the Rubber Research Institute of Malaya, given in the appendix to this paper, indicates the very large quantities of of nutrient elements locked up in the various tissues of the tree. The *Pueraria* cover already present on the ground may spread over it and help the decomposition of the plant debris at a more rapid rate. Valuable organic matter together with the large proportion of nutrient elements it contains may thus be added to the soil which the badly eroded old rubber land greatly needs. Further, the presence of a good cover of *Pueraria* may keep off harmful weeds from invading the area. This should effect savings in weeding costs. The Indian Rubber Board will be quite pleased to give advice on different methods of new planting and replanting rubber to suit local conditions.

The method of weeding in rubber plantations continues to be by manual labour. Mechanical weeding is found to be impracticable owing to the sloping nature of the hilly land of most of the plantations. General chemical weed killers are used in other rubber growing countries to destroy certain noxious weeds such as lallang and bracken. The chemical generally used for this purpose is sodium arsenite solution which is a very dangerous poison. It is not being used for this purpose in South India.

Weeds which are found to be very troublesome here are mostly grasses. What is needed, therefore, is a selective weedicide, which would kill the grasses without causing serious damage to dicotyledonous species of natural covers and leguminous covers. As already mentioned, a satisfactory weedicide of such selective properties has not yet been discovered.

Acknowledgment.

The author had been a member of the staff of the Rubber Research Institute of Malaya until recently. Naturally much of the information contained in this paper is drawn from the work of that Institute. This does not mean that the Institute endorses the views expressed here. His grateful thanks are due to the Institute.

APPENDIX

The Results of Analysis of a Rubber Tree carried out by the Rubber Research Institute of Malaya. (*Ref:— Journal R. R. I. M. 9—1939—pp. 6-13 and 14-16*).

Height of the tree—60 ft.

Girth at ground level—29 inches.

(1) Composition of a tree weighing approximately 11,700 lbs. (Extracts from Table ii), values expressed in lb.

Fractions	Total weight	Moisture	Dry weight
Leaves	367	219	148
Leaf stalks	56	37	19
Twigs	650	419	231
Small branches	637	278	359
Side branches	1,230	326	904
Main branches	3,657	885	2,772
Main stem	3,338	1,065	2,273
Roots	1,764	559	1,205
Total	11,699	3,788	7,911

(2) The total amount of Nutrient Elements in the Tree (Extract from Table ii), values in lb.

Minerals	Leaves and stalks	Whole tree (all tissues)
Nitrogen	4.20	34.28
Phosphoric acid	0.59	10.76
Potash	1.93	38.68
Calcium oxide	3.29	57.75
Magnesium oxide	1.19	14.69
Mangenese oxide	0.06	1.495
Sodium oxide	0.004	1.2125
Total	11.264	158.8675

Calculated on the basis of 100 trees per acre and stated in terms of the weights of commercial fertilizers, the nitrogen, phosphoric acid and potash contained in the trees per acre are equivalent to 7.7 tons of sulphate of ammonia, 2.2 tons of bone meal, and 3·5 tons of sulphate of potash.

If the rubber trees are burnt, all the nitrogen they contain may be lost in the atmosphere but most of the other elements may be left behind as concentrated ash residues. If the trees are allowed to rot *on the surface* of the soil, then also a substantial proportion of nitrogen may be lost in the process of decomposition but at least a small propotion may be incorporated with the soil. Owing to further advantages which may accrue from leaving the timber and other plant debris on the land, such as protection of the soil beneath it from the impact of direct rain and sun, reducing the rate of soil erosion, addition of organic matter to the soil, etc. the disposal of the trees by sale or by burning, unless the area on which they are standing is infested with root disease, does not seem to be advisable.

Since the actual amounts of nutrient elements are calculated on the basis of the analysis of one tree only, these figures should not be relied upon too much. The composition may vary with different trees growing on different types of soils. However, they give a fair indication of the amount of nutrients contained in the tissues of the rubber tree.

PLANT HORMONES AND YIELD IN HEVEA BRASILIENSIS*

by

G. W. CHAPMAN

(Chemara Central Research Station, Malaya)

Introduction

This work, (which falls into three faces) was started in 1937 because cowdung mixtures applied to the scraped bark to improve bark renewal and yield were widely used by Asian planters.

In the early work, bark analysis was carried out as well as the application of mixtures to the bark. These mixtures included numerous combinations of various oils—both vegetable and mineral—cowdung, plant nutrients and sulphur in various forms. The bark analysis is described below, the bark treatment experiments may be dismissed with the statement of two important conclusions.

(1) All the better mixtures had one common factor, they contained plant hormones.

(2) Elementary sulphur was highly beneficial under certain conditions, when clearly (as judged by the smell) some Sulphur compound was formed.

Other work in Malaya (1) and Ceylon (2) belonging to this phase has also shown that yield can be increased by applying certain vegetable oils to the bark, preferably after scraping.

The second phase of this work commenced after the war when selective weed-killers and other synthetic plant hormones were available in commercial quantities. Work was then started with a-naphthalene acetic acid, 2:4-Dichlorophenoxy acetic acid and its methyl derivative marketed as Methoxone.

In the course of this work more than 50 different preparations were tried on the bark of rubber trees. Broadly speaking they all gave the same type of results but some gave much better yield increases than others and 2:4-D proved the most satisfactory of the three hormones.

These results clearly suggested the hypothesis that natural hormones played a part in the yield capacity of rubber trees. Thus the work entered its third phase with the development of an analytical method for estimating hormones in latex, sufficiently rapid for routine work.

A preliminary survey of the conditions causing variations in the hormone content of latex has been carried out to determine whether yield is influenced by hormone production in the tree, but much work remains to be done.

---

*Reproduced from the Journal of the Rubber Research Institute of Malaya, vol. 13, Commn. 276.

Effect on yield of applying 2:4-D to the bark

Initially, old seedling rubber was used and each treatment was applied to 30 trees. Before treatment some hundreds of trees were individually yield recorded by the cup coagulation method and the few trees which showed erratic yields were rejected. The remainder were then graded on yield so that every treatment contained three equivalent groups of 10 trees each. Group I contained the best yielders and group III the worst. Later when more uniform young seedling and budded rubber were used the number of trees in each group was halved.

The most outstanding feature of these experiments is the better response of the trees in groups II and III compared with group I. This is observed both for seedlings and buddings but as might be expected the difference is greater for seedlings than buddings as is seen from three experiments which are described below. In these experiments the outer dead zone of the bark was removed by light scraping over a region 3 inches below the half spiral tapping cut.

On estate 'A' on young seedling rubber there were 10 treatments and in all except control the bark was scraped and painted with nine different preparations containing 2:4-D. On estate 'B' the following six clones were treated with the standard preparation used on the Guthrie Group of Estates: G. 1, B.D. 5, Tj. 1, P.B. 25, Pil. B. 84 and P.B. 86, and on estate 'C' the following three clones were treated with the same preparation: Tj. 1, P.B. 25 and P.B. 86. In the figures given below as percentage of control the averages for all treatments or clones are given by groups for the first month after treatment.

		Group 1	Group II	Group III
Estate 'A'-Seedlings	..	152	162	193
,, 'B'-6 clones	..	129	142	157
,, 'C'-3 clones	..	179	189	212

In all the above cases group III is significantly greater than group I, but this is not always so for the difference between group I and group II. On estate 'A' the yield ratios for groups III, II and I were approximately as 1 : 2 : 3. With the clones the differences in response between groups were less as was also the case with seedlings when the yield differences between groups were less.

The yield responses varied considerably between different clones on the same estate and between the same clone on different estates as the following extreme figures illustrate:—

	Estate 'B'			Estate 'C'		
Clone	Group I	Group II	Group III	Group I	Group II	Group III
P.B. 25	95	119	130	155	157	169
Tj. 1	154	168	204	237	252	288

Other experiments demonstrated the following facts :

1. Scraping the bark even without other treatment usually raises the yield temporarily, but afterwards the yield falls below the control.
2. All the preparations used were more effective if applied to the scraped bark, presumably because absorption was facilitated.
3. Full spiral gave a good increase, but the dripping often lasted till next day at the peak yield period.
4. Late dripping is a characteristic of all hormone treatments at the yield peak. Indeed the increased yield is largely due to a longer dripping period.
5. Despite the late dripping, D. R. C. was only slightly lowered by hormone treatment, normally only 2 or 3%.
6. The extent and the position of the area treated was of primary importance. If applied only above the tapping cut yield is actually depressed, while if applied both above and below a slight increase is obtained. Applying over a 3" band below the tapping cut appears to be sufficient to give a maximum increase. It is better to treat a narrow band than to treat a larger area because the treatment can be repeated as soon as the treated bark has been tapped away.
7. Trees on daily or slaughter tapping systems do not react well to treatment with hormone preparations and should not be treated with them.
8. The curve showing the relationship of yield to time after application is characteristic and is shown in Graph (1).* Maximum yield is attained within a week to 10 days. Thereafter yield falls steadily until 6 weeks after the application and then rises to a second maximum at the end of about 2 months. From then on it falls slowly over a period of months but never seems to drop below control. Numerous experiments have shown that the yield remains a few percent above control for a long time after all the treated bark has been removed. Subsequent applications after about 4 months do not produce results identical with the first, the initial maximum is not so high, but the minimum and second maximum are both higher so that the yield obtained over the later 4 months periods are the same as that over the first 4 months. This statement can only be made for P.B. 86 as no other clone has yet been treated four times.

* Not reproduced here.

A count of dry trees showed no significant difference between the treated trees and the controls, nor did the trees show any other sign of injury. Nevertheless in the present state of our knowledge it would be a risk to treat high yielding trees at frequent intervals over a prolonged period.

At present it is suggested that treatment should not be more frequent than once in four months and the wintering period should be avoided. In some area Tj. 1 latex has shown an increased tendency towards precoagulation with treatment at the wintering period and apart from this consideration a tree in the process of refoliation should not be heavily tapped.

Under certain conditions the hormone treatment should not be used. P. B. 25 as reported above sometimes gives a very poor response but otherwise there appears to be no reason for not treating it. But Lunderston N. and B. D. 5 alone of the clones tested should never be treated as the bark is injured to some extent although no permanent damage is done to the trees. Damage can also be caused by very deep scraping combined with excessive application of the oil. Old trees with very thin and knotted bark cannot be treated because of the impossibility of scraping such trees.

Relation of Bark Composition to yield :

In order to obtain an insight into the mode of action of hormones both bark and latex have been analysed. The work on bark was incomplete when interrupted by the Invasion.

The survey of composition gradients in bark was carried out for the major nutrients, nitrogen, phosphorous, potash, calcium and magnesium. All nutrients showed marked changes in a radial direction when the bark was divided into three zones. The first or innermost zone is soft and is not removed in normal tapping. The second zone is the latex yielding region and the third is brittle and contains many stone cells. The outer dead layer was discarded.

Bark composition changes in a vertical direction were determined from 20" to 120" above the ground, both for virgin bark and for trees in tapping. No consistent difference was found between high and low yielding trees in the change of bark composition with height. However, in all the comparable groups examined the bark of the higher yielding trees was higher in calcium, particularly in zone 1.

The effect on bark composition of treatment with the natural hormone mixtures then in use was examined. Bark magnesium was invariably increased but there was no consistent effect on the other nutrients unless they were present in the preparations applied to the bark, when they were apparently absorbed. Whether it is a mere coincidence that the divalent metals are higher in both natural high yielders and those produced artificially cannot be stated, but it is well known that the ratio of divalent to monovalent metals in tissues affects their permeability and might therefore have a bearing on yield.

Estimation of Natural Hormones in Latex:

In the determination of hormones in latex the standard methods given by Jensen (3) and Went and Thimann (4) for the estimation of auxin were used with modifications.

. . . .

. . . .

Since high and low yielders react very differently to hormone treatment a series of determinations was carried out on the hormone content of high and low yielders in different areas. On estate 'C' the high yielders contained more hormone.

Seedlings	— 7.0	per litre	4.6 per litre
P. B. 86	— 6.8	,,	5.7 ,,

But on estate 'B' in an old area which was being tapped very drastically, though not actually slaughter tapped the high yielders had less hormone than the low yielders. The form of the curve for the high yielders was the same as that for the slaughter tapped rubber. It is therefore suggested that under very heavy tapping the highest yielding trees are most affected and their latex hormone content falls to the slaughter tapping level.

As zinc deficiency in Citrus and a few other species produces deformities of shoots and leaves similar to those which can be produced by 2 : 4-D a few trees were injected with zinc sulphate crystals by drilling a hole in the base of a large branch. A reduction in yield resulted but no tree was dried up as recently reported by Compagnon and Tixier (5). This may be attributed to the fact that only 2 gm. zinc sulphate were injected far from the tapping panel to avoid damage to the tree. Following the report by the same authors that copper increased yield it was decided to test the effect of copper on latex hormone. Three groups of P. B. 86 trees were used. One was untreated, the second was only scraped and the third scraped and 5% copper sulphate applied. When the effect of scraping had worn off as judged by a similar yield in both scraped and unscraped trees the hormone was determined. It was found to be the same in the scraped and unscraped but was higher in the copper treatment at 6.1 per litre against 4.9. The yield was also 20% higher for the copper treatment.

Conclusions

Considering the above results it must be remembered that the water phase in latex is drawn from several different types of tissue in the process of tapping. The hormone found in the latex may therefore not be evenly distributed amongst these tissues in which case the analytical results may not present a true picture of the hormone concentrations in the wood and bark of the tree. There is, however, fair evidence that hormone in latex is influenced by tapping which can either increase or decrease the hormone according to its intensity. The curves further suggest that even the nature of the hormone is not constant. Under these conditions it is not surprising to find that the hormone content of latex is often not correlated with yield although the application of artificial hormones to the bark increases yield.

The great difference in response to hormone treatment of the same clone in different areas is remarkable as is also the difference in response to simple bark scraping. Normally the latter produces only a slight temporary rise in yield as is well known amongst planters, but other Malayan work (*loc. cit*) affords an example of a large increase obtained by this method.

Yield can be increased not only by scraping the bark but also by fire damage, arsenical poisoning and injecting copper—Compagnon and Tixier (*loc. cit*). It would therefore appear that natural hormone is produced in response to tapping and various other forms of wounding. If this is correct the differences in behaviour between the areas mentioned above should be explainable from a better knowledge of the hormone metabolism of the tree.

The reduction in yield by the application of hormones above the tapping cut is curious and is difficult to explain on the hypothesis that they produce more latex. If however they bring about a local change in the water relations of the tissues either by altering permeability or osmotic pressure an explanation might be possible. The higher bark content of divalent metals in high yielders may be of significance in this connection.

The conclusion may reasonably be drawn that the artificial hormones are acting in a similar manner to the natural ones and may be described as supplying a natural deficiency from the point of view of yield.

Acknowledgments

The writer wishes to express his thanks to Messrs. Guthrie & Co. for permission to read this paper and for the co-operation of the Managers of the estates on which the field work was carried out.

References

(1) R. R. I. Report 1941-1945.

(2) Rubber Res. Scheme (Ceylon) Ann. Rept. 1942, 1944 and 1945.

(3) JENSEN B. P., 1936, Translation, New York, *Growth Hormones in Plants*.

(4) WENT F. W. and THIMANN K. V., 1937, New York, *Phytohormones*.

(5) COMPAGNON P and TIXIER P., 1950 *Rev. Gen. Caout.*, 27 Nos. 9, 10, 11.

THE INJECTION OF TRACE ELEMENTS, ESPECIALLY OF COPPER IN THE FORM OF SULPHATE, INTO THE HEVEA BRASILIENSIS TREE ‡

P. TIXIER
(Institut des Recherches sur le Caoutchouc en Indochine)

Introduction.

In a publication appearing in *Rev. Gen. Caout.*, 27, 524, 591, 663 (1950), Campagnon and Tixier have shown that the injection of a few grams of copper sulphate into Hevea brings about an increase in the production of rubber, which seems to last from three to five months and is in the neighbourhood of 40% to 60% over the controls. It is further observed that the rubber content of the latex of the injected trees is less than that of the control latices.

The object of the present communication is to bring forward some new information relative to this increase in production in the light of results from experiments carried out in the course of the year 1950.

These experiments are chiefly relating to copper as sulphate; this salt was the first tried and with it the response was the best. Nevertheless other salts and chemicals have been tried. Information on typical results obtained with some of them will be given.

I. INJECTING COPPER AS SULPHATE

A. Experiments carried out since the beginning of the study.

May	1949	Experiments on four twin pairs.* (No further re-injecting)
October	1949	Experiments on four twin pairs. (No further re-injecting)
December	1949	Experiments on three twin pairs. (Re-injected every six months)
January	1950	Experiments on budded Djasinga 1; injecting at different heights. (No further re-injecting)
May	1950	Experiments on 20 brown-bast seedlings. (Re-injected after six months)
July	1950	Experiments on 200 budded Tj. 1 trees put into tapping three months before injection. (Part of them were re-injected in January, 1951).

‡Reproduced from the Journal of the R. R. I. of Malaya, Vol. 13—Communication 276.

*For all the experiments carried out on twin pairs, one member of each pair was injected, the other served as a control.

August	1950	Experiments with Copper acetate instead of Copper sulphate on three twin pairs.
October	1950	Experiments with different quantities of Copper sulphate on budded Djasinga 1.
November	1950	Experiments on 100 budded AV. 50 (1934 planting), 100 of the same budded trees used as a control.

All experiments were made on 1941-1942 plantings except the last.

B. Response Period and Consequences.

The response period depends on various factors not yet known. Usually a definite increase in the weight of rubber produced can be observed over a period which exceeds three months and usually lasts for five or six months.

The figures given in Table I relate to the May 1949 experiments and show the production and the D. R. C. after one year.

TABLE I

EXPERIMENT OF MAY 1949

Observations from the 13th to the 18th month after Injecting

	Monthly yield in gms.		D. R. C. monthly mean	
	Injected	Control	Injected	Control
June 1950	1734·7	1671·2	32·5	35·1
July	1720	1490·7	30·7	33·3
August	1823·6	1534·6	32·1	34·5
September	1497·6	1235·1	30·5	32·9
October	1670·1	1720·2	28·9	30·9
November	1865·2	1924·5	33·4	34·6
Mean	1718·5	1596	31·35	33·55

The figures in Table II give the quarterly production over a period of 15 months for one twin pair of the October, 1949 experiment. The response of this twin pair to copper was especially high over a period of nine months.

TABLE II

Quarterly production from a twin pair of the October 1949 Experiments

		'Injected' Yield in gms	'Control' Yield in gms	Yield % of the control
October December	1949 „	2342.5	962.2	243%
January March	1950 „	2148.6	1250.2	171%
April June	1950 „	3155.4	1811.5	174%
July September	1950 „	1803.6	2054.8	87%
October December	1950 „	2448.4	1783.0	137%

From these two tables it appears that the immediate yield increase is not obtained at the expense of future production.

C. Re-injection of the Trees.

Successive re-injections might be a method of forcing the trees and so indicate adverse effects from the injections.

The trees used in the December 1949 experiments were re-injected for the first time on June, 1950 and for the second time on December, 1950, i. e., every six months. The production relating to the first month following each injection is given on Table III.

TABLE III

Mean production by tapping day relating to the first month after each injection on the same trees

	'Injected' gms/tapping day	'Control' gms/tapping day	% of the control.
December 1949 1st Injection	155	99.7	155%
June 1950 2nd Injection	170.1	102.1	166%
December 1950 3rd Injection	193.1	104.1	185%

It appears that re-injection is not detrimental to future yields, an increase in production of the treated trees is even observed which is not evident in the controls. No sign of harmful effect appeared on bark or foliage. This experiment is to be continued in the same way.

D. **Influence of the Amount Injected.**

Experiments with various quantities of copper sulphate, from 3 grams to 12 grams per tree gave very similar results. There is no proportionality between the response of the tree and the amount of copper sulphate used. This experiment will show later if the response lasts for a longer time with large amounts.

E. **Effect of Copper acetate instead of Sulphate.**

The increase in production was very small and the effect lasts three months. The D. R. C. remained the same. It must be noted that the salt was acid which has perhaps an adverse effect due to low pH.

F. **Injecting Brown-bast Trees.**

Twenty brown-bast seedlings of 1941 planting with dry tapping-cuts and brown bark but without trunk distortion) were selected, and each received 4 gms. of copper sulphate at the beginning of June 1950. They were re-injected in December. Production is given in Table IV.

TABLE IV

Mean production of Brown-Bast trees for each Tapping Day.

MONTHS	'YIELD' gms. tree/ tapping day	Observations
June	4.36	First injection
July	10.76	
August	15.90	
September	7.41	
October	7.05	
November	4.54	
December	9.11	Re-injection

The following obbservations are made:—

Injecting copper sulphate appears to be a possible means of curing brown-bast trees, except for distorted trees.

One only among twenty injected trees remained dry.

The yield of these treated trees was very irregular from one tapping day to another.

The rapidity of response and the period of response are very variable for different trees.

G. **Effect on different planting materials**

Besides the experiments mentioned above, applications have been carried out on several estates and it appears that an increase of the order of 50% cannot be considered as a general rule. Big differences in reaction are observed according to the plant material used, and the same clones have not reacted in the same way in different localities. From the results on one estate where many experiments were carried out, a greater increase (up to 190%) seems to be obtained on old trees. In this connection, we observe no increase at all for our July 1950 experiment on Tj. 1 trees, where the trees were in tapping for only three months.

If Copper is involved in the formation of rubber from carbohydrates, the response may be dependant on the disposable amount of carbohydrates, and in certain cases carbohydrates would be the limiting factor, then according to this hypothesis no response is to be expected. Bark analysis could give information on this point.

H. The best period for injections

In Indochina the best period seems to be the beginning of the dry season. Three arguments support this view.

During the wet season a great part of the production increase is included in the afternoon latex collection; with afternoon rains this over-production is lost.

The flow of latex is normally at a maximum in the first part of the dry season, injecting trees at the beginning of this period gives an increase in production which is not the highest in per cent, but is the maximum in rubber weight.

As said in the paper mentioned above, the recovery in yield after the rest period is more rapid in the injected trees.

As an example, Table V gives recent figures from our November 1950 experiment on Avros 50.

TABLE V.

Experiment on Av. 50 budded trees (Injected on 10-11-50)

	'YIELD' gms/tree/tapping day		Percentage of the control
	Injected trees (98 trees)	Control (102 trees)	
From 13-11-50 to 1-1-51	119·0	89·0	33·6%
From 1-1-51 to Rest Period (Rest Period, from 2-2-51 to 19-2-51)	100·5	87·1	15%
From Rest Period to date (10-3-51)	42·4	23·2	82·8%

I. Technological properties of rubber from injected trees

Investigations have been made on a semi-industrial scale, (i. e. July 1950 and November 1950 experiments) on the latex from the injected trees and the properties of rubber therefrom.

Mooney Viscosity and Modulus values which are used in the testing of "Technically Classified Rubbers" were determined. The results are given on Table VI.

We see that the modulus of the rubber from injected trees is significantly increased and the Mooney Viscosity is lower.

According to the paper of Compagnon and Cretin (Paper No. 28 of this Symposium). this modulus increase is correlated with D. R. C. decrease and nitrogen centent increase. The D. R. C. decrease of injected trees latices is well known, and a few analyses show a slight increase in the nitrogen content of the latices.

It is worth noting that for the July 1950 experiment on Tj.1 no increase in production was obtained, but nevertheless the latex D. R. C. was lower and the rubber modulus higher than for the control.

TABLE VI

Mooney Viscosity and Modulus at 600% of rubber from Injected trees and controls.

			Mean	Student's "t"	Level of significance
Mooney VISCOSITY	Tj.1 (July Exp.)	Control	74.1	1.636	P = 0.1
		Injected trees	71.5		
	Av.50 (November Exp.)	Control	89	2.495	P = 0.05
		Injected trees	80.7		
MODULUS AT 600%	Tj.1 (July Exp.)	Control	42.1	2.837	P = 0.02
		Injected trees	48.6		
	Av.50 (November Exp.)	Control	26.1	2.642	P = 0.05
		Injected trees	31.7		

It must be also noted that the latex stability in the field appeared better for the injected trees.

II. Injection of other Elements:

All were injected as sulphate except for boron. We shall merely mention here the most important observations.

Boron:

Only one experiment was carried out with boric acid. Over twenty weeks the injected trees gave an increase in production of 30% on the control. The effect on the D. R. C. appears very slight.

Manganese:

Manganese seems to act as copper, but manganese reinjected into the trees does not give so much response as copper. Moreover the D. R. C. decrease is less with manganese than with copper.

Iron:

We observe a D. R. C. decrease as with copper, but only a slight increase in production.

Zinc:

It was not confirmed that injecting the zinc salt could stop production, but it appears that zinc has a definite depressive effect on the yield.

2 : 4. D

The effect of this biotic substance has already been discussed (*loc. cit.*). It was seen that injection or application to the bark below the tapping cut gave an increase in the yield and a decrease of the D. R. C. Reinjection experiments with 2 : 4. D has now indicated that excess of this product can cause very damaging effects to the bark.

INDIAN RUBBER STATISTICS

TABLE 1

Monthly Production, dry weight in tons, 1948 to June 1952

Months	1948	1949	1950	1951	1952
January	1,425	1,326	1,291	1,307	1,651
February	270	257	208	260	325
March	956	798	988	902	1,127
April	1,498	1,563	1,640	1,664	1,973
May	1,646	1,240	1,450	1,808	1,533
June	694	854	836	562	1,153
July	844	904	758	1,258	1,510
August	1,068	1,245	1,053	1,654	1,167
September	1,646	1,410	1,414	1,756	2,596
October	1,796	1,944	1,937	1,807	1972
November	1,742	2,011	1,975	1,981	
December	1,837	2,035	2,049	2,189	
Total	15,422	15,587	15,599	17,148	

TABLE 2

Monthly consumption of Raw Rubber (indigenous and imported) by Rubber Goods Manufacturers (Tons,) 1948 to June 1952

Months	1948	1949	1950	1951	1952
January	1,587	1,548	1,162	1,868	2,059
February	1,494	1,414	1,295	1,894	1,980
March	1,587	1,284	1,320	1,821	1,954
April	1,668	1,981	1,435	2,134	1,598
May	1,432	1,847	1,372	1,576	1,514
June	1,875	1,770	1,517	1,131	1,757
July	1,801	1,785	1,800	2,077	2030
August	1,902	1,819	1,670	2,007	1840
September	1,753	1,638	1,506	1,953	1633
October	1,109	1,068	1,253	1,788	1330
November	1,700	1,697	1,737	2,061	
December	1,811	1,341	1,668	2,117	
Total	19,719	19,192	17,735	22,427	

TABLE 3

Imports of Raw Rubber to India during 1948 to June 1952 (Tons)

Months	1948	1949	1950	1951	1952
January	...	501	339	945	447
February	...	354	41	1,377	638
March	...	954	44	1,124	217
April	...	691	...	850	544
May	...	9	132	521	187
June	315	71	44	477	315
July	705	...	...	843	Nil
August	444	...	...	115	235
September	941	3	...	185	300
October	649	2	75	243	393
November	595	66	175	136	
December	684	116	232	105	
Total	4,333	2,767	1,082	6,921	

TABLE 4

Production, Consumption and Stocks of Rubber—January/June 1952

GROUUPS	Production: Jan./June 1952	Consumption of rubber by manufacturers Jan/June 52	Stocks with estates and dealers as on 30-6-'52	Stock in transit sold to manufacturers as on 30-6-1952	Stocks of rubber with manufacturers as on 30-6-1952
Group 1	3,127	4,118	714	423	1,209
Group 2	1,562	2,773	516	250	231
Group 3	704	415	288	101	162
Group 4	479	375	288	25	133
Group 5	366	1,579	153	121	739
Group 6	202	447	175	120	204
Group 7	8	68	42	15	22
Scrap Grades	909	119	442	10	54
Latex (D. R. C)	153	367	178	...	125
Sole Crepe	252	151	167	...	29
Estimated unspecified		450*			75*
Total	7,762	10,862	2,963	1,065	2,983

* Estimated consumption by and stocks with some manufacturers from whom returns have not been received.

TABLE 5

Rubber Prices in Ceylon and India

Grades	Average monthly F. O. B. Colombo prices for 100 lbs. (Jan./June 1952)						Controlled Indian Minimum F.O.B. Cochin prices for 100 lbs. from 21-5-1951
	Jan.	Feb.	March	April	May	June	
RMA 1	216.65	192.25	173.44	174.67	172.40	188.00	127.00
RMA 2	210.55	186.69	168.63	169.83	168.20	184.81	125.50
RMA 3	204.40	181.25	163.69	164.92	163.80	181.63	124.00
RMA 4	192.55	169.75	153.50	154.00	131.70	150.25	120 50
RMA 5	156.25	145.56	137.25	137.50	110.65	122.50	116 50
Pale Latex Cr. IX	256.60	231.13	207.00	207.00	193.10	189.75	130.50
Pale Latex Cr. 1	249.15	226.75	203.75	203.25	185.15	181.88	128.50
Flat Bark	122.15	113.25	104.81	107.75	82.80	78.94	91.50

TABLE 6

World Production of Raw Rubber (Tons)
(Revised and corrected up to date)

Countries	1948	1949	1950	1951
Malaya	698,189	671,503	694,090	605,343
Indonesia	432,349	431,841	696,472	805,159
Ceylon	95,000	89,500	113,500	105,000
Vietnam & Cambodia	43,935	43,010	48,482	52,136
India	15,424	15,587	15,599	17,148
Sarawak	39,680	39,461	55,615	42,359
Other Asia *	127,500	125,000	151,500	148,500
Africa *	42,000	45,000	54,500	72,000
Brazil	20,158	21,318	19,402	20,777
Others (Latin American and Oceania) **	10,452	6,859	9,827	11,709
Total (rounded off)	1,525,000	1,490,000	1,860,000	1,880,000

Source - Rubber Statistical Bulletin, July 1952.

* Estimated.

**Partly estimated.

TABLE 7

World Production, Consumption and Stocks of Natural Rubber (In tons)

Year.	Production	Consumption	Total stocks in producing & consuming countries and stocks afloat.	Increase (†) or decrease (-) in total stocks.
1948	1,525,000	1,422,500	770,000	- 75,000
1949	1,490,000	1,437,500	720,000	- 50,000
1950	1,860,000	1,705,000	767,500	† 55,000
1951	1,880,000	1,500,000	825,000	† 57,500

Source. Rubber Statistical Bulletin.

Exports	according to returns recd	according to Sea-borne Trade
1946 -	Nil	1255372
1947	Nil	Nil
1948	Nil	13440
1949	Nil	883344
1950	1088	2325120
1951	144 1992	324551
1952 upto Oct.	31 1875	

Nov: Decemb

[illegible] S.C.

ANNOUNCEMENTS

(i) Supply of Fertilisers to the Rubber Plantation Industry from the Central Fertilizer Pool.

Rubber growers who desire to have an allotment of the Sulphate of Ammonia for the year 1953 are requested to intimate to this Board's office the quantity (tonnage) required by them. They are also requested to indicate the rubber area proposed to be manured, age of the trees and the rate of proposed application of the fertilizer. Applications should reach the Indian Rubber Board's Office before the 10th November, 1952, in order to enable this Board to submit to the Government of India a consolidated demand in respect of the Rubber Plantation Industry.

The Government of India have decided to discontinue the "Phosphatic" part of the Central Fertilizer Pool as they do not expect any difficulty in future, regarding the availability of this fertilizer.

Messrs The Fertilizers and Chemicals (Travancore) Ltd., Udyogamandal P. O., Alwaye, have informed this Board that they can now supply superphosphate 17½% and 16% super at Rs. 240/- and Rs. 222/- respectively per ton f. o. r. Alwaye/Cochin Harbour Terminus.

(ii) Paranitrophenol.

Rubber growers are requested to intimate to this Board before the 10th November, 1952, their annual requirements of Paranitrophenol in order to enable us to give an estimate of the requirements of this chemical for the rubber plantation industry to importers.

(iii) Preserved Latex.

With reference to a representation that stocks of latex for which there was no ready demand in the country should be allowed to be exported to foreign countries, the Board decided that no recommendation should be made for the issue of export licenses for latex and that a general circular should be sent to producers of preserved latex advising them that they should as far as possible regulate their production of latex according to demand to avoid the risk of stocks of latex remaining unsold. It was also suggested by the Board that stocks of latex for which there was no demand in the country should as far as possible be converted into other grades of rubber for which there was a demand. This decision of the Board is published for the information of rubber growers.

C. M. S. P.—623—1500—13-10-1952

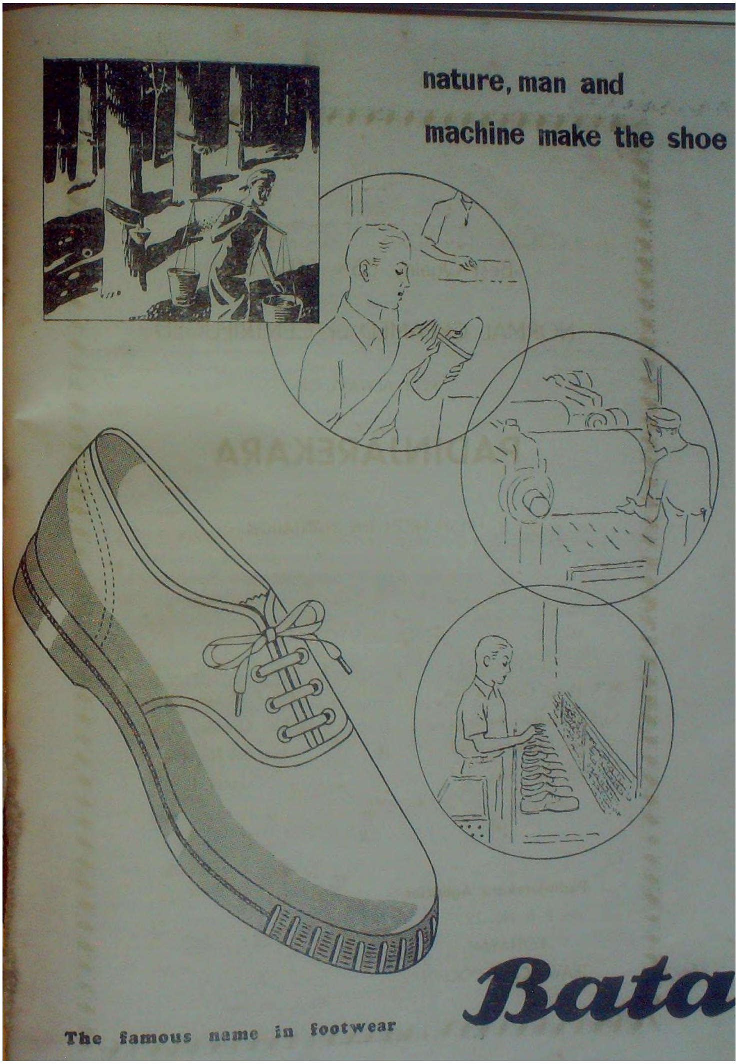
THE

INDIAN RUBBER BOARD
BULLETIN

Vol. I Nos. 3 & 4. JULY—DECEMBER 1952

CONTENTS

THE INDIAN RUBBER BOARD BULLETIN


nature, man and
machine make the shoe
Bata
The famous name in footwear

THE

INDIAN RUBBER BOARD
BULLETIN

Vol. I Nos. 3 & 4. JULY—DECEMBER 1952

EDITORIAL

The utilisation of the products of rubber seed for industrial and other purposes has been the subject of investigation in many countries in the past. It has been found out that the seed is rich in oil which can be extracted and used in the manufacture of paints, etc., and that the oil-cake, a by-product, can be used as cattle food. But, so far, the extraction of oil from this seed does not seem to have been undertaken on a commercial scale in any of the rubber growing countries. The main reasons for this are reported to be the high cost of collection of the seed from plantations, the cost of drying and preserving it (without which it deteriorates), seed-fall being seasonal. Consequently the cost of production of rubber seed oil is said to be comparatively higher than that of other economic oil seeds.

On receipt of a report that cattle grazing on a rubber plantation have been found to eat rubber seeds lying on the ground and a suggestion that the possibility of using the seed as cattle food might be investigated into, the Board despatched a quantity of freshly collected rubber seeds to the Director of the Dairy Research Institute, Bangalore, who kindly undertook to carry out the necessary investigations. A brief report on the preliminary results of feeding trials carried out at the Institute is published in this issue. "The observations made so far," says the report, "tend to suggest that the kernel as such is not likely to be a suitable feed for cattle unless a major portion of its oil is extracted out."

In the particular case reported to us, the cattle might have become accustomed to eating it, particularly when they were very hungry and when there was nothing better to choose on the ground they were grazing. The attention of owners of rubber plantations are, however, drawn to the report published in this Bulletin and they are requested to warn owners of cattle grazing on their plantations that rubber seed kernel with its high oil content is not a suitable cattle food.

THE

INDIAN RUBBER BOARD
BULLETIN

Vol. II Nos. 3 & 4. JULY—DECEMBER 1952

EDITORIAL

The utilisation of the products of rubber seed for industrial and other purposes has been the subject of investigation in many countries in the past. It has been found out that the seed is rich in oil which can be extracted and used in the manufacture of paints, etc., and that the oil-cake, a by-product, can be used as cattle food. But, so far, the extraction of oil from this seed does not seem to have been undertaken on a commercial scale in any of the rubber growing countries. The main reasons for this are reported to be the high cost of collection of the seed from plantations, the cost of drying and preserving it (without which it deteriorates), seed-fall being seasonal. Consequently the cost of production of rubber seed oil is said to be comparatively higher than that of other economic oil seeds.

On receipt of a report that cattle grazing on a rubber plantation have been found to eat rubber seeds lying on the ground and a suggestion that the possibility of using the seed as cattle food might be investigated into, the Board despatched a quantity of freshly collected rubber seeds to the Director of the Dairy Research Institute, Bangalore, who kindly undertook to carry out the necessary investigations. A brief report on the preliminary results of feeding trials carried out at the Institute is published in this issue. "The observations made so far," says the report, "tend to suggest that the kernel as such is not likely to be a suitable feed for cattle unless a major portion of its oil is extracted out."

In the particular case reported to us, the cattle might have become accustomed to eating it, particularly when they were very hungry and when there was nothing better to choose on the ground they were grazing. The attention of owners of rubber plantations are, however, drawn to the report published in this Bulletin and they are requested to warn owners of cattle grazing on their plantations that rubber seed kernel with its high oil content is not a suitable cattle food.

RUBBER SEED KERNEL AS CATTLE FOOD

By K. C. SEN, D. SC., F. N. I.,
Director, Dairy Research Institute, Bangalore

1. Through the courtesy of the Indian Rubber Board, 150 lb. of undecorticated rubber seed was received on 19-8-52. On arrival the seeds were shelled to separate out the kernel. On weighment, the kernel portion was found to be about 60 per cent of the total weight of the whole seed. The analysis of the kernel gave the following composition.

Particulars of constituents	%
Moisture	8·50
Crude protein	17·63
Ether extract	48·50
Total carbohydrate	22·89
Ash	2·48
Calcium (Ca)	0·12
Phosphorous (P)	0·43

2. It is evident from the data given above that the seed is exceptionally rich in Ether Extract (oil), and this factor has to be reckoned with in using it as a cattle feed. One high oil bearing seed which is commonly used in this country as well as elsewhere as cattle feed, i. e., cottonseed, contains less than half as much of oil as present in rubber seed kernel. Investigations carried out in India to study the effect of feeding seeds rich in oil (such as linseed, toria seed, sarson seed etc.) have shown that animals can consume only a limited quantity of these stuffs, and very soon show symptoms of impaired digestion (in the form of diarrhoea) when they are made to eat larger quantities. The protein content of the rubber seed kernel is comparable to that of cottonseed and the make-up of other nutrients of the two is more or less similar.

3. A series of exploratory feeding trials were carried out to assess the palatability and the quantitative consumption of the kernel. The results obtained from these trials may briefly be stated as follows:

(i) The animals refused to eat rubber seed kernel as a single feed.

(ii) Cooking and salting the seed-kernel also failed to induce consumption.

(iii) Attempts made to feed it with jaggery failed to help in the consumption of any appreciable quantity.

(iv) When added to the usual grain mixture, the maximum amount consumed was only 4 oz.

(v) When offered after cooking and mixed with a small quantity of wheat bran (4-6 oz.), the animals could be made to consume a maximum of 2 lb. of kernel per head per day.

When the palatability and the mode of consumption was established according to the last method as mentioned above, a 10-day feeding trial was carried out with the rest of the kernels on four male calves varying in age from 13 to 23 months, and weighing between 366 to 576 lbs. These animals were found to maintain at the end of this short feeding period their normal growth rate and they showed no ill effect from the feeding of the rubber seed kernels.

The observations so far made with the small quantity of seed obtained from the Indian Rubber Board, tend to suggest that the kernel as such is not likely to be a suitable feed for cattle unless a major portion of its oil is extracted out. The excess of this somewhat aromatic and semi-drying oil seems to be the limiting factor not only in regard to palatability but also in regard to its consumption in reasonable quantity. The shell of the rubber seed has also been analysed and found to contain a fairly large amount of fibre (57·00%). It contains, however, 6·45% of crude protein. On offering to cattle, the shells were found to be consumed in very small quantities (4-8 oz.) and that only when admixed with the usual concentrate feeds.

The preliminary results as given above indicate that the rubber seeds-kernel may serve as a cattle feed only after de-oiling, but further work is desirable.

A NOTE ON ROOT DISEASES OF RUBBER IN INDIA

Even though most of the root diseases of rubber which are known to cause considerable destruction of trees in other rubber growing countries in the East, have been recorded in South Indian Plantations also, their incidence in this country generally have been extremely low if not rare. The exact reasons for this greater freedom from root disease are not known. Perhaps the continuous drought obtaining during 4 to 5 months in the year when the top layers of the soil of the hilly plantations become dry to a depth of 2 feet or more may be one of them. However, many planters seem to be under the impression that root diseases are absent in their estates. The facts that the disease causing organisms are present in the planting districts here, and that serious outbreaks of the diseases can occur under favourable conditions in this country also is evident from the two cases described below.

Outbreaks of root disease were reported to us by two estates. In the first estate situated in Malabar, the root disease occurred in an area of about 7 years old rubber. On examination the causal fungus was found to be *Fomes lignosus*. The source of infection in the case of an affected tree examined in detail was traced through the roots to the stump of an *Albizzia* tree situated about 25 feet away.

In the second estate, which is also situated in the Malabar District, patches of diseased trees were found scattered about in an old rubber area which was reported to have been planted in the year 1907. Extensive thinning out, by cutting down the trees mostly at ground level, had been carried out in the area during the last 4 to 5 years. The disease appeared to be spreading outwards to the neighbouring trees around the affected patches and infected trees at various stages of development were seen among them. The root of an affected tree which was examined in detail showed parasitic fungus growth. The source of infection of this tree could not be traced. As there was some doubt about the identity of the causal fungus, specimens of infected roots were taken to the Mycologist of the Agricultural Research Institute, Coimbatore, who identified it as *Fomes noxius*.

Regarding the source of infection in this case it has to be admitted, as already stated above, that only one infected tree was examined to find out the source of infection. The possibilities, therefore, that the original point of contact of infection, if any, might have been missed or disturbed in the course of inspection or might have already been lost by natural disintegration cannot be ruled out. No conclusions under the circumstances could be drawn in this case about the source of infection of the disease until further investigations are carried out.

Stray cases of root disease, it was reported, had occurred in the area in the past but its incidence on any such large scale was noticed only 2 to 3 years after thinning out had been carried out. The question arises, therefore, as to why the incidence of root disease had become high after the thinning-out. Does thinning out encourage the outbreak of root disease ?

Cases of abnormally high incidence of root disease in areas where a proportion of rubber trees had been thinned out, and also in replanted areas where the stumps of felled rubber trees are allowed to remain untreated have been observed in Malaya. In the Annual Report of the Pathological Division of the Rubber Research Institute of Malaya, Altson has reviewed (pp. 136—39) the results of experiments in progress in Malaya relating to this subject and also current explanations of this phenomenon under the heading " *The manner in which potential sources of infection become converted into actual ones*." Owing to the great importance of this subject to rubber planters in this country also the above review is reproduced in full below.

" The manner in which potential sources of infection become converted into actual ones.

The main, if not sole, way in which a replanting of rubber becomes affected by root disease is through spread of the disease (by the way of root contacts) from infected stumps, or root fragments, left behind by the previous stand.

Considered in relation to the part they may play as future sources of infection for the new stand, the old trees in an area destined for replanting fall into two distinct categories, namely: those whose stumps will become *actual* (i. e. active) sources of infection ; and those whose stumps will become *potential* sources of infection. The first category comprises the trees whose roots are already diseased at the time of clearing; and in a field of old rubber such trees will occur, almost without exception, on the margins of open patches which have developed as the result of the gradual destruction of a part of the stand by spread of the disease from some central focus.

The second category is represented by the trees, growing well away from the open patches, which appear perfectly healthy at the time of clearing. The stumps of these trees are said to form *potential* sources of infection because experience has shown that despite their original freedom from disease they frequently become invaded by *Fomes lignosus* or, less frequently, by *Fomes noxius*, and thus converted into *actual* sources of infection.

Most of the old rubber which is earmarked for replanting was originally established on land cleared from forest, and the parasites now growing in the roots of the trees whose stumps will become the *actual* sources of infection have reached their present situation by slow centrifugal spread from some jungle stump that was either diseased at the time the forest was felled or which became diseased shortly afterwards. But how these parasites succeed in invading the stump of a tree that has remained apparently unaffected by root disease for 30 or more years, thus converting it from a *potential* into an *actual* source of infection, is still not understood.

Two explanations of this phenomenon have been advanced: one that the cut surface of the healthy stump becomes infected through the agency of air- or insect-borne spores; and the other that the fungus is present in the roots (or in the soil in contact with the roots) in a dormant condition and springs into activity when the resistance of the host tissue is lowered by severance of the stem. The first of these two hypothesis (which is the more orthodox one) held the field in the early days of the rubber industry, when attention was drawn to the phenomenon not, of course, by its occurrence in replantings, but by the spread of infection from the stumps of apparently healthy trees which had been felled in the course of thinning out a stand. But largely owing to the growth of an erroneous belief that the fructifications of *Fomes lignosus* were invariably sterile, this older theory was eventually discarded, and the hypothesis of dormant sources of infection emerged. And although Napper subsequently showed that *Fomes lignosus* actually produces spores in abundance during certain seasons of the year, the latter hypothesis continued to gain ground not only in Malaya, but also in Ceylon and Indonesia; receiving considerable support in 1939 from the publication of what appeared to be confirmatory observations on *Armillaria mellea* in Africa. As late as 1940, Napper expressed his views on this phenomenon in the following words: "The origin of this attack is at present obscure. The sources have so far proved undetectable, and it is not yet possible to say with certainty whether they are generally present in mature areas (in the soil or in the roots of the old trees), or are introduced after felling through the agency of wind-blown spores (though this latter mode of introduction is regarded as unlikely)".

As, however, no convincing evidence has ever been adduced to justify acceptance of the theory of dormant sources of infection, in so far as rubber and its major root parasites are concerned, an investigation was begun towards end of 1947 which it was hoped might throw some light on the matter. Since the basis of the theory is that a dormant parasite lying within, or in close contact with the host is stimulated into activity by a decline in resistance of the host tissue, the procedure adopted was as follows : large lateral roots of 20 year old trees were exposed, severed by a saw cut, and then re-covered with soil. Once a month, for a period of twelve months, a proportion of the severed roots was removed and brought back to the laboratory for detailed examination.

The results were entirely negative. Indeed the only pathogen of rubber whose growth appears to have been encouraged by the experimental treatment was *Ustulina zonata* a well-known wound parasite. This single experiment cannot, of course, be held to disprove the theory of dormant sources of infection—it has merely failed to confirm it: but it is nevertheless of some significance that the field (No. 9 at Sungei Buloh) where the observations were made was one in which the incidence of *Fomes lignosus* had been particularly high during the first four or five years after planting.

Further information having an important bearing on this question has emerged from another observation made at Sungei Buloh. A round of collar inspection carried out in February in Field 32 (planted in 1937; budded in 1939) brought to light the fact that the number of cases of disease due to *Fomes noxius* had increased by nearly 30 times in the nine months that had elapsed since the previous inspection. The source of this outbreak was found to be the stumps of the trees that had been felled during the course of thinning two years earlier. These had been cut at about 18 inches above ground level, and their butts then stripped of bark to prevent the shooting of dormant buds. A careful examination of a number of these stumps made it quite clear that their infection had not been brought about by root contacts but had been initiated at some point on the stem, the obvious inference being, therefore, that it had occurred through the agency of air- or insect-borne spores. Furthermore, there was a suggestion that this spore infection had actually been favoured by the removal of the bark, for in another field (35 B) which was thinned-out at the same time as Field 32, but where the butts were not stripped, the incidence of *Fomes noxius* has remained normal. However, it would be unwise to regard this as any more than a suggestion because the difference between the two fields might well have been the result of a difference between the relative prevalence of the primary sources of the infection, namely, fructifications of *F. noxius*."

Gadd, in his book "The Common Diseases of Tea" published by the Tea Research Institute of Ceylon (1949) describes a somewhat similar phenomenon in respect of tea where the stumps of felled shade trees get infected by root diseases and become actual sources of infection of healthy tea plants, as follows:—

"That the felling of shade trees is often followed by root diseases in the tea is well known to all planters. A field of tea with a good stand of healthy shade trees such as *Grevillea* or *Albizzia* may be free from any root disease until some of the shade trees are felled. One or two or more years later tea bushes in the immediate vicinity of the stumps begin to die. The diseases concerned are almost invariably *Ustulina* or Brown root disease (*Fomes noxius*); *Poria* and *Rosillina* rarely arises in that way .....When their spores fall on the exposed wood surface of the stump of a felled tree (they) begin to grow and feed as saprophytes ..... If the tree was recently felled and the roots not yet dead, their parasitic ability though it be small enables them to forge ahead......into the still living parts of the roots. Also they can now pass from the stumps' roots to those of any tea bush in contact with them."

In the first estate in Malabar, described above, the stump of the Albizzia tree might have been attacked by *Fomes lignosus* in the manner described by Gadd and then become converted into actual source of infection to the neighbouring rubber trees by root contact. In many rubber plantations in South India it has been the practice to plant *Albizzia* or other species of shade trees among young rubber. These are generally cut down when the rubber trees become mature. The possibilities of the stumps of shade trees getting infected by root disease and becoming sources of infection for rubber trees, unless adequate precautions to protect the stumps are taken, is emphasised here as a warning.

In the second estate, it is likely that the stumps of thinned-out rubber trees, as explained in Altsons report, might have become infected with *Fomes noxius*, through the agency of air or insect-borne spores and that the disease spread to other healthy trees by root contact. Confirmation of this, however, require further investigation.

With regard to measures for the prevention of root diseases from becoming established on the healthy stumps, according to circular No. 36 of the R. R. I. of Malaya (1952), "The problem is best dealt with by removing as much as possible of the healthy stand; thereby the amount of green timber left exposed to infection is reduced, its rate of decay is increased because of the smaller total bulk, and the cost of controlling such root disease as may occur in the young stand is minimised by the source of infection being easily removed. There are, however, considerations which may rule out complete removal of the stumps—the area to be replanted may be steep with consequent risk of erosion, or the cost may be found prohibitive." In such cases the R R. I. suggests stump poisoning with sodium arsenite solution. "Poisoning," the circular points out, "does not destroy a root parasite already present. There are good grounds for supposing that stump-poisoning exerts its effect by hastening the death of the roots, thereby exposing them to invasion by saprophytic fungi which are antagonistic to the root parasites."

Advisory circular No. 33 (1952) of the R. R. I. of Ceylon describes a method of mechanical felling of rubber trees with Trewhella Monkey Grubber for replanting. By this method "the tree is pulled out with the taproot usually complete and with up to six feet of the large laterals attached to the tree." "This" says the circular, "has a distinct advantage from the root disease view-point since *Fomes lignosus*, if present, is liable to subsist on the large laterals and remain to infect the new planting. All tree stumps (uprooted) are readily accessible for *Fomes* inspection and treatment if necessary." In this method of uprooting the trees, therefore, the potential source of root disease infection, the stumps, is eliminated.

According to Gadd, quoted above, if the stump or tree is felled a few inches below the ground level and covered with soil or if the cut surface of the stump is tarred the possibility of infection by air-borne spores is likely to be much less.

Mr. T. L. Jackson, the Manager of the estate on which the outbreak of *Fomes noxius* had occurred, observes that the long drought period obtaining in most planting districts *generally* kills out the old stumps within a year of felling and termites do the "cleaning up" and hence the disease does not usually assume "epidemic" form. He further observes that the chances of infection of the stumps by root disease are reduced if the trees are cut down at about 18 inches below ground level severing the lateral roots; this would enable the remaining parts of the root to rot quickly and to be eaten by termites.

Acknowledgement. The Board's thanks are due to the Managers of the two estates for providing its Field Officer with the necessary facilities to examine the root diseases, etc.

PRE-COAGULATION OF LATEX *

The importance of this subject to planters is borne out by two main facts, first, the very considerable amounts of low grade rubber caused by pre-coagulation, and second, the disorganisation of latex collection during wet weather which enhances the phenomenon. It is also well known that much inconvenience occurs during the wintering season.

Non-Rubber Constituents. What do we understand of the nature and causes of pre-coagulation? Broadly speaking it is due to changes taking place in the latex non-rubber components and manifests itself in numerous ways such as lumps in the tapping cup, clots in the latex, complete coagulation during transportation and fermentation bubbles in the coagulum.

To explain this breakdown, which is analogous both to the clotting of blood and to the souring of milk, it is necessary to know something of the characteristics of latex. Like many biological liquids, it is a colloidal suspension of particles in water containing dissolved substances. In latex, the suspended bodies are rubber particles stabilised by a surrounding protein layer which produces an electric charge on the particles and helps to maintain them in a dispersed condition. There are also other bodies known as lutoids, because of their yellow colour. The continuous aqueous phase (serum) contains dissolved sugars, proteins and salts.

Immediately on exudation of the latex after tapping, the mechanism of natural clotting begins, as in blood, by the activation of enzymes already present in the latex. Enzymes like vitamins with which they are associated, are present in all living tissue in very small quantities and are essential for all life process. Among other things they act in latex by altering the structure of the protein stabilising layers, thereby allowing amalgamation of the rubber particles, that is, coagulation. Recent work at the Rubber Research Institute has shown that the lutoids coagulate first and may separate out with associated rubber particles to give the familiar 'yellow fraction.' This is probably what happens during lump formation in the tapping cut.

Bacteria. The amounts of these important non-rubber constituents in latex and consequently the resistence to spontaneous coagulation, vary greatly from latex to latex depending on age, type of tree, type of soil and other ecological conditions. If the latex is a highly stable one, then another mechanism of breakdown asserts itself, about six or 12 hours after tapping. Bacteria from atmosphere, containers, etc. pollute the latex in a manner similar to that giving rise to milk fermentation. They react mainly on the sugars and proteins dissolved in the serum, forming acids and putrid substances. Multiplication of these acidic materials will eventually coagulate the latex by neutralising the electric charge on the particles. A small amount of fermentation in the latex will produce bubbles in sheet rubber during drying. The two factors involved in the pre-coagulation of latex are thought to be, therefore, 1, spontaneous clotting of latex by enzymes destabilising the proteins round the rubber particles and 2, production of acids by bacteria. It remains for us to consider how wet weather affects these mechanisms.

Wet Weather and Wintering. It is obvious that the wetting of the trees has a major effect and it has been shown recently at the R. R. I. that water soluble

* Reproduced from the Rubber Research Institute of Malaya's Planter's Bulletin, Sept. 1952.

bark substances when washed into the latex are a direct cause of premature clotting. The substances involved are tannins and metallic salts, such as those of calcium or magnesium. Tannins react with proteins (for which purpose they are employed in the leather industry for the treatment of hide) and thereby destabilise the rubber particles. The metallic salts probably activate the native latex enzymes and accelerate the spontaneous clotting process. They also react with proteins.

Pre-coagulation during wintering is most likely connected with the alteration of the tree metabolism and hence, of the relative amounts of non-rubber substances in the latex, leading to a decrease in stability.

Remedies. The foregoing discussion helps us to understand the processes involved and so to devise remedies which, of course, are the rubber growers' main interest. One solution to the problem would be to produce trees giving latex of high stability. This is another problem for the botanist adding one more item to his already crowded programme. Another fundamental approach might be by injection of the tree with chemicals as done by our French colleagues in Indo-China. They claim to have altered the properties of the latex by copper injection, and also to have increased the yield of rubber.

Although prevention is better than cure we must consider for immediate practical purposes remedies which are known to be effective. The usual method is to add anticoagulants (such as small quantities of ammonia) to the latex in the tapping cups and collecting buckets. The nature of these anticoagulants must be such that on the above interpretation for the mechanisms involved the clotting process is prevented by killing the responsible enzymes and the fermentation process, delayed both by destroying the causative bacteria and by neutralising the acids produced.

Since the clotting mechanism starts as soon as the tree is tapped it is necessary to add the preservative as soon as possible, especially with unstable latex. This, as most planters know, to their cost, is exceedingly difficult to insure. To prevent contamination by bacteria it is essential to keep all cups, buckets, tanks and other utensils spotlessly clean and frequently sterilized with antiseptic chemicals such as formaldehyde and paranitrophenol (PNP). In wet weather anticoagulants are again effective but what is required is waterproof tree or latex resistant to the action of the soluble bark substances.

It will be seen from the above that there are quite a few problems still to be solved on this subject and the chemists at the RRI are actively concerned in their elucidation. However, what is first required is a complete understanding of the complicated biological structure of latex and of the various mechanisms whereby the latex coagulates. It is to be hoped that this scientific insight will shortly be forthcoming, to the material convenience and financial benefit of the planting community in particular and of rubber users in general.

SUPPLY OF APPROVED CLONAL SEED BY THE INDIAN RUBBER BOARD

Supplies made in 1952.

With the object of popularising the use of high yielding rubber planting material particularly among small holders, the Board has been obtaining selected clonal seed from local sources and supplying them to rubber growers since 1949. Details of the distribution scheme undertaken in 1951 have been described in the Indian Rubber Board Bulletin, Vol. I, No. 4, Page 105.

In 1952 also the Board decided to continue this important work. A concession rate of Rs. 20/- per thousand seeds was fixed for quantities up to a maximum of 2,000 seeds supplied to any one party. Quantities above this, when supplied to a party, were charged at the rate of Rs. 30/- per thousand. Applications for the supply of about eight lakhs seeds were received by the Board, compared to about 5½ lakhs in 1951. As seed production was generally good in the country sufficient seeds to meet the increased demand could be obtained. The majority of applicants preferred the seed in the ungerminated condition. Advisory leaflets on method of germinating rubber seeds and on the establishment and maintenance of seedling nurseries were circulated among those who had applied for seeds.

At the sources of supply, the approved clonal seeds were picked up and packed well with slightly moist charcoal in gunny bags. These were first forwarded to the office of the Indian Rubber Board where the seeds and the packing were checked up, re-packed where necessary and distributed. To save time in transport, the majority of applicants took delivery of the seeds at the Board's office. The total quantity of seeds obtained and supplied by the Board in 1952 were as follows:—

Quantity of ungerminated seed supplied to rubber growers:	692,615
Quantity of germinated seed supplied to rubber growers:	105,965
Total quantity of seed supplied:	798,580

The number of parties to whom seeds were supplied by tho Board amounted to 365, most of whom are small holders.

Proposals for Supply of Clonal Seed in 1953

As the increasing demand for approved high-yielding clonal seed, during the last 3 years, is a clear indication of the increasing interest shown by rubber growers particularly small holders, in this regard the Board has decided to continue this work in 1953. More or less the same scheme adopted in 1952 will be followed in 1953 also. The maximum quantity which may be supplied to any one party at a concession rate of Rs. 20/- per thousand has been fixed at 2,000 seeds. Limited additional quantities may also be supplied at actual cost if sufficient seeds are available for distribution after making the above basic allocation. Those who require much larger supplies than the above are requested to book them direct with seed suppliers in order to ensure supplies. A list of approved clonal seed suppliers may be obtained on application to this Board.

THOSE WHO DESIRE TO OBTAIN SUPPLIES OF SELECTED CLONAL SEED THROUGH THE BOARD UNDER THE ABOVE SCHEME SHOULD MAKE THEIR APPLICATION TO THIS BOARD SO AS TO REACH HERE ON OR BEFORE 15TH MAY, 1953.

If the seed is required for replanting, the Register Number assigned by this Board to the holding or estate should be mentioned in the application. If it is for new-planting, the locality and survey number of the land earmarked for it should be mentioned.

NEWS AND NOTES

(1) **Staff.** Sri P. C. John, Chief Accountant and Statistical Officer, resigned from the service of the Board as from 1st January, 1953.

Sri V. C. Naidu, who had been deputed to the Board as Secretary since 2nd July, 1948, will be returning to his permanent post in the Central Secretariat Cadre early in 1953.

Sri P. N. Ramachandran, Assistant Private Secretary to the Minister of Commerce and Industry, has been appointed as Additional Secretary to the Board and will take over charge as Secretary to the Board on Sri Naidu's relief.

The Board has approved the appointment of Sri K. M. Joseph, Field Experiment Controller of Messrs. Socfin & Co. Ltd., Malaya, as a Field Office. of the Board.

(2) **Control over distribution of iron materials:**

Under Government of India Notifications No. S. C(A)-4 (159) and No. S. C(A)-4 (158) dated the 19th January 1953, the control over distribution of the following articles have been lifted by the Iron & Steel Controller, Calcutta:—

(i) Any variety of pipes, tubes and fittings (indigenous or imported).

(ii) Bars (including flats, squares, rounds, hexagons and rods) and Light Structurals (including light sections of joists, channels, angles, tees, and light rails of 30 lbs. and under).

(3) **Recognition of a New Leaf Disease of Rubber:**

A new leaf disease on rubber has been described by Mr. K. P. John, Asst. Pathologist of the R. R. I. of Malaya in communication No. 278 of the Journal of the R. R. I. of Malaya. The causal fungus has been established as a species of *colletotrichum* which is different from the two species of it already recorded on rubber. Symptoms:—The affected leaves show the characteristic lesions scattered all over the leaf, either between or on the veins. These lesions are almost circular in shape with reddish brown lower surfaces and ash-brown upper surfaces. Their general appearance is grey or black due to the presence of numerous tufts of black setae arranged usually in concentric circles, especially towards the margin of the spot. The setae usually bear a few white glistering spores at their ends. The lesions may reach as much as 5·0 millimeter in diameter. The fungus may account for all the spots of a leaf or may be associated with "*Helminthosporium heveae.*" This is considered to be only a minor disease of rubber and is not likely to prove serious.

(4) Thornless Mimosa invisa.

Mimosa invisa, popularly known as 'giant mimosa' is a member of the family *Leguminosae*. It may be called the giant brother of the well known touch-me-not plant (*Mimosa pudica*—തൊട്ടാവാടി). In the search for a suitable leguminous cover crop on rubber areas this plant had also been tested in many rubber growing countries particularly in Indonesia during the 1920's. It grows luxuriantly in new-clearings forming an effective soil cover and producing large quantities of green manure. But owing to the sharp thorns it possesses this species had been discarded as a cover crop on rubber areas. According to a note by G.G. Boulhuis published in the 'World Crops' (Vol. 5, Jan. 1953, p. 37) a thornless variety of *Mimosa invisa* has been found out by Mr. A. S. Bolt, Manager of Tjirung Estate in Java. This variety breeds true to type and does not differ from the original *Mimosa invisa*. "As *Mimosa invisa* forms a very good soil-cover, suppresses weeds excellently, produces a good mulch and a great many root nodules, this new variety must be considered a very welcome addition to the large assortment of soil covers and green manures available for tropical agriculture," says the note. Even though this plant grows so luxuriantly in the open, it is not known whether it will thrive well under the shade of the rubber trees. If it does, this variety of 'giant mimosa' should prove to be a useful permanent cover under rubber. The Indian Rubber Board is trying to obtain some seed of this variety of giant mimosa for testing in South Indian plantations.

(5) Scheme for a Rubber Manufacturers' Research Institute in India:

At the Conference of the Indian Rubber Manufacturers held under the auspices of the Indian Rubber Industries Association at Calcutta from the 24th to 27th December, the following resolution was unanimously passed:—

> "This Conference of the Indian rubber manufacturers is happy to note that the Council of Scientific and Industrial Research has taken a lead in preparing a scheme for the establishment of Rubber Research Institute in India. The Conference endorses the provisional decisions taken at a meeting of the representative of Indian Rubber Association, A. R. M. I., N. C. L., Indian Rubber Board and C. S. I. P. under the presidentship of Dr. S. S. Bhatnagar at Poona. The Conference, however, feels that considerable time has elapsed since the above decision was arrived at and that no further progress in this direction has been made. The Conference considers the establishment of Rubber Research Institute as of vital importance to the Rubber Industry in this country. It, therefore, urges upon the Council of Scientific and Industrial Research to implement the decision of the Poona meeting without any further delay......"

(6) The Quality of Indigenous Raw Rubber:

Speaking on "The Problems of Rubber Industry" at the first Conference of the Indian Rubber Industries Association held at Calcutta on 25th December, Sri L. M. Jamnadas (Cosmos-India) said—"The question of raw rubber is considerably eased as far as the quality of Raw Rubber is concerned as Indian producers are following International standards. It is likely that some dealers may overgrade their rubber but it is for the manufacturers to select a proper supplier. Even in this matter the Indian Rubber Board has provided for Arbitration Panels and if there is any dispute between the supplier and the producer the same can be referred to arbitration."

(7) **Restrictions on the movement of raw rubber in India.**

Under Notification No. S. R. O. 2076 dated the 18th December, 1952, the Central Government have removed the restrictions imposed on the movement of raw rubber from the State of Travancore-Cochin and the District of Malabar in the State of Madras. Consequent on this, the post of Rubber Controller, Kottayam, was also abolished with effect from the afternoon of 31st December, 1952.

(8) **Malayan Plant Importation Rules—Prohibited Plant Specimens.**

The following announcement made in the Rubber Research Institute of Malaya's Planters' Bulletin is reproduced below for the information of rubber planters in India.

"**Prohibited Plant Specimens.** Attention of planters and others in territories outside the Federation of Malaya and the Colony of Singapore is drawn to the Malayan Plant Importation Rules which prohibit the importation into Malaya of any part of a plant, whether living or dead, unless it is accompanied by a permit issued by the Director of Agriculture, Federation of Malaya. No permit will be issued in respect of any diseased plant or any plant pest. Any plant imported in contravention of these Rules (whose object is to prevent the introduction of diseases or pests) will be destroyed without examination. Anyone outside Malaya who desires our advice on pests or diseases or any other matters that may require examination of living material must first submit an inquiry by letter giving the fullest possible description of their problem."

Rubber producers in India are invited to write to the Indian Rubber Board, Kottayam, for advice or information on pests and diseases and on other problems relating to the growing and production of rubber. Interviews may also be arranged with the officers of the Board by letter.

PLANT PROTECTION

Rules for Regulating Import of Rubber Planting Material into India.

(For the information of importers of rubber planting material, relevant rules from the Government of India Notification No. F. 320/35–A, dated the 20th July, 1936 and Notification (Agriculture) No. F. 6-4/52 Dte. i, dated the 5th January, 1953, are reproduced below)—

2. No plant shall be imported into India by means of the letter or sample post; provided that sugarcane for planting intended to be grown under the personal supervision of the Government Sugarcane Expert, Coimbatore, may be imported by him by such post.

3. No plant shall be imported into India by air; provided that plants which are infested with living insects and are intended for the introduction of such living insects may be so imported if they are accompanied by a special certificate from the Head of Division of Entomology Indian Agricultural Research Institute that such plants are imported for the purpose of introducing such insects.

4. No plants other than fruits and vegetables intended for consumption, potatoes, sugarcane and unmanufactured tobacco either raw or cured, shall be imported into India by sea except after fumigation with hydrocyanic acid gas and at a prescribed port.

5. (i) No plants, other than unmanufactured tobacco imported from Burma, fruits and vegetables intended for consumption and potatoes, shall be imported into India by sea unless accompanied by an official certificate that they are free from injurious insects and diseases.

(ii) The certificate shall be in the form prescribed in the Third Schedule or in a form as near thereto as may be and supplying all the information called for in that form.

CERTIFICATE (Third Schedule)

"This is to certify that the

plant(s), living plant(s) or plant products
a representative sample of the plant(s), living plant(s) or plant products
(Strike out the words not applicable)

included in the consignment, of which particulars are given below were/was thoroughly examined on the (date)............by (name)................a duly authorised official of the..............and found to be healthy, no evidence of the presence of any injurious insect, pest, or disease (destructive to agricultural or horticultural crops or to trees or bushes) having been found in/on them and that the consignment (including the packing) covered by this certificate has/has not been treated in the following manner (e. g. fumigated with........or disinfected with........prior / immediately subsequent to inspection).

Inspected / Not inspected in the field by a duly authorised inspector on..........

(*Signature*)..................

(*Official Status*)..................

Date..........
No. and description of packages..........
Distinguishing marks..........
Description of plants or plant products or parts thereof..........
Started to be grown at..........
Exported by..............
Name and address of consignee..............
Name of vessel or particulars of route..........
Date of shipment..........
Port or place of entry..........
Additional Certificate(s) attached..........

(Give here details of any special certificate or certificates issued in respect of imports specifically scheduled)."

7. Rubber plants shall not be imported into India by sea unless, in addition to the general certificate required under Rule 5, they are accompanied by an official certificate that the estate from which the plants have originated or the individual plants are free from Fomes, Lignosis, Sphoerostible repens, Dothidella ulei (Melanopsammopsis ulei Fusicladium macrosporum) and Oidium heveae.

10. (i) Hevea rubber plants and hevea rubber seeds shall not be imported into India from America or from the West Indies except by the Director of Agriculture, Madras Presidency.

(ii) *Rubber seeds from other countries may be imported into India only after fumigation and disinfection at the port of entry, namely Madras or Bombay, as the case may be.

RUBBER REPLANTING SCHEME IN MALAYA

Scheme No. 2, for the administration of Fund 'B' under the above Ordinance

Simultaneously with the publication of *The Rubber Industry (Replanting) Ordinance, 1952*, in the Federation of Malaya Government Gazette of November, 15, 1952, the following PRESS RELEASE was also published in Malaya.

BACKGROUND

The Rubber Industry (Replanting) Ordinance 1952 was introduced and became law in May 1952 with the object of encouraging and accelerating the replanting of old rubber, both on small holdings and on medium and large estates. Under the provisions of the Ordinance, a Board, known as the Rubber Industry (Replanting) Board, has been established to administer the funds available and to make and approve schemes etc. for the general replanting of rubber. The Board obtains its funds from cesses on rubber exported from the Federation which are imposed by The High Commissioner in Council on the recommendations of the

* As amended by Notification No. F. 6—4/52 - Dte. 1 dated 5th January, 1953, of the Government of India, Ministry of Food & Agriculture (Agri).

Board. These cesses are collected through the normal Customs channels and the money divided between Funds "A" and "B" in proportion to the quantity of rubber exported by Estates of over 100 acres and small holdings of under 100 acres respectively. Fund "A" deals with the large and medium Estates and is administered by its own body of Administrators. Similarly Fund "B" deals with holdings of under 100 acres and is administered by five representatives of the smallholders and three members appointed by the Federation Government.

The vital and urgent necessity for replanting a large proportion of the old and worn out rubber in Malaya cannot be over-stressed. It is probable that at least one-half of the total population of the Federation is directly dependent on rubber for a large proportion of its livelihood and many are entirely dependent on it. There are, for instance, over 370,000 holdings of under 100 acres totalling nearly 1,600,000 acres. The owners of these holdings, together with their dependents, may be estimated to total about 1½ million persons. While some of these have other sources of income, it would be reasonable to assume that the majority of them are dependent on their rubber land for virtually everything. Again, the large Estates employ over 300,000 workers, these together with their dependents must number another half a million persons. There are also large numbers employed in the ancilliary industries, transport, engineering, building, retail dealers, etc., etc., who are very largely dependent on the power of the rubber producers in all categories to spend money. Not only is the individual producer directly affected by the prosperity or otherwise of the rubber industry, but the indirect effects of low exports and small incomes resulting from poor yields and low prices are reflected in the lives of all. The Federation Government is dependent on the rubber industry for a very high proportion of its annual revenue; without that revenue, funds available for dealing with the Emergency and for the many schemes of social betterment now in train must be severely restricted or become non-existent.

Our natural rubber now has to compete with the synthetic article. Natural rubber can hold its own provided it can be sold at a competitive price. It is unlikely, owing to this competition between natural and synthetic, that we shall ever again see the natural product at the high prices ruling for some months until early this year. The important thing to bear in mind is that the consumption of natural rubber is greatly increased if prices are not excessive. The potential needs for rubber are vast but recent high prices have been a deterent to many uses. A lot of cheap rubber can be more easily disposed of than a small quantity at very high prices. For example, the use of rubber for roadways may be prohibitive at $1·50 per pound but may be thoroughly economic at, say 75 cents per lb. In other words, producers can maintain their incomes and even improve them by putting themselves into the position of being able to produce larger quantities and sell more cheaply.

That is the object of Scheme No. 2. Many small holders are now producing not more than 15 to 20 katties of rubber per acre per month from their old trees, some below that rate. Also, in a vast number of cases, the prospects of maintaining even these small yields are poor owing to bark exhaustion. Replanting properly carried out with the high yielding material that will be made available and with the new trees carefully upkept to maturity, offers prospects of three or four times or even more than much old rubber is yielding today. In short, an income from the holding or holdings several times as large as that now accruing can be obtained.

THE SCHEME

The main points in Scheme 2 before you are:—

1. The Scheme aims at a target of 500,000 acres old rubber replanted by the end of 1959. The target for 1953 is 50,000 acres. At present there is a shortage of approved clonal seed but high yielding budding material is sufficient.

2. The Scheme is to be administered by the eight Administrators appointed for the purpose through an Executive Officer in Kuala Lumpur.

3. At State and Settlement level, it is intended to appoint State or Settlement Replanting Officers. These will be men with wide experience in replanting and in rubber cultivation generally and will be assisted by a trained staff. They will supervise the actual replanting operations in the States and Settlements.

4. The Mentri 2 Besar or Resident Commissioners in the States and Settlements may, if they desire, appoint State/Settlement Replanting Committees. These will assist in the drafting of local schemes and will advise generally on any problems that may arise within their areas. It is hoped that such Committees will be formed in all States and Settlements.

5. Applications for assistance in replanting will be dealt with by State and Settlement Replanting Officers acting on the advice of the State/Settlement Replanting Committee where such has been appointed.

6. The scale of grants in cash or kind is clearly laid down in the scheme * The State or Settlement Replanting Officer may, at his discretion, utilise a portion of the grant for the purpose of supplying planting material, fertilisers etc. The State or Settlement Replanting Officer, must, in all cases, be satisfied that the grant, approved for replanting, is being properly applied to that work.

7. Generally, the Scheme is designed to provide grants for replanting up to one-third of the acreage owned by an applicant. Owners of less than 6 acres of rubber land, however, may be permitted to replant up to 3 acres of their land. No grants will be approved for the replanting of areas of less than one acre. Owners of a number of holdings, no matter where situated, aggregating less than 100 acres, may treat their total holdings as a single unit for the purpose of applying for a replanting grant.

***Scale of grants.**

		$
1st year	Advance to be made after felling or destruction by other means of the old rubber trees is completed to the satisfaction of the State or Settlement Replanting Officer	120
2nd year	For the cost of manuring and maintenance subject to the area being properly upkept	80
	Advance to be made 6 months after a satisfactory stand of rubber has been established and subject to the area being properly kept up	120
3rd year	" "	20
4th year	" "	20
5th year	" "	20
6th year	" "	20
	Total	400

8. There is provision in the scheme for assistance for those who wish to replant their holding/holdings with a crop other than rubber. Cases of this nature will be dealt with by the Administrators on individual merit and they are empowered to authorise grants at such rates as they may deem appropriate, having regard to the nature of the new cultivation.

9. Scheme 2 is expected to come into operation on 1st January 1953.

There is in operation at the moment an interim Scheme 1. Applications for participation in this Scheme close today. It was designed to assist those who had already taken steps on their own initiative to replant in 1952. It provides that, where land has been cleared and properly prepared for replanting, a grant equal to the first year grant under Scheme 2 may be approved. Those participating in Scheme 1 will be merged into Scheme 2 when the latter comes into operation and must then apply to be admitted into that Scheme.

INDIAN RUBBER STATISTICS

TABLE 1

Monthly Production, dry weight in tons, 1948 to 1952

Months	1948	1949	1950	1951	1952
January	1,425	1,326	1,291	1,307	1,651
February	270	257	208	260	325
March	956	798	988	902	1,127
April	1,498	1,563	1,640	1,664	1,973
May	1,646	1,240	1,450	1,808	1,533
June	694	854	836	562	1,153
July	844	904	758	1,258	1,510
August	1,068	1,245	1,053	1,654	1,167
September	1,646	1,410	1,414	1,756	2,596
October	1,796	1,944	1,937	1,807	1,972
November	1,742	2,011	1,975	1,981	2,450
December	1,837	2,035	2,049	2,189	2,406
Total	15,422	15,587	15,599	17,148	19,863

1952

TABLE 2

Monthly Consumption of Raw Rubber (indigenous and imported) by Rubber Goods Manufacturers (Tons) 1948 to 1952

Months	1948	1949	1950	1951	1952
January	1,587	1,548	1,162	1,868	2,059
February	1,494	1,414	1,295	1,894	1,980
March	1,587	1,284	1,320	1,821	1,954
April	1,668	1,981	1,435	2,134	1,598
May	1,432	1,847	1,372	1,576	1,514
June	1,875	1,770	1,517	1,131	1,757
July	1,801	1,785	1,800	2,077	2,035
August	1,902	1,819	1,670	2,007	1,840
September	1,753	1,638	1,506	1,953	1,633
October	1,109	1,068	1,253	1,788	1,330
November	1,700	1,697	1,737	2,061	1,686
December	1,811	1,341	1,668	2,117	1,675
Total	19,719	19,192	17,735	22,427	21,061

TABLE 3

Imports of Raw Rubber into India during 1948 to 1952 (Tons)

Months	1948	1949	1950	1951	1952
January	...	501	339	945	447
February	...	354	41	1,377	638
March	...	954	44	1,124	217
April	...	691	...	850	544
May	...	9	132	521	187
June	315	71	44	477	315
July	705	...	...	843	..
August	444	...	...	115	235
September	941	3	...	185	300
October	649	2	75	243	388
November	595	66	175	136	336
December	684	116	232	105	244
Total	4,333	2,767	1,082	6,921	3,851

TABLE 4

Exports of Raw Rubber from India (Tons) 1950—1952

Month	*1950*	*1951*	*1952*
January	...	...	4
February	...	...	6
March	89	...	1
April	383	...	5
May	373	...	...
June	1	...	...
July	112	16	6
August	27	20	4
September	17	23	2
October	12	38	4
November	16	36	...
December	8	12	64
Total	1038	145	96

TABLE 5

Production, Consumption and Stocks of Rubber by Groups January/December 1952

GROUPS	Production Jan./Dec. 1952 (Tons)	Consumption of rubber by manufacturers, Jan./Dec. '52 (Tons)	Stocks with estates and dealers as on 31-12-1952 (Tons)	Stocks in transit sold to manufacturers as on 31-12-1952 (Tons)	Stocks of rubber with manufacturers as on 31-12-1952 (Tons)
Group 1	8,188	7,941	1,762	317	1,232
Group 2	3,790	4,875	1,010	343	701
Group 3	1,755	1,029	721	136	156
Group 4	1,147	732	607	41	178
Group 5	834	3,310	233	59	530
Group 6	563	1,003	337	60	244
Group 7	34	119	55	5	39
Scrap Grades	2,323	199	658	4	34
Latex (D.R.C.)	558	667	351	12	66
Sole Crepe	671	286	347	4	34
Estimated unspecified	..	900*	...	...	*75
Total	19,863	21,061	6,081	981	3,289

* Estimated consumption by and stocks with some manufacturers from whom returns have not been received.

Note.—

Group 1 is composed of		RMA IX and I.
Group 2	,,	RMA 2, 3 and cuttings No. 1.
Group 3	,,	RMA 4, 5 and cuttings No. 2.
Group 4	,,	Precoagulated Crepe, PLC IX, 1, 2 & 3.
Group 5	,,	Estate Brown Crepe IX, 2X , Smoked Blanket and Remilled Crepe 2.
Group 6	,,	Estate Brown Crepe 3X, Remilled Crepe 3 & 4.
Group 7	,,	Flat Bark.

TABLE 6.

Total Planted Area, Estates and Holdings, corrected up to 31st December 1952 and Planting Materials used

	ESTATES (acres)				SMALL-HOLDINGS (acres)				GRAND TOTAL (acres)			
	Ordinary seedling	Budded	Clonal seedling	Total	Ordinary seedling	Budded	Clonal seedling	Total	Ordinary seedling	Budded	Clonal seedling	Total (acres)
Planted earlier than 1938	59,040·22	7,286.78	327·78	66,654·78	38,944·77	47·25	1·25	38,993·27	97,984·99	7,334·03	329·03	105,648·05
in 1938	351·65	1,264·71	..	1,616·36	158.27	12·26	5·02	175·55	509·92	1,276·97	5·02	1,791·91
1939	276·72	2,062·14	499·08	2,837·94	896·11	267·62	27·66	1,191·39	1,172·83	2,329·76	526·74	4,029·33
1940	227·21	1,639·28	471·60	2,338·09	1,107·89	223·24	35·12	1,366·25	1,335·10	1,862·52	506·72	3,704·34
1941	11·79	1,255·19	81·00	1,347·98	718·43	57·60	5·67	781·70	730·22	1,312·79	86·67	2,129·68
1942	988·76	2,114·48	413·57	3,516·81	2,210·16	149·02	95·14	2,454·32	3,198·92	2,263·50	508·71	5,971·13
1943	2,721·47	1,976·18	1,285·50	5,983·15	7,491·03	769·68	504·58	8,765·29	10,212·50	2,745·86	1,790·08	14,748·44
1944	3,081·63	1,153·03	762·49	4,997·15	6,099·79	297·78	339·53	6,737·10	9,181·42	1,450·81	1,162·02	11,734·25
1915	2,420·65	423·90	2,247·88	5,092·43	4,351·91	192·24	134·70	4,678·85	6,772·56	616·14	2,382·58	9,771·28
1946	949·08	500·49	531·22	1,980·79	2,149·78	44·98	121·92	2,316·68	3,098·86	545·47	653·14	4,297·47
1947	330 65	822·48	313·73	1,466·86	1,147·98	73·28	79·32	1,300·58	1,478·63	895·76	393·05	2,767.44
1948	398.98	507·12	95·51	1,001·61	227·00	6·50	47·24	280·74	625·98	513·62	142·75	1,282·35
1949	445·19	299·03	160·31	904·53	136·94	..	59·84	196·78	582·13	299·03	220·15	1,101·31
1950	764·76	245·76	337·36	1,347·88	109·50	8·00	17·00	134·50	874·26	253·76	354·36	1,482·38
1951	107·00	559·48	392·01	1,058·49	57·43	..	54·40	111·83	164·43	559·48	446·41	1,170·32
1952	189·96	580·20	267·19	1,037·35	73·50	1·25	44·22	118·97	263·46	581.45	311·41	1,156·32
Total	72,305·72	22,690·25	8,186·23	103,182·20	65,880·49	2,150·70	1,572·61	69,603·80	138,186·21	24,840·95	9,758·84	172,786·00

TYPE DESCRIPTIONS
AND
PACKING SPECIFICATIONS FOR NATURAL RUBBER*

ADOPTED BY

THE RUBBER MANUFACTURERS ASSOCIATION, INC.

444 Madison Avenue, New York 22, N. Y.

1832 M Street N. W., Washington 6, D. C.

AND ENDORSED BY

RUBBER TRADE ASSOCIATION OF NEW YORK, INC.

15 William Street, New York 5, N.Y.

Effective as of July 1, 1952

The RMA Type Descriptions and Packing Specifications contained herein supersede in their entirety the booklet "Crude Rubber Type Descriptions and Packing Specifications for Crude Rubber" effective as of August, 1938, as well as the "Temporary Packing Specifications for Crude Rubber" effective July 1, 1951. All subsequent amendments and additions to the Type Descriptions and Packing Specifications contained herein will be issued under the title "Type Descriptions and Packing Specifications for Natural Rubber – Amendment I (II, III, etc.)" with the pertinent effective date.

---

* Reproduced by kind permission of the Rubber Manufacturers Association, Inc.

TABLE OF CONTENTS

Part I. OFFICIAL NATURAL RUBBER TYPE DESCRIPTIONS

PART I

OFFICIAL NATURAL RUBBER TYPE DESCRIPTIONS

Section 1. PURPOSE OF OFFICIAL TYPES

The Rubber Manufacturers Association, Inc., representing factory consumers in the United States, has established over the years official types of the several marketable grades of dry natural rubber. Only grades of rubber derived from the latex of the Hevea Brasiliensis tree are included in the official types. All known requirements for dry natural plantation rubber can be satisfied with one or more of these official types. Presently all consuming and producing countries of the world recognize these types as universal standards.

Observance of these standards by producers and packers assures acceptance by consumers.

Purchase of these official types by consumers under proper contracts* creates legal rights to insist on deliveries of official contract grades.

Section 2. RMA TYPE SAMPLES

For each of the RMA types hereinafter described, except where specifically noted there have been established official RMA type samples. These sample books, bearing the official RMA seal, contain several carefully selected pieces of rubber showing the range of quality included in the type and grade represented. Deliveries of types specified in contracts must conform to the *average* quality represented by the several sheets in the type sample book. Rubber inferior to any part of the RMA type cannot be averaged with superior rubber to make up a proper tender. A delivery consisting entirely of rubber equal in quality to the lower pieces in the official sample book of the contract grade is not a proper tender. Since it is impractical to cover by language all the necessary description of a commodity graded by visual inspection, the average quality of the sample shall be governing, except for the conditions specified in the following descriptions.

The following descriptions supersede the descriptions printed on the inside cover of the RMA type sample books distributed prior to May 1, 1952.

Wet, bleached and virgin rubber and rubber that is not completely dry at the time of buyers' inspection is not acceptable for any of the RMA official types. (Except slightly undercured rubber as specified under 5 Ribbed Smoked Sheet description.) Skim latex coagula shall not be used in whole or in part for producing any of the RMA types.

Copper or manganese content in any RMA type and grade of rubber shall not exceed the following maximum tolerances: Copper 8 parts and Manganese 10 parts per million.

The official RMA Type Samples are prepared by a joint committee of the Rubber Manufacturers Association, Inc. and the Rubber Trade Association of New York, and may be purchased from either Association.

---

*Factory consumers in the U. S. A. who buy rubber under the RMA contract have the right to reject tenders if they are not of contract grade and if they are not packed in accordance with the official packing specifications. The RMA contract is printed in booklet form, having the following title and is available on request:

"Rules and Regulations covering transactions between sellers and factory buyers of crude rubber in the U. S. A.—Also Contract Form"

The report of the Packing and Marketing Committee, International Rubber Study Group, Eighth Meeting, Rome 1951, provided:

"The Committee was of the opinion that, as was the case pre-war, Rubber Trade Associations in other markets might wish to duplicate the established RMA type samples for working purposes. No objection was voiced to this procedure, but it was clearly understood that such duplication was the responsibility of the Rubber Trade Association concerned, and in the absence of agreement to the contrary, all quality arbitrations would be based on the established RMA type samples."

Section 3. RIBBED SMOKED SHEETS

Nothing but ribbed smoked sheets of rubber can be used in making these grades; cuttings, block or frothy sheets, or other scrap, air-dried sheets or smooth sheets not permissible.

No. IX RSS—Superior Quality Ribbed Smoked Sheets

The grade must be produced under conditions where all processes are carefully and uniformly controlled.

Each bale must be packed free of mould but very slight traces of dry mould on wrappers or bale surfaces adjacent to wrapper found at time of delivery will not be objected to provided there is no penetration of mould inside the bale.

The rubber must be dry, clean, strong, sound and evenly smoked, and free from blemishes, specks, rust, blisters, and any foreign substances. Small pin-head bubbles, if scattered, will not be objected to.

No. 1 RSS—Standard Quality Ribbed Smoked Sheets

Each bale must be packed free of mould but very slight traces of dry mould on wrappers or bale surfaces adjacent to wrapper found at time of delivery will not be objected to provided there is no penetration of mould inside the bale.

The rubber must be dry, clean, strong, sound and free from blemishes, rust, blisters, and any foreign substances, except slight specks as shown in type sample. Small pin-head bubbles, if scattered, will not be objected to.

No. 2 RSS—Good Fair Average Quality Ribbed Smoked Sheets

Slight rust and slight amounts of dry mould on wrappers, bale surfaces and interior sheets, found at time of delivery will not be objected to, provided these conditions, either singly or in combination, do not exist to an objectionable extent on and in more than 5% of the number of bales included in the delivery, lot or tender as determined by the number of bales inspected.

Small bubbles and slight specks of bark, if scattered, will not be objected to.

Rubber must be dry, clean, strong, sound and free of blemishes, blisters, and all foreign substances other than those specified above as permissible.

No. 3 RSS—Fair Average Quality Ribbed Smoked Sheets

Rust and dry mould on wrappers, bale surfaces and interior sheets, found at time of delivery will not be objected to, provided these conditions, either singly or in combination, do not exist to an objectionable extent on and in more than 10% of the number of bales included in the delivery, lot or tender as determined by the number of bales inspected.

Slight blemishes in color, small bubbles and small specks of bark permissible.

Rubber must be dry, strong and free of blemishes, blisters, and all foreign substances other than those specified above as permissible.

No. 4 RSS—Low Fair Average Quality Ribbed Smoked Sheets

Rust and dry mould on wrappers, bale surfaces and interior sheets, found at time of delivery, will not be objected to provided these conditions, either singly or in combination, do not exist to an objectionable extent on and in more than 20% of the number of bales included in the delivery, lot or tender as determined by the number of bales inspected.

Translucent stains, medium size bark particles of the size shown in the type sample, bubbles, slightly sticky, over-smoked rubber permissible.

Weak rubber, under-cured rubber, heated or oxidized spots or streaks not permissible.

Rubber must be dry, firm and free of blemishes, sticky blisters, and all foreign substances other than those specified above as permissible.

No. 5 RSS—Inferior Fair Average Quality Ribbed Smoked Sheets

Dry mould on wrappers, bale surfaces and interior sheets, found at time of delivery will not be objected to provided this condition does not exist to an objectionable extent on and in more than 30% of the number of bales included in the delivery, lot or tender, as determined by the number of bales inspected.

Rust, stains, large bark particles of the size shown in the type sample, bubbles, oversmoked, slightly sticky, and slightly under-cured rubber permissible.

Weak rubber, heated or oxidized spots or streaks not permissible.

Rubber must be free of blemishes, sticky blisters, and all foreign substances other than those specified as permissible.

Section 4. THICK PALE CREPES

These grades must be produced from the fresh coagula of natural liquid latex under conditions where all processes are carefully and uniformly controlled. The rubber is creped out in thickness corresponding to the type sample.

No. IX—Superior Quality Thick Pale Crepe

Deliveries must consist of dry firm rubber of very light uniform color.

Discoloration, regardless of cause, dust, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible.

No. 1—Standard Quality Thick Pale Crepe

Deliveries must consist of dry, firm rubber of light color with very slight variation in shade permissible.

Discoloration, regardless of cause, dust, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible.

No. 2—Good Fair Average Quality Thick Palish Crepe

Deliveries must consist of dry firm rubber, slightly darker than No. 1 Thick Pale Crepe with slight variation in shade permissible.

Slightly mottled rubber, of the degree shown in the type sample will not be objected to, provided this condition does not exist in more than 10% of the number of bales included in the delivery, lot or tender, as determined by the number of bales inspected.

Discoloration, regardless of cause, dust, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible, other than those specified above as permissible.

No. 3—Fair Average Quality Thick Off-Color Palish Crepe

Deliveries must consist of dry firm rubber of yellowish color with variation in shade permitted. Mottled and streaked rubber and fungus spots of the degree shown in the type sample permitted, provided this condition does not exist in more than 20% of the number of bales included in the delivery, lot or tender, as determined by the number of bales inspected.

Discoloration, regardless of cause, dust, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible, other than those specified above as permissible.

Section 5. THIN PALE CREPES

These grades must be produced from the fresh coagula of natural liquid latex under conditions where all processes are carefully and uniformly controlled. The rubber is creped out to produce in thickness corresponding to the type sample.

No. 1X—Superior Quality Thin Pale Crepe

Deliveries must consist of dry firm rubber of very light uniform color.

Discoloration, regardless of cause, dust, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible.

No. 1—Standard Quality Thin Pale Crepe

Deliveries must consist of dry, firm rubber of light color with very slight variation in shade permissible.

Discoloration, regardless of cause, dust, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible.

No. 2—Good Fair Average Quality Thin Palish Crepe

Deliveries must consist of dry firm rubber, slightly darker than No. 1 Thin Pale Crepe with slight variation in shade permissible.

Slightly mottled rubber will not be objected to provided this condition does not exist in more than 10% of the number of bales included in the delivery, lot or tender, as determined by the number of bales inspected.

Discoloration, regardless of cause, dust, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible, other than those specified above as permissible.

No. 3—Fair Average Quality Thin Off-Color Palish Crepe

Deliveries must consist of dry firm rubber of yellowish color with variation in shade permitted. Slightly mottled and streaked rubber permitted, provided this condition does not exist in more than 20% of the number of bales included in the delivery, lot or tender, as determined by the number of bales inspected.

Discoloration, regardless of cause, dust, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible, other than those specified above as permissible.

Section 6. ESTATE BROWN THICK CREPES

These grades are to consist of rejections of Pale Latex Crepe, lump, and other high grade rubbers generated on rubber estates. Tree bark scrap, if used, must be precleaned to separate the rubber from the bark. Power wash mills are to be used in milling these grades into a form of crepe of thickness corresponding to the type sample. Use of earth scrap, smoked scrap, and wet slab is not permissible in the preparation of Estate Brown Thick Crepes.

No. 1X—Clean Thick Light Brown Crepe

Discoloration, regardless of cause, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible.

No. 2X—Clean Thick Brown Crepe

Discoloration, regardless of cause, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible.

No. 3X—Brown to Dark Brown Thick Crepe

Discoloration, regardless of cause, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible, except specks of bark of the degree shown in the type sample will not be objected to.

Section 7. ESTATE BROWN THIN CREPES

These grades are to consist of rejections of Pale Latex Crepe, lump, and other high grade rubbers generated on rubber estates. Tree bark scrap, if used, must be precleaned to separate the rubber from the bark. Power wash mills on estates are to be used in milling these grades into a form of crepe of thickness corresponding to the type sample. Use of earth scrap, smoked scrap, and wet slab is not permissible in the preparation of Estate Brown Thin Crepes.

No. 1X—Clean Thin Light Brown Crepe

Discoloration, regardless of cause, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible.

No. 2X—Clean Thin Brown Crepe

Discoloration, regardless of cause, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible.

No. 3X—Brown to Dark Brown Thin Crepe

Discoloration, regardless of cause, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible, except specks of bark of the degree shown in the type sample will not be objected to.

Section 8. THICK BLANKET CREPES (AMBERS)

These grades are manufactured on power wash mills from wet slab, unsmoked sheets, lump, and other high-grade scrap generated on estates or small holdings. Tree bark scrap, if used, must be precleaned to separate the rubber from the bark. Earth scrap is not permissible in these grades. The rubber is creped out to produce crepe in thickness corresponding to the type sample. These grades were formerly described as Remilled Thick Brown Crepes.

No. 2—Clean Thick Blanket Crepe (Amber)

Deliveries must consist of dry clean rubber, light brown in color.

Discoloration, regardless of cause, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible.

No. 3—Clean Thick Blanket Crepe (Amber)

Deliveries must consist of dry clean rubber, brown in color.

Discoloration, regardless of cause, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible.

No. 4 –Clean Thick Blanket Crepe (Amber)

Rubber must be dry and brown to dark brown in color.

Discoloration, regardless of cause, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible.

Section 9. THIN BROWN CREPES

These grades are manufactured on power wash mills from wet slab, unsmoked sheet, lump, and other high-grade scrap generated on estates or small holdings. Tree bark scrap, if used, must be precleaned to separate the rubber from the bark. Earth scrap and smoked scrap are not permissible in these grades. The rubber is creped out to produce crepe in thickness corresponding to the type sample. These grades were formerly described as Remilled Thin Brown Crepes.

No. 1—Clean Thin Superior Light Brown Crepe

Deliveries must consist of dry, clean rubber.

Discoloration, regardless of cause, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible.

No. 2—Clean Thin Light Brown Crepe

Discoloration, regardless of cause, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible.

No. 3—Clean Thin Brown Crepe

Discoloration, regardless of cause, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible.

No. 4—Thin Brown to Dark Brown Specky Crepe

Discoloration, regardless of cause, specks, or other foreign matter, oil or other stains, or any evidence of oxidation or heat, not permissible, except specks of bark of the degree shown in the type sample will not be objected to.

Section 10. FLAT BARK CREPE

This material is produced on power wash mills out of all types of scrap rubber, including earth scrap.

Standard Flat Bark Crepe

The rubber is very dark brown to black in color and is medium hard to soft in texture.

Sludge, uncured rubber, cotton, sand, and other foreign matter, except fine bark particles, not permissible.

Heated and discolored rubber not permissible.

Due to rapid deterioration of this grade, no official RMA Type Sample has been established.

Hard Flat Bark Crepe

The rubber is very dark brown to black in color and is manufactured in the form of thick, firm, comparatively tough crepe.

Sludge, cotton, sand, except fine bark particles of the degree shown in the type sample, not permitted.

Heated and discolored rubber not permissible.

Section 11. PURE SMOKED BLANKET CREPES

Standard Quality Pure Clean Smoked Blanket Crepe

This grade is made by milling on power wash mills rubber derived exclusively from Ribbed Smoked Sheets (including block sheets) or Ribbed Smoked Sheet Cuttings. No other type of rubber shall be used, and no non-rubber material shall be added. Rubber of this type is clean, firm, tough, and retains an easily detectable smoked sheet odor.

Sludge and uncured rubber, oil spots, heat spots, limited amounts of copper or manganese and foreign substances are not permitted.

Color variation from brown to very dark brown permissible.

Section 12. OTHER TYPES OF NATURAL RUBBER

The above-described grades are the only official RMA types of natural rubber. These types cover the full range of grades for which definite standards have been established. From time to time factory consumers will be offered grades of natural rubber other than the above-described official types. Factory consumers should exercise the utmost care in buying grades other than these official types.

PART II

NATURAL RUBBER PACKING SPECIFICATIONS

All natural rubber of the types specified in Part I must be packed in accordance with the following specifications contained in Part II.

No other kind of packing is acceptable unless by specific contract designation.

Of particular note in the following specifications are the requirements regarding uniform bale weights. The use of talc is strictly limited to the requirements listed in the following specifications.

Section 1. RIBBED SMOKED SHEETS

(a) All Ribbed Smoked Sheets shall be packed in rubber covered bales.

(b) The maximum weight of each bale should be 250 lbs. net per five cu. ft outside measurements. The minimum weight of each bale shall be 224 lbs. net, except where lower weights are specified in the buyer's contract. Each bale within a given shipment covered by a single bill of lading shall be of uniform weight.

(c) Each bale must be wrapped on all sides and corners with equal or higher quality rubber of the same type. Double wrapper sheets must be used if wrapper sheets contain holes. No metal bands or wire or non-metallic binders shall be placed under wrapper sheets.

(d) For No. 1X, No. 1, and No. 2 Ribbed Smoked Sheets the outside of the bales shall be lightly dusted with talc before applying the wrapper sheets to prevent sticking. Talc must not appear in any other part of the bale. For Nos. 3, 4, and 5 Ribbed Smoked Sheets, no talc shall be used on the inside of the wrapper sheet, nor in any other part of the bale.

(e) To overcome adhesion in transit and also to provide proper background for stenciling of colored shipping marks, the outside of the wrapper sheet must be completely and entirely painted on all six sides with one coat of the RMA bale coating solution. No other bale coating solution may be used, except were such use has been specifically accepted by the buyer. (The formula for this solution is shown in Section 7, Page 69.)

(f) Bale markings, as required in Section 8, Page 70, shall appear on two adjoining sides of the bale.

Section 2. THICK PALE CREPES

(a) Thick Pale Crepe types must be packed in coated burlap-covered bales. It is preferable that the bale be wrapped on all sides and corners with equal quality thin or thick crepe and the burlap covering applied thereafter.

(b) The maximum weight of the rubber in each bale should be 224 lbs. net per five cu. ft. outside measurements. The minimum weight of each bale shall be 160 lbs. net, except where lower weights are specified in the buyer's contract. Each bale within a given shipment covered by a single bill of lading shall be of uniform weight.

(c) Before covering with burlap, each bale shall be properly strapped by using not less than three iron bands of a minimum width of $\frac{5}{8}''$. These bands should preferably be galvanized to prevent rust stains. If rubber wrappers are used on the outside of the bale, the bands must be placed outside the rubber wrapper and under the burlap. No wires shall be used.

(d) Nothing inferior to new 12-ounce hessians shall be used for covering. Second-hand rice or sugar bags, equal to or superior to new 12-ounce hessian, without holes or patches, provided tney are thoroughly cleaned, are also satisfactory. Use of burlap previously treated or processed to prevent mildew is srtictly prohibited. All coverings must first be liberally coated with a proper mixture of sago flour, water and silicate of soda to prevent the covering from adhering to the rubber. A generous application of this solution must be given to insure proper absorption. The burlap should be thoroughly dried before applying it to the rubber. Before application of the burlap cover, the surfaces of the bale must be lightly and evenly dusted with talc. No other talc shall appear in the rubber.

(e) Markings must be placed on two adjoining sides of the bale in accordance with the bale marking requirements given in Section 8, Page 70.

Section 3. THIN PALE CREPES

(a) The maximum weight of the rubber in each bale should be 224 lbs. net per five cu. ft. outside measurements. The minimum weight of each bale shall be 160 lbs. net, except where lower weights are specified in the buyer's contract. Each bale within a given shipment covered by a single bill of lading shall be of uniform weight.

(b) Each bale must be wrapped on all sides and corners with equal or higher quality pale crepe. Multiple plies of pale crepe shall be used in the wrapper so as to insure that the interior rubber shall be protected. The surfaces of the bales must be lightly and evenly dusted with the talc before application of the wrappers. Talc shall not be used in any other part of the bale.

(c) Three iron bands of a minimum width of $\frac{5}{8}''$, preferably galvanized, on the outside of the wrapper sheet are permissible, but wire shall not be used. No metal bands or wire or nonmetallic binder shall be used under the wrapper sheets.

(d) The rubber-covered bales may be shipped in this form or they may be covered with coated burlap.

(e) To overcome adhesion of the bales in transit when shipped without burlap coverings, the outside of the wrapper sheet must either be heavily talced or painted with one coat of the RMA bale coating solution.

(f) Nothing inferior to new 12-ounce hessians shall be used for covering. Second-hand rice or sugar bags, equal to or superior to new 12-ounce hessian, without holes or patches, provided they are thoroughly cleaned, are also satisfactory. Use of burlap previously treated or processed to prevent mildew is strictly prohibited. All coverings must first be liberally coated with a proper mixture of sago flour, water and silicate of soda to prevent the covering from adhering to the rubber. A generous application of this solution must be given to insure proper absorption.

The burlap should be thoroughly dried before applying it to the rubber. Before application of the burlap cover, the surfaces of the bale must be lightly and evenly dusted with talc. No other talc shall appear in the rubber.

(g) Markings must be placed on two adjoining sides of the bale in accordance with the bale marking requirements given in Section 8, Page 70.

Section 4. FLAT BARK CREPE

(a) Flat Bark Crepe shall be packed in coated burlap or covered with no more than two coats of the RMA coating solution. Straw mats shall not be used.

(b) The maximum weight of the rubber in each bale should be 224 lbs. net per five cu. ft. outside measurements. The minimum weight of each bale shall be 204 lbs. net, except where lower weights are specified in the buyer's contract. Each bale within a given shipment covered by a single bill of lading shall be of uniform weight.

(c) Before covering with burlap or coating with solution, each bale shall be properly strapped by using not less than three iron bands of a minimum width of ⅝". These bands should preferably be galvanized. Wire shall not be used.

(d) Nothing inferior to new 12-ounce hessians shall be used for covering. Second-hand rice or sugar bags, equal to or superior to new 12-ounce hessian, without holes or patches, provided they are thoroughly cleaned, are also satisfactory. Use of burlap previously treated or processed to prevent mildew is strictly prohibited. All coverings must first be liberally coated with a proper mixtute of sago flour, water and silicate of soda to prevent the covering from adhering to the rubber. A generous application of this solution must be given to insure proper absorption. The outside of the bale should be lightly dusted with talc. No talc shall appear in the rubber, other than on the outside of the bale.

(e) When the RMA coating solution is used in place of burlap, two burlap patches or thin light-colored natural rubber patches of suitable size must be placed under the strapping on opposite sides of the bale for purposes of identification marks.

(f) Identification marks must appear on the two patches, or on two adjoining sides of the bale when packed in burlap, in accordance with the bale marking requirements shown in Section 8, Page 70.

Section 5. ALL OTHER RMA TYPES OF NATURAL RUBBER

(Estate Brown Thick and Thin Crepes, Thick Blanket Crepes [Ambers], Thin Brown Crepes, Smoked Blanket Crepes)

(a) The maximum weight of the rubber in each bale should be 250 lbs. per five cu. ft. outside measurements. The minimum weight of each bale shall be 204 lbs. net, except where lower weights are specified in the buyer's contract. Each bale within a given shipment covered by a single bill of lading shall be of uniform weight.

(b) Each bale shall be properly strapped by using not less than three iron bands of the minimum width of ⅝" These bands should preferably be galvanized Wire shall not be used.

(c) No straw mats or wooden cases shall be used in packing these types of rubber. Packing of these types is acceptable in three alternate ways :

1. **Unwrapped Bales.** Two burlap patches or thin light-colored natural rubber patches of suitable size should be placed under the strapping on opposite sides of the bale.

2. **Rubber Wrapped Bales.** Each bale may be wrapped on all six sides and corners with rubber of the same type of equal or higher grade. When using rubber wrapper sheets, the iron bands shall be placed on the outside of the wrapper sheets.

3. **Coated Burlap Wrapped Bales.** Nothing inferior to new 12-ounce hessians shall be used for covering. Second-hand rice or sugar bags, equal to or superior to new 12-ounce hessian, without holes or patches, provided they are thoroughly cleaned, are also satisfactory. Use of burlap previously treated or processed to prevent mildew is strictly prohibited. All coverings must first be liberally coated with a proper mixture of sago flour, water and silicate of soda to prevent the covering from adhering to the rubber. A generous application of this solution must be given to insure proper absorption. The burlap should be thoroughly dried before applying it to the rubber. Before application of the burlap cover, the surfaces of the bale must be lightly and evenly dusted with talc. No other talc shall appear in the rubber.

(d) To overcome adhesion of non-burlap covered bales in transit, the outside of the bales must either be heavily talced or painted with no more than two coats of the RMA bale coating solution. No talc shall be used in any other part of the bale.

(e) Identification marks must appear on the two patches, or on two adjoining sides of the bale when burlap covers of rubber wrappers are used, in accordance with the bale marking requirements shown in Section 8, Page 70.

Section 6. TALC SPECIFICATIONS

Talc is basically a hydrous magnesium silicate mineral with the presence or absence of other chemical components creating differences in the physical characteristics of the ore itself. The terms soapstone, magnesium silicate, steatite, fibrous talc, are frequently used interchangeably with talc. However, in general the term talc is more widely used than the other names.

In addition to the above materials, whiting or calcium carbonate may be used in coating and packing natural rubber.

The powders used must meet the following minimum specifications when washed through the following sieves.

100% penetration through standard U. S. Sieve No 100

93% penetration through standard U. S. Sieve No. 325

The screens used for testing should conform to the U. S. Standard Sieve Series Equivalents, as specified by the American Society for Testing Materials, A. S. T. M. designation E. 11-39.

The specific gravity of the powders used may range from 2·60 to 2·90 and the slip characteristics must range from Good to Excellent.

Section 7. BALE COATING SOLUTION

The solvent that must be used in the RMA bale coating solution, previously specified in RMA packing specifications as mineral turpentine, is an aliphatic hydrocarbon of petroleum distillate with a distillation range of 290°F. to 410°F. The specific gravity at 60°F. ranges from 0·766 to 0·830. The flash point in a closed cup ranges from 90°F. to 105° F.

Known trade names of this material as distributed in South East Asia are as follows: Shell Oil—"Mineral Turpentine"; Standard Vaccum Oil—"Varnolene":

Following herewith is the formula for the RMA bale coating solution:

Coating Mixture

4 U. S. gal. Solvent (above)

16 lbs. Gum Solution (see below)

Up to 48 lbs. fine Talcum (or reduced amount depending on presence of calcium carbonate). (Enough for coating approximately 75 bales.)

Gum Solution

½ lb. Pale Crepe cuttings (or clean RSS)

1 U. S. gal. Solvent (above)

(Leave for 24 hours, then add ½ gal. Solvent [above])

Experience has shown that talcums available for sale in the rubber producing areas vary as to their weight per unit volume. If lighter weight varieties of talcum are used, strict adherence to the above formula may result in a solution too heavy to be practicable. In these cases, instead of using the specific amount of talcum by weight shown in the above formula, it may be necessary to reduce the quantity of talc with the objective of producing a bale coating solution which will flow on readily and remain bonded to the rubber after drying.

The Indonesian Rubber Research Institute has reported satisfactory results by increasing the proportion of rubber to solvent in the *gum solution* from the specified ratio of ½ lb. rubber to 1½ U. S. gal. total solvent to ½ lb. rubber to 1 U. S. gal. total solvent and reducing the amount of talc in the coating mixture to approximately 27 lbs.

Section 8. BALE MARKING REQUIREMENTS

At least the following marks, in addition to those required by law, must appear on each bale.

(a) **Grade Marks**—Eight-inch characters on two sides of the bale.

(b) **Firm Marks**—Five-inch letters identifying the shipper's firm on two sides of the bale.

(c) **Lot Identification Marks**—Five-inch numbers appearing immediately below the firm marks on two sides of the bale. These numbers must be the same on all bales covered by the same bill of lading. Different numbers must be used for each separate bill of lading covering lots shipped by a single firm and loaded on the same vessel.

These marks must be stenciled on rubber covered bales or on the burlap or rubber patches.

The following marking solution is required: Dissolve 2 lbs. rubber in 7 gallons of kerosene or mineral turpentine. By cutting the rubber into half-inch squares, it will dissolve more quickly. This forms a basic solution into which dyes or pigments are introduced at time of stenciling.

Certain satisfactory results have been reported in producing a marking paint which penetrates through the coating into the wrapper sheets by addition of resins and low viscosity petroleum oils to the marking mixture of rubber and mineral turpentine. Provided further investigation demonstrates the acceptability of these newer marking mixtures a standard RMA mixture will be subsequently specified.

PART III

GLOSSARY OF TERMS

1. **Bark Specks or Particles**

   Literally it is the external covering of the woody stems, branches and roots of plants but in rubber it includes all foreign matter of organic origin.

2. **Blemishes**

   Any defects, stains or disfigurements not elsewhere classified except for slight milling disfigurements on ribbed smoked sheets.

3. **Blister**

   A sac, pit, pocket, or depression on or in a sheet of rubber resulting from decomposition and gas formation during the processing operations. The inner surfaces of blisters are frequently sticky.

4. **Bubbles**

   Small round globules of air or gas within the rubber formed during the coagulation process by trapped air or slight fermentation. The surfaces inside a bubble are usually dry and are not sticky.

5. **Bleached Rubber**

   See Virgin Rubber.

6. **Discoloration**

   A staining primarily indicative of biochemical degrading of the rubber as a result of packing rubber that has not been thoroughly dried. The staining may be attended by mould, heat spots, and or a foul decomposition odor.

7. **Firm Rubber**

   Rubber which is uniformly strong and solid as contrasted to rubber which is weak and spongy.

8. **Foreign Substances**

   Any material whatsoever other than rubber hydrocarbon and the natural serum substances occuring in rubber latex.

9. **Frothy Sheets**

   Sheets containing excess bubbles or blisters to the extent that the entire sheet shows nothing but this condition, caused by excess fermentation during the coagulation process. These sheets are soft, and deteriorated as a result of poor preparation.

10. **Heated Rubber**

    Soft sticky spots or streaks appearing in the rubber, regardless of cause.

11. **Mottled Rubber**

    Rubber containing spots, blotches or streaks of darker colored rubber and or spotted as the result of fungi.

12. **Over-smoked Rubber**

    Rubber which has been smoked so heavily as to have become almost opaque. This description does not include rubber which has been slightly charred as a result of too close contact to smoke fires.

13. Oxidized Rubber

Rubber hydrocarbon, any of its serum constituents, or any foreign substance within the rubber which have combined with oxygen to deteriorate or degrade the rubber.

14. Skim Latex

The residual liquid, of negligible dry weight rubber content, being the by-product of the concentration of normal liquid latex.

15. Sludge

Generally regarded as impurities removed from field latex and/or slushy deposits known as tank residue.

16. Sound Rubber

Free from any defect or weakness.

17. Sticky Rubber

Tacky, viscous or gluey rubber.

18. Strong Rubber

Property of resisting strain or tension.

19. Type and Grade

Type refers to the kind of preparation given the rubber. Grade refers to the arbitrary sub-divisions made in a type of rubber with reference to quality.

20. Under-cured Rubber

Portions of rubber which have not been thoroughly dried during the smoking or drying processes.

21. Weak Rubber

(Sometimes known as "short" rubber.) Ribbed Smoked sheet which tears easily or breaks on application of sudden tension.

22. Virgin Rubber

Rubber which still retains enough of the original moisture present as to present a whitish appearance as contrasted to "bleached rubber" which is rubber that has become wet and has absorbed excess moisture.

ANNOUNCEMENT

METROLACS

A limited quantity of Metrolacs are available for supply with :

(1) Messrs. Harrisons & Crosfield Ltd., Cochin,
(2) „ Darragh Smail & Co. Ltd., Alleppey.

The supply of this instrument to actual users is made by the above firms on the recommendation of this Board.

Rubber producers who wish to obtain Metrolacs may therefore apply for the same to any of the above firms through the Indian Rubber Board, Kottayam.

THE INDIAN RUBBER BOARD