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THE RUBBER BOARD

KOTTAYAM 686 001 INDIA

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Director of Research
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Project Officer
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RUBBER BOARD BULLETIN

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THE RUBBER BOARD

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THE QUARTER

There is an ever-increasing demand for natural rubber in the country. Commensurate with the demands, the production of natural rubber is not increasing, the result of which is that we spend our valuable foreign exchange towards import of rubber.

To overcome this gap Rubber Board calls for replanting the old and uneconomic holdings with high yielding varieties. The new Rubber Development Scheme being implemented by the Rubber Board contains provisions for financial assistance on liberal terms.

The speech delivered by shri K Mohanachandran Chairman, at the Board meeting held on 25th September 1982 has revealed that the plantation development efforts have been progressing satisfactorily. Certain difficulties in the procedure adopted in credit financing under the scheme have been solved now and similar financial arrangements in Tamil Nadu, Karnataka, Goa and Maharashtra will be finalised shortly. He anticipates that with these arrangements the Plantation Development Scheme would gather a new momentum.

Almost all large plantations have been totally replanted with high yielding varieties. But an area of about 50,000 hectares belonging to the small holding sector still remains to be replanted. The yield now obtaining in our small holdings is far from satisfactory. When there are planting materials capable of giving an yield of up to 2.5 tonnes per hectare, it may not be advantageous to retain the old and uneconomic trees.

The small holders should not rely on temporary gains. They should replant their holdings and utilise all the facilities available under the Rubber Development scheme and the other schemes implemented by the Board for the welfare of the small holding community as a whole.

●

RECENT RESEARCH ON GUAYULE

The IRCA has undertaken the introduction of guayule into Africa, while carrying out several studies on its seeds in France. In Senegal and Morocco, trials currently in progress are proving very favourable, and experiments on the largest scale have become necessary as a preparation for cultivation.

Numerous searchers throughout the world are working on the improvement of the production and adaptability of this plant and on the perfecting of methods of cultivation and rubber extraction.

The profitability of guayule in the U. S. A. seems to be established. Africa will be able to profit from this plant, as a result of diversification of cultivation and growth of economic independence.

●

MALAYSIAN RUBBER-BASED PROJECTS EXPANDING

The Malaysian primary industries minister, Paul Leong, has expressed optimism over the country's rubber industry not only because of rising demand but also because more manufacturers from developed countries are shifting their activities to developing countries like Malaysia, reports Bernama Pool.

He said in 1981 alone, the Malaysian Industrial Development Authority (MIDA) had approved 38 applications for the setting up of rubber-based projects and expanding existing facilities in the country.

These ventures have total capitalisation of over 150 million ringgit (about 64 million dollars) and will generate additional employment for some 3,800 people, Mr. Leong said.

"While our own market is limited, the external market for rubber products is such that great potentials exist for local manufactures to increase their market share", Mr. Leong said.

Mr. Leong said Malaysia offered deifinite advantage especially in the fabrication of latex-based articles and products which have a high natural rubber content.

Apart from ready access to high quality Malaysian rubber, there are savings in export duty and in freight costs, particularly for latex. In the technical aspectst of production, Malaysia also has the technology centre at the Rubber Research Institute to meet the demands for technical back-up and support for existing and new rubber-based industries.

Steps to upgrade output efficiencies

The Malaysian government has taken definite steps to make the primary commodity sector more competitiveand resilient in the face of world recession.

These steps were to upgrade the production efficiencies and to further market promotion and technical research on primary commodities, Mr. Leong said. At the international level, the government would utilise all possible instruments for price stabilisation and seek common supportive measures from other producing countries to improve market conditions. It would undertake more active market promotion to consolidate existing markets and to find new markets with the use of technical support.

It would seek better market access through the reduction or removal of both tariff and non-tariff barriers in consuming countries. On the home front, Mr. Leong said, fiscal measures would be improved to encourage the development of primary commodities, such as in the case of rubber. The government would accelerate replanting in low-yielding areas with the latest high yielding clones and planting materials and would also intensify research and development for end-use applications and research on technologies in crop production and processing.

WARM RECEPTION TO LT. GOVERNOR PROF. KM CHANDY

Prof. KM Chandy, Honourable Lt. Governor of Pondicherry was accorded a warm reception on 3rd July 1982 at the Council Hall of the Rubber Research Institute of India. Shri. K Mohanachandran IAS, Chairman, Rubber Board welcomed the distinguished guest. In his reply, Prof. Chandy expressed his admiration and gratitude to the staff of the Rubber Board who extended him all help during the period of his Chairmanship. He said whatever little things he could do in the Rubber Board was with the active co-operation of all sections of employees and that the Rubber Board got its due recognition in the international forums as a result of the endeavours during his tenure of office. He recollected with nostalgic feelings the days he spent in Rubber Board and mentioned that he had only good things to say about his colleagues here and expressed great satisfaction that the administrative experience he gained in the Rubber Board had been of immense value in his present assignment.

Shri. K. Mohanachandran welcoming the distinguished guest.

Lt. Governor Prof. K. M. Chandy

Achievement

Shri. K. Mohanachandran IAS in his welcome address paid glowing tributes to the Lt. Governor. He said that the unique honour conferred on Prof. Chandy is an appropriate recognition to his colourful personality and multifaced public career. His six-year-long intimate association with the rubber industry as the person at the helm of affairs of the Rubber Board, stands out as an era of overall modernisation of the rubber industry and related spheres of economic activity, Shri. Mohanachandran continued:

"The introduction of technical specification in rubber processing and total restructuring of post harvest rubber technology during his Chairmanship in the Rubber Board are significant and longstanding achievements. Revitalisation of the co-operative net work and their reorientation as effactive instruments of change achieved in the field of rubber marketing also deserve special mention.", Shri. Mohanachandran said that the attempt made by Prof Chandy for enforcing equality of economic opportunities for the various sectors within the rubber industry, both large and small, has really paid dividends.

India's position

"The Indian Rubber Industry had crossed the national borders and interacted with other rubber producing nations during his period This has enabled effective exchange of ideas, technology, materials and personnel for our lasting benefit. India to-day is well known among the rubber producing countries of the World. Both in innovativeness and rubber productivity, India is second to none, though agroclimatically our facilities are not so very congenial, Our induction to International organisations like IRRD, IRSG, ANRPC and WORLD BANK through the prestigious KAD Project have materialised during the period while Prof. Chandy was Chairman of the Rubber Board. Our association with these organisations has opened up new vistas of international co-operation and understanding. The fact that we are called upon to participate and act in rubber development projects in various under-developed countries abroad testifies the superiority of our technological competence in the field of Rubber.

Reformist and freedom fighter

As a great reformist and freedom fighter even from student days, Prof. Chandy continued to preach the causes of equality and social justice to the less privileged section. Prof.Chandy is known for his high sense of commitment to the ideology wedded to socialist society."

Shri. Mohanachandran in his capacity as Chairman, Cardamom Board also recalled the prosperity the Cardamon Plantation Industry attained under the stewardship of Prof Chandy when he was head of the Cardamom Board.

Shri ET Varghese,ViceChairman, Rubber Board proposed a vote of thanks. □

PRUNING, PROPPING AND MULCHING

Immediately after planting, sprouts may start coming up from the stock and they should be removed by weekly inspection. Only the shoot developing from the bud is allowed to grow. The bud shoots are usually bright, green in colour while those growing from the stock are usually dark coloured. Occasionally two shoots may sprout from the bud, but only one must be allowed to grow. It is not desirable to have branches up to about 2.5 m from the ground level and hence pruning of side shoots is done during initial years. For pruning, a sharp knife should be used. Top pruning of young budgrafts should be avoided since it results in the formation of a circlet of branches which makes the tree prone to wind damage. Branches arising above 2.5 m may be pruned judiciously wherever necessary to avoid lop-sided development at the canopy.

Propping

Clones like RRIM 600 have a tendency for severe bending during the initial years and for such clones it may be necessary to pull the tree into erect position by providing support. Wooden or bamboo props could be used for the purpose of propping. Alternatively, coir ropes could be tied at convenient height on the stem, trees pulled into erect position and the other end of the rope tied to pegs. It is desirable to provide such support from the three sides in a triangular manner. The bark of the trees must be protected with folds of sacking or other suitable materials to avoid damage to the tender rind.

Mulching

The immediate vicinity of the young rubber plants in the field should be kept clean weeded to prevent competition. By doing so there is a possibility of soil degradation around the plants due to the severe climatic conditions prevalent in most of the rubber growing regions. Providing a protective layer of mulch materials is, therefore, recommended as a cultural operation for young plants. Since the direct exposure of soil to sunlight is being prevented by mulch materials, the soil is kept cooler and more moist during summer months. This helps in the increase of bacterial population in soil, ensuring better availability of plant nutrients. Besides, the exposed plant bases are protected from the beating action of rain drops, thus helping in reducing soil erosion. The mulch materials also help in the control of weeds around the plant bases. Since organic materials are used for the purpose, the capacity of the soil to hold water and plant nutrients is improved. Commonly recommended mulching materials are dry leaves, grass cuttings and cover crop loppings. In young plantations, mulching should be undertaken after fertilizer application and just before the onset of summer. Usually, the month of November is the ideal time for mulching. However, in some areas, mulch can harbour slugs and snails that attack the terminal shoot of young rubber and hence suitable control measures may have to be adopted.

RUBBER PLANTATION DEVELOPMENT SCHEME AND TIPS FOR PLANTING RUBBER

Against 1,85,000 tonnes of natural rubber required in the country in 1981-82, India produced only, 1,53,000 tonnes during that period. The need for rubber in the country is increasing year after year thereby widening the existing gap between demand and supply. In order to meet the ever growing demand, rubber production in the country has to be stepped up by maximising production from existing holdings and introducing rubber to new areas.

The Rubber Board has drawn up an integrated scheme for encouraging both newplanting and replanting of rubber by extending financial aid adequate to cover almost the entire cost of cultivation to those who come forward to newplant or replant.

Planting: Aids and techniques

This new aid programme which is known as "Rubber Plantation Development Scheme" covers both small and large growers but the scale of subsidy varies for the two sectors. The minimum area to be new planted under this scheme in any one year shall be 0.20 hectare of contiguous land and for replanting 0.10 hectare of contiguous land.

The nature and extent of assistance provided under the new scheme are as follows:

Cash subsidy

Cash subsidy at the rate of Rs.5000.00 per hectare to growers owning up to 20 hectares of rubber plantation including the area proposed for new planting under the scheme and at the rate of Rs. 3000.00 per hectare to growers owning rubber plantation above 20 hectares, will be granted for newplanting/replanting. New entrepreneurs who do not own rubber now are also entitled for assistance at the above rates. The cash subsidy is disbursed in seven annual instalments as shown below:

Subsidy Instalments

	Up to 20 *hectares* *(Rs.)*	Above 20 *hectares* *(Rs.)*
Ist year	1500.00	1000.00
2nd year	1000.00	500.00
3rd year	500.00	300.00
4th year	500.00	300.00
5th year	500.00	300.00
6th year	500.00	300.00
7th year	500.00	300.00
	5000.00	3000.00

Capital loan through Banks

The beneficiaries under the scheme may avail of long term loans also from Banks under the agricultural credit scheme of the Agricultural Refinance and Development Corporation (ARDC) in order to supplement the assistance available from the Rubber Board. The maximum credit that can be availed of from Banks shall be limited to Rs 15,000 00 per hectare, which will be advanced to growers in 7 annual instalments.

The annual subsidy payable by the Rubber Board to each loanee will be credited to his loan proportionately reducing his liability with the Bank at the close of every year.

Disbursement of loan instalments per hectare

1st year	–	Rs.	5000.00
2nd year	–	Rs.	2000.00
3rd year	–	Rs.	2000.00
4th year	–	Rs.	2000.00
5th year	–	Rs.	1500.00
6th year	–	Rs.	1300.00
7th year	–	Rs.	1200.00
		Rs.	15000.00

The loan (less the subsidy adjusted by the Rubber Board) is repayable in 5 equal annual instalments from the 10th year to the 14th year of planting. There will be a moratorium on the payment of interest till the 7th year of planting. Interest is repayable in 7 annual instalments commencing from the 8th year of planting.

Interest subsidy

The normal rate of interest chargeable on loans disbursed for rubber plantation development under ARDC programme is 11 per cent per annum. Out of this 3% will be borne by the Rubber Board, for the 1st to the 10th year of planting thereby bringing down the interest to 8%. But growers who own over 20 hectares of rubber are not entitled for interest subsidy.

The repayment of interest and capital of the loan are so adjusted that the grower need think about it only later when the plantation raised by him using the aid comes into bearing and start generating income.

Input subsidies for smallholders

In addition to cash subsidy and long term loan at reduced interest, the scheme also provides to growers owning not more than 6 hectares (15 acres) of rubber including the area proposed to be newplanted for reimbursement of full cost incurred on procurement of approved planting materials, half of the approved cost of fertilizers used during the immaturity period and a subsidy upto Rs. 150.00 per hectare for soil conservation. If quantified this would work out to about Rs. 2500.00 per hectare.

The scheme thus makes available a total assistance of Rs. 17500.00 per hectare to every small holder who comes forward to plant rubber ie. Rs. 5000.00 as cash subsidy, Rs. 10,000.00 as long term loan at reduced interest and Rs. 2500.00 worth of additional assistance in kind.

On account of these special features the Rubber Plantation Development Scheme stands out as an unmatched agricultural reform ever attempted in India and abroad.

Tips for planting rubber

1) Clearing the area

Slash the existing vegetation, partially dry them under the sun, heap the dried matter here and there and give a light burning (to be completed in March).

2) Spacing

In flat even lands planting distance recommended for rubber is 4.6 m. x4.6m (15'x15'), while on slopy land the spacing suggested is 6.4 mx3m (20'x10'). Pegmark the area to suit the respective spacing.

In slopy areas contour terraces are to be formed to check soil erosion. It is desirable to have individual platforms in undulating areas.

3) Pits

Pits of size 75cm × 75 cm (2½'×2½'×2½') are to be dug in the pegmarked points in April-May after a few showers. The pits so dug are allowed to weather for about 2 weeks. The pits are then filled using top soil gathered from around. While filling pits, care should be taken to see that leaves, roots stones etc are removed from the soil.

Pit manuring should be done on the top 25cm. (10") of the soil using 175 gm. of Rock Phosphate (Mussorie Phos) and 12 kg (one kerosine tin full) of well rotted cattle manure or compost.

While filling the pit the top surface of the pit should be about 5 cm (2") above the ground level so that when the soil sets, the filled pit keep the level with the ground. The centre of the filled pit should be marked by a peg.

Planting materials and planting

Budded stumps of clones RRII-105, RRIM-600, and GT-I are the three important high yielding rubber planting materials recommended.

Rubber planting is normally done in June with the onset of rains. About 5cm (2") of surface soil of the filled pit is first removed from an adequate area around the planting point to accomodate the whorl of lateral roots at the collar of the stump. A planting cavity is then made with a crowbar to a depth equal to the actual length of pruned tap root. After thrushing the crowbar to the required depth, its top end is moved around and the cavity widend sufficiently to allow easy insertion of the stump. The stump is then carefully inserted into the cavity sufficiently deep for the whole of the lateral roots to be in position in the area dug. It is important to see that the side roots are set neither too shallow nor too deep. Special attention should also be given to ensure that the tip of the tap root is in actual contact with the soil at the bottom of the cavity. An air gap should not be allowed in the planting cavity as it may lead to the failure of root development. Loose soil is put in the cavity around and pressed firmly. This is best done by pushing the crowbar into the edge of the planting hole as deep as the tap root or more in a slanting manner so that the top part of the crowbar is away from the stump and then pulling it strongly towards the stump which is firmly held in position. This is repeated on all sides.

Cover Crop

Pueraria phaseoloides could be gainfully raised as a cover crop in rubber plantations. Seeds of Pueraria need soaking in lukewarm water for 4 to 6 hours before sowing. Sowing is done on beds of size 120cm×60cm (4'×2') made one each in the centre of 4 planting points. The cover crop seeds should be mixed with equal quantity of Rock Phosphate (Mussoorie Phos) at the time of sowing.

Cover crop should essentially be raised as it helps to smother weeds, prevent soil erosion, fix atmospheric nitrogen in its roots, reduce soil moisture loss, add litter to the soil and reduce immaturity of rubber.

The seed rate per hectare of Pueraria is 4-4½ kg.

Aftercare

(1) The grafted bud starts sprouting 2-3 weeks after planting. Sprouts appearing from any where outside the budpatch should be nipped off.

(2) Shade basket of 75cm. (2½') length and 45cm. (1½') diameter may be fixed around the budded stumps as soon as they sprout, so that the tender shoots enjoy protection against hot sun wild animals etc.

(3) Pruning may be carried out appropriately to remove any side shoots developing upto 2½ meters (8') from the ground level in the main shoot.

(4) The young plants may be manured twice in an year

Year of planting	Months after planting	Time of application	Dose of mixture per plant	Quantity of the mixture required per hectare with 440-450 planting points
1st year	3 months	Sept-Oct.	225 gm.	100 kg.
2nd year	9 months	April-May	450 gm.	200 kg.
do	15 months	Sept-Oct.	450 gm.	200 kg.
3rd year	21 months	April-May	550 gm	250 kg.
do	27 months	Sept-Oct.	550 gm.	250 kg.
4th year	33 months	April-May	450 gm.	200 kg.
do	39 months	Sept-Oct.	450 gm.	200 kg.

using fertilizer mixture as shown below:

During the first 4 years, the fertilizer mixture is applied around the base of the plant in a circle and mixed up with the soil with a fork.

From 5th year onwards manuring should be done based on soil and leaf analysis. If this is not possible, the general recommendation to use NPK. 12:12:12 may be followed as shown below:

Year	*Time of application*	*Quantity per hectare.*
5th	April-May.	125 kg
,,	Sept-Oct.	125 kg.
6th	April-May.	125 kg
,,	Sept-Oct.	125 kg.
7th	April-May.	125 kg.
,,	Sept-Oct.	125 kg.

From the 5th year, fertilizer is applied and forked into the soil in square or rectangular patches in between rows, each patch serving 4 trees.

(5) Weeding should be done regularly in rubber plantations in earlier years till the cover crop spreads fully.

(6) The plant bases should be mulched during summer (from October onwards) using dry leaves, grass or any other local materials to prevent sun scorch and loss of soil moisture.

(7) Vacancies in the planted area should be filled up preferably with polybagged plants, two-year old budded stumps or stumped buddings.

(8) Brown portion of the stem of young plants should be white washed during summer from second year onwards using quick lime to protect them against sun scorch. This should be continued every year till the canopy closes.

(9) Suitable plant protection measures may be adopted against pest and diseases at the appropriate time as recommended by the Rubber Board.

(10) The site proposed to be planted with rubber should be properly fenced with available local materials to prevent cattle menace.

(11) If branches do not develop above a height of 2.5 meters (8') from the stem it should be induced by artificial methods like notching or suppressing the apical bud by closing it with the tender leaves around

(12) Take care to see that the cover crop does not twine round the trunk of the rubber plants as it will suppress the growth □

NEW RUBBER-YIELD BOOSTER

CALCIUM CARBIDE, if applied in Rubber Estates is found to double the yield of rubber with immediate effect. This chemical is to be applied to the soil 15 cms away from the base of yielding rubber trees in a hole 50 cms deep dug using a crowbar. After depositing Calcium Carbide under the tree each hole should be filled up with soil. The recommended dose of Calcium Carbide per rubber tree is 15 grams. This is suggested to be applied to the soil only when there is adequate moisture

The Calcium Carbide so deposited in the hole under the soil comes in contact with the soil moisture and releases acetylene gas which stimulates the rubber trees resulting in increased yield. The beneficial effects of one such application is likely to last for about 3 to 4 weeks.

This is a technology developed by the Chinese and it needs exhaustive study under Indian conditions to judge the feasibility. This is being looked into by the Rubber Research Institute of India. Therefore, to begin with, it is advisable to adopt this technology in rubber estates where the trees are intended to be cut down in the next few years prior to replanting.

HOW TO INCREASE PRODUCTIVITY IN RUBBER PLANTATIONS?

CM GEORGE
PROJECT OFFICER

Introduction

The current year has been earmarked as the productivity year in the country. Therefore it is very essential for the Board to give guidance to the rubber growers as to what are the methods that can be used for increasing production and productivity from the existing areas. In the present note, therefore an attempt is made to suggest a package of practices that can be adopted by the rubber growes to increase production from their plantations during the current productivity year.

Package of practices suggested for increasing production

The national average production of rubber in India is only at a level of about 800 kg/hectare/year, when material capable of yielding more than 2000kg/hectare were available even in the sixties. Therefore, it is only in the fitness of things to find out the package of practices that can help to achieve the potentials of production from the existing planted rubber in the country. The practices/techniques that have commercially proven useful for increasing production from the existing plantations are the following

1. Opening of all trees for tapping when they attain 20" of girth at 50" from the bud union in the case of buddings and 22" girth at 20" from the base in the case of clonal seedling.
2. Employment of the correct slope and depth of tapping.
3. Early tapping during the summer months.
4. Fixation of a replanting cycle of 25 to 30 years and employment of the most economically suitable tapping systems, depending on the planting material, age of the trees and date fixed for replanting.
5. Employment of upward tapping on the virgin bark in the case of old trees and trees whose first renewed barks are spoiled.
6. Stimulation of the flow of latex using Ethrel depending upon the age of the trees, tapping system used and date fixed for replanting.
7. Rain guarding the trees under tapping and continuous tapping throughout the year.
8. Manuring adopting the discriminatory approach.
9. Protection of the tapping panel from diseases as per requirements governed by the agro-climatic conditions prevailing in the location of the plantation
10. Adoption of protective spraying at the correct time using optimum quantities of fungicides which may depend on the age of the trees, the planting material and rainfall distribution pattern.
11. Effective tapping control and adoption of production linked wage payment systems and/or provision of collection assistance to tappers which will motivate them to increase production.

Productivity is the key to progress. It serves as a barometer that indicates the economic progress of a country. In this process, Rubber Plantation Industry in India has to play a vital role and contribute its own share. The Prime Minister has declared 1982 as the "Productivity Year" and chalked out a 20 point programme for the country. The following article on "How to increase productivity in rubber plantations" prepared by Shri C. M. George, Project Officer, Rubber Board is relevant in this context especially at a time when the need for enhancing rubber production is all the more great today.

Having listed the package of practices that can increase production, it is necessary to discuss the implications of each of the practices for increasing rubber production to achieve something tangible during the productivity year.

(1) Opening for tapping early

It is well known that in the case of vigorously growing clones and clonal seedlings which are not susceptible to wind damage and which can grow satisfactory even after the starting of tapping, early tapping can be done with much economic benefits In fact,by advocating opening of trees when they attain 20" or 22" girth respectively for buddings and seedlings without waiting for 70% of trees to attain the criteria, it will be possible to bring in an additional effective area of about 1000 hectares during 1982. This would mean an additional production to the tune of 200 tonnes in 1982-the productivity year.

(2) Employment of correct depth and slope

A good percentage of the large rubber growers and a sizeable portion of the small holders in the country are reported to be very conservative in regard to tapping. In fact, while they are not very particular in adopting the correct slope to the tapping cut, they are found to give special care in ensuring that the tappers are not wounding the trees and such practices invariably lead to inefficient exploitation and poor yield. A study conducted in Malaysia showed the percetnage of latex vessel rings severed by tapping at different depth of tapping. The figures are as given below:

Depth of tapping	% of latex vessel rings severed
2.0 mm from cambium	38
1.5 mm ,, ,,	48
1.0 mm ,, ,,	62
0.5 mm ,, ,,	80

This situation suggests that there is scope for increasing the yield by about 30% at least in 25% of the areas under virgin bark tapping by ensuring that the tapping standard in these areas are improved. Even in the case of the tapping of the first renewed bark, if our rubber growers can be educated to adopt a liberal tapping policy in regard to depth of tapping, a 5% average increase in crop can be obtained easily from such areas.

(3) Early tapping during summer months

It is well established that better yield can be obtained when tapping commences early before day break. According to Dijkman, yields at 09.00 hours and 11.00 hours are only 96% and 85% respectively of the yield at 07 00 hours. Wounding in Malaysia also showed that latex yield at 11.00 hours was less by 15% when compared to yield at 08.00 hours The reason for lower yield during the day has been shown to be due to an increase in the rate of transpiration. In the rubber growing regions in India during the summer months (December–April), the fall in atmospheric humidity used to be very rapid as time advances after day break when compared to the rainy season and this situation can result in poor yield during summer months in plantations where the tapping time is the same throughout the year Therefore there is a strong case for advocating early tapping during the summer months in our plantations. By ensuring that early tapping is resorted to, during the summer months, an increase in crop of about 5% can be obtained during the months.

(4) Replanting cycle and tapping system

In India, tapping of the rubber trees can be started 7 years after planting. After commencement of tapping the virgin bark is invariably used for 12 years, the first renewed bark for another 12 years and intensive tapping and slaughter tapping for another 4 to 6 years. In some plantations, the growers used to tap the second renewed bark also and this means another 12 years more of tapping. Thus the present practice is found to be one wherein the replanting cycle adopted is over 30 years. In the estate sector in Malaysia, where they practice the modern concept of exploitation, they are found to adopt a much shorter replanting cycle of only 25-30 years which will ensure them a high per hectare yield throughout the tapping life of the trees, and optimum utilization of the new high yielding clones and improved cultivation practices. The average per year per hectare yield in such cases where a shorter replanting cycle is adopted, has always been found to be above 1500 kg dry rubber. In India, where the rubber wood fetches a much higher price when compared to Malaysia, the socio-economic benefits of adopting a shorter replanting cycle are more. Therefore it is only in the fitness of things to recommend adoption of a shorter replanting cycle which does not exceed 30 years in our plantations. Based on a replanting cycle not exceeding 30 years the life span of trees in individual fields under tapping should be fixed and depending on the number of years left for replanting a planned system of exploitation of the trees during the remaining years taking into account the nature of the planting material and its potentials and previous tapping history should be adhered to. By doing so it will be possible to increase the per hectare yield at least by 20%, in the case of areas where conservative techniques only were employed previously.

(5) Employment of upward tapping

Upward tapping in the case of trees without bark reserves has been shown to be very attractive and practical. In fact studies conducted in different rubber growing countries have proved that in most circumstances upward tapping can increase yield by more than 30%. Trials conducted in one of the large group of company estates in India also substantiated the findings Therefore there is a strong case for adopting upward tapping in the case of all the areas where tapping has been completed in the virgin bark and first renewed bark and for trees whose first renewed barks were spoiled. A total of about 50,000 hectares of rubber may be available for such upward tapping in the country at present.

(6) Stimulation of the flow of latex using Ethrel

It is well known that yield stimulation using Ethrel has already become a proven innovation for the efficient exploitations of rubber trees. This innovation provides the practical means not only for increasing the elasticity of production, but also of ensuring that the rubber trees can realise its full genetic potential. Studies conducted in Malaysia have shown that simple application of Ethrel provides yield increases ranging from 30 to 60% averaging over a seven year period. The yield increase due to stimulation was found to be more marked in the case of upward tapping. In fact an increase in yield of over 50% can be realised, when both these innovations are used side by side. An experiment conducted in Malaysia on clone GT–1 has given the following results in the first year.

Treatment	Yield Kg/ha	Percentage
Control	2521	100
Stimulated	3476	138
Stimulated–Upward tapping	5912	235

Preliminary commercial trials conducted by one of the large group of company estates in the country also obtained somewhat similar results. All these informations suggest that adoption of stimulation with or without upward tapping by our planters on a large scale can definitely increase our production of rubber.

(7) Rainguarding of the trees and continuous tapping

In most of the rubber growing districts in the country, about 60 to 75 tapping days in an year will be lost if rain guarding is not resorted to. Though rain guarding has already become popular in large estates since the practice has found usefulness as a management tool, the small holders have not yet started this practice. Therefore there is good scope for popularising among smallholders who are tapping their trees adopting standard tapping systems, and thereby increasing production. Also, the practice of giving annual tapping rest of 2 to 6 weeks at the time of refoliation of the trees, which will result in loss in production has found to be rather very common in the country. In this connection it is pertinent to point out that under the climatic conditions prevailing in India, it will take at least 2 to 3 weeks after the restarting of tapping to get economic yield from plantations. Thus the total crop loss due to rains, tapping rest and time required by the trees for the adjustment necessary to start economic production after re-starting of tapping can easily come to about 15%. Therefore adoption of rain guarding and continuous tapping in the case of all trees where standard tapping systems are practised, can contribute substantially for improving the rubber production in the country.

(8) Regular manuring adopting the discriminatory approach

Manuring of existing rubber under tapping can increase yield in two ways Normally by manuring, the vegetative growth of the trees will be improved, which in turn will improve the girthing and bark regeneration. As a consequence of the improved girthing and bark regeneration, yield improvement also will be there. To get such improvement in production, it may take some time. Improvement in production through manuring can come in another way also. In this, manuring aimed at correcting nutritional imbalances that can lead to instability of latex, can result in dramatic improvement in yield. There are cases where 40 to 50% improvement in yield was obtained by such manuring during the year of application itself Adoption of such a manuring policy requires a discriminatory approach based on analysis/testing results of soil and leaf samples representing the individual areas. Since the Rubber Research Institute is already having facilities to undertake soil and leaf sample analysis and also a mobile laboratory to test soil and leaf samples from small holdings, it will be possible to provide correct fertilizer recommendations based on the discriminatory approach on a large scale during the year thereby ensuring substantial yield increase.

(9) Protection of tapping panel

Inadequate tapping panel protection as per the requirements of the different agro-climatic regions are known to result in reduced crop from rubber plantations. Therefore, adoption of timely tapping panel protection operations particularly in the case of all areas where tapping is done during the rainy months, would ensure significant increase in yield.

(10) Adoption of protective spraying

Efficient control measures are available for the prevention of the abnormal leaf fall disease of the rubber trees which can adversely affect the yield of high yielding varieties in areas where the disease is known to be severe due to heavy rainfall incidences. Adoption of protective spraying at the correct time using the required quantity of fungicides which may depend on the age of the trees, the planting material and rainfall distribution pattern may provide a substantial increase in yield level in the case of areas not regulary sprayed.

(11) Effective tapping supervision and motivation of tappers

Rubber is a peculiar crop in the sense that the efficiency of its harvesting depends to a very great extent on the skill and sincerity of the tappers. In fact the tappers influence on production can be as high as 100%. Therefore, for increased production, effective tapping control in rubber plantations has to be adopted and to enable this it may be worthwhile to provide training to tapping supervisors of plantations on management of tapping operations. Observations conducted in estates and large plantations have shown that absenteeism in tapping and selective tapping by tappers leaving the poor yielding trees in their blocks, account for a substantial loss in production. Lack of motivation to the tappers also has been found to be an important factor adversely affecting production in a number of estates and small holdings. Therefore it is desirable that a suitable practical system of wage payment to tappers which will motivate them to increase production, be developed for adoption in plantations By ensuring that plantations are adopting proper tapping control and a sound policy for the management of tappers which will motivate them, it will be possible to contribute much for improving production from a sizeable percentage of our rubber plantations.

The strategy required for achieving the targets

A consideration of the present state of affairs in our plantations, suggests that a good percentage of the rubber plantations in the country, particulary the small holdings are maintained, exploited and managed at a low technology level. New innovations are not being put into practice expeditiously even in the new plantings and replantings and the main reasons for such a situation are lack of know-how on the part of the growers regarding modern innovations and the comparatively low intensity of extension activities in term of number of officers properly trained and credit facilities Taking into consideration all these problems and the package of solutions available, an integrated strategy which calls for missionery zeal is required for achieving something tangible during the productivity year. This strategy should involve a concerted effort and determination in ensuring that the rubber growers are adopting the package of practices already mentioned in their plantations and for this, the Rubber Board may have to take appropriate steps.

Conclusion

The scope for increasing production of NR during the productivity year from the existing plantations and the package of practices to be adopted by the growers for increased production are discussed. By ensuring that plantations are adopting the package of practices, it will be possible to achieve something substantial to increase productivity during the current productivity year □

QUALITY LATEX CATHETERS MADE IN MALAYSIA

Malaysia is keen to expand its local rubber manufacturing industry and is encouraging this expansion by aiding the formation of joint ventures between existing foreign rubber manufacturers and home based organizations. Latex goods such as catheters seem particularly appropriate for such projects. Not only does manufacturing latex articles in a major latex-producing country save the cost of transporting across the world a liquid raw material which is about 30% water, it also allows advantage to be taken of the cheap, readily trainable local workforce, a major attraction for the labour-intensive manufacture of articles like catheters.

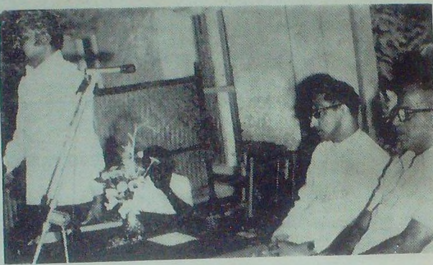
In 1973 Euromedical Industries Sdn Bhd was set up to manufacture catheters in a new industrial estate in Sungei Patani, Malaysia. The company is a joint venture between Euromedical, a UK company which is now a subsidiary of Hoechat AG, and the Kedah State Development Corporation. As is typical in such a venture, the foreign company provided capital investment and technical and marketing expertise, while Malaysia provided further finance, land and the workforce. In addition the Malaysian government gives such projects a range of tax incentives during the early years, and local organizations such as the Malaysian Industrial Development Authority are on hand to give assistance. Practical help with latex processing, in Euromedical's case with latex testing, in the early days, is available from the Rubber Research Institute of Malaysia.

Euromedical Industries is now using 500 tonnes of latex per annum to produce some 3.5 million urinary cathethers per year, and claims to supply over 15 per cent of the world balloon catheter market. A workforce of 500 mans the continuous production line which involves a complex sequence of dipping and assembly. Various types of catheters are produced with a range of tips, valves, and channels for suction, irrigation, drainage and balloon inflation. As is normal for medical products intensive quality control checks are carried out and strict hygiene procedures are maintained throughout the process.

Most of Euromedical Industries' production is exported, typically to the USA, UK and Japan, and with a strong growth rate the managing director expects production to reach about 10 million catheters per annum in the not too distant future, which would make the company the largest catheter manufacturer in the world. Further information about this successful venture into rubber manufacturing in Malaysia can be found in the latest issue of RUBBER DEVELOPMENTS, quarterly journal of the Malaysian Rubber Producers' Research Association.

"RUBBER TO THE POOR" NOVEL SCHEME BY MDS INAUGURATED

"A novel attempt being made for the first time in the world" remarked Shri P. Mukundan Menon, Rubber Production Commissioner while inaugurating the "Rubber to the Poor" project sponsored by the Malanadu Development Society (MDS), the official organisation for social service in the diocese of Kanjirapally. On the occasion of the inauguration of the Project Shri Menon distributed 25 budded RRII 105 stumps each to two cultivators owning 10 cents of land. The function was held at Koovapally, 8 kilometres south-east of Kanjirapally, on 26th June 1982, under the joint auspices of Malanadu Development Society, Pyrites, Phosphates and Chemicals Ltd., Season Rubbers (P) Ltd., and Koovapally Service Cooperative Bank Ltd.



Shri P Mukundan Menon inaugurating the "rubber to the poor project" Seated on the dias are(L to R)Shri PK Narayanan Public Relations Officer, Mar Joseph Pawathil' Bishop of Kanjirappally and Shri MG Jagadish Das, Jt Rubber Production Commissioner

Shri Mukundan Menon distributing seedling to a marginal farmer

"Rubber to the Poor" project

It is a Project founded by the Malanadu Development Society to help the poor and marginal farmers. The MDS has jurisdiction in 3 Districts of Kottayam, Idukki and Quilon, where 22 village development units have been organised with 1200 marginal and poor farmers as its members. Those farmers who own between 10 cents and 2 acres of land are eligible to enroll themselves as members in this Project. The MDS has also appointed full time supervisors in these units and provides basic training on all aspects of rubber cultivation. The MDS renders all sorts of assistance to these member-farmers which includes tools, equipments, fertilizers and other inputs.

Optimum yield from minimum plants

The Society believes that the lesser the number of plants cultivated, the greater is the attention

Participants of the rubber seminar at Koovappally

paid to them by each grower. This leads to optimum yields however small the holding might be. With the planting materials supplied by the Society, the yield is estimated to be over 1 kg DRC per 10 trees. Even the smallest grower who owns only 10 cents of land would get 2 kg DRC per day, or 7 kg per week. The income from 10 cents of land is a creditable achievement.

Speaking at the inaugural function Shri Mukundan Menon assured them all help from the Rubber Board. Mar Joseph Powathil, the Bishop of Kanjirapally presided. He wished that the voluntary institutions could prosper only with the active co-operation of the Governmental agencies. Shri P. K. Narayanan, Public Relations Officer, Rubber Board paid glowing tributes to the sponsors of the MDS who started the Project as a silent action for the economic emancipation of the poor farmers. S/Shri Thomas Kallampally MLA and K. V. Thomas also spoke. The inauguration of the Project was followed by a rubber seminar. The Officers of the Rubber Board S/Shri M. G. Jagadish Das, V. Parasuraman, P. S. Kuriakose, M. J. George, R. Kothandaraman, K. K. Ramachandran Pillai and Dr. S. N. Potti held classes on the day. Shri M. A. Bhashyam of PPCL also addressed the participants.

The seminar organised jointly by the MDS and the Rubber Board in connection with the inauguration of the 'Rubber to the Poor' project, is the seventh in the series. Plans are also afoot to conduct three more similar seminars this year itself at the different project centres of the MDS. The sponsors of the MDS believe that success depends on perfect transfer of scientific farm technology to the farmers who are participants of this novel venture. □

RECESSION IN AUTOMOBILE INDUSTRY

A severe recession has gripped the automobile industry in the country. Almost all manufacturers have curtailed their production in the last three months, and this happens in the year of productivity. Manufacturers like Ashok Leyland, Hindustan Motors, etc. have been compelled to slash production not because of poor demand but for the want of normal credit facility usually allowed to the industry. It is said that over 4,000 chassis are lying with TELCO for want of buyers, and almost a similar situation is reported to be facing Ashok Leyland which has a stock of over 3,000 chassis ready for sale. Similarly, over 1,000 Ambasador cars are lying unsold at Hindustan Motors factory at Uttarpara. According to industry circles the continuance of credit squeeze will adversely tell upon the performance of the industry in the current year. Already manufacturers like Ashok Leyland and TELCO, which had taken up big expansion plans, may have to reconsider their plans as they have been compelled to cut existing production drastically owing to paucity of funds from regular channels. The automobile industry recorded appreciable increase in production in 1981 as the following figures show: jeeps 17,029 as against 15,068 in 1980; cars 42,106 (30,538); commercial vehicles 89,752 (68,311); motor cycles 110,039 (101,573); mopeds 185,424 (106,073, tractors 82,516 (67,105) and engines 7,277 (4,066). Sectors which showed a decline were scooters 201,786 (212,400) and three-wheelers 24. 833 (26,519). In the situation presently obtaining it is doubtful if the industry will be able to maintain even the last year's production.

REPORT OF THE STUDY ON PRODUCTION OF PRESERVED LATEX AND LATEX CONCENTRATES IN INDIA

CM GEORGE, RG UNNI AND
TP SIVANKUTTY ACHARI

A study on preserved latex and latex concentrates in India was conducted by a team of experts from Rubber Board consisting of S/Shri CM George, Project Officer, RG Unni, Dy. Director (Statistics and Planning), TP Sivankutty Achari, Asst. Secretary (Marketing and Co-operation). Dr. MG Kumaran, Rubber Specialist (Chemical), and Shri George Jacob, Market Research Officer of the Department of Rubber Processing assisted the team in undertaking the study. Relevant portion of their report is extracted below:

Background

Rubber is a strategic industrial raw material used for the manufacture of over 50,000 different articles useful for human life. These rubber products are generally classified into two, viz: rubber products produced from preserved latex and latex concentrates and rubber products produced from dry rubber, generally available as ribbed smoked sheets, crepes and/or as block rubber. The crop from rubber plantations consists of rubber latex which contains about 30 to 35% of dry rubber and field coagulum (scrap rubber). The composition however, varies widely depending upon the extent of dryness, climate, size of the material etc. The ratio of latex rubber to scrap rubber in a typical plantation is normally 80:20 based on dry rubber content. The latex and scrap collected from the plantations have to be processed into various marketable forms for effective and efficient use in the manufacture of different rubber products. For the manufacture of latex rubber products, the crop collected as liquid latex have to be processed into preserved latex and/or latex concentrates. To manufacture dry rubber products on the other hand, the latex is to be processed either into visually graded dry ribbed sheets and crepes or into technically specified block rubber. The scrap rubber can also be processed into visually graded crepes and/or technically specified block rubber.

Preserved latex and latex concentrates are important raw materials which find its way into a wide spectrum of uses. Nearly 10% of the world supply of natural rubber is used in the form of preserved latex and latex concentrates. About half of the preserved latex concentrates are used to make latex foam, using various processes to beat air into the latex which is then gelled and vulcanised. Other important outlets are dipped goods such as household and surgical gloves and a variety of adhesive applications including backing for tufted carpets. Elastic thread is also made from NR latex.

Through the years a number of completely new uses for preserved latex and latex concentrates have emerged. Being in liquid form it is suitable for introducing rubberiness into other materials by simple admixture. In fact a large proportion, possibly as much as one third, of the latex currently produced is consumed in areas where the latex plays an adhesive role. For example, reconstituted leathers, fibre boards, bonded hair, non woven fabrics, tufted carpets and self sealing envelopes are some of the products wherein more and more rubber latex would be used in the years to come. Therefore preserved latex and latex concentrates have to be considered as one of the versatile basic industrial raw material of the 20th century from which thousands of utility goods can be made.

For a considerable period, India was importing preserved latex and latex concentrates for the manufacture of rubber goods. In 1934, the first experimental consignment of latex containing barely 3 kgs of rubber prepared on an Indian estate was despatched to a rubber factory. This was found to be equally good as imported latex. From this small beginning, the Indian latex producing industry grew very fast with many ups and downs and attained the present status of producing a substantial quantity with 15000 MT dry rubber content per year valued at about Rs. 30 crores. Rubber goods from these latices are now being manufactured by more than 500 factories scattered all over India. The total value of rubber goods manufactured from latex is estimated to be around 5 times the cost of the latex at about Rs. 150 crores.

At the beginning of the latex trade, preserved normal latex only was produced and marketed in India. In the pre-war days, most of the latex consumed in India was used for balloon manufacture which requires only comparatively low quantity of rubber in the compound. Normal latex containing less but more stable rubber than the concentrate was found suitable for this purpose. During the War when the manufacture of balloon and other non essential dipped goods was prohibited, the demand situation changed particularly with the development of the latex concentration processes. Creaming of latex was the process first became popular in the country for production of latex concentrates. By using this process water present in normal latex can be reduced from about 65% to 40%. But creamed latex prepared in India had only a d. r. c generally varying from 55 to 60% and in practice the rubber content was brought down and standardised at 50% by adding a calculated quantity of normal latex and marketed. Only a small percentage of creamed latex was marketed as 58 to 60% latex. With the availability of creamed latex the demand became mostly for preserved latex concentrates. Thus by 1945, the approximate percentage of latex marketed at 35%, 50% and 58 to 60% d. r. c. became 18,75 and 7 respectively. The situation again changed with the starting of centrifuged latex production in the country. Also after showing steady growth till 1947, the marketing and utilization of latex in India showed a declining trend for few years. The main reasons for the decline were identified as follows:

(a) Loss of the overseas markets due to bad quality;

(b) Complete overloading of the local market with inferior quality goods;

(c) Inability to change over to any other type of production except dipped goods;

(d) The mushroom growth of factories with insufficient capital and uncontrolled production.

This declining trend changed in course of time particularly with the availability of centrifuged latex concentrates which are purer and better suited for a large variety of utility goods for which purity and good white colour are essential and the industry registered a phenomenal growth year after year producing more and more of centrifuged latex concentrates and less of preserved latex and creamed latex. Almost all the units producing preserved latex and creamed latex also switched on to production of centrifuged latex gradually and the industry reached a stage where 95% of the latex marketed in the country has become in the form of 60% centrifuged latex concentrates by the end of the sixtees.

The growth pattern of the latex industry during the seventees can be seen from table-1 which gives the production figure of preserved latex and latex concentrates from 1970-71 to 1980-81. A perusal of the table clearly shows that at present there is only one commercial unit namely Kanjirappally Small Scale Industrial Co-operative Society Ltd producing and marketing preserved latex and creamed latex and the number of units producing centrifuged latex concentrates increased from 12 during 1970-71 to 21 in 1980-81. All these units produced and marketed latex concentrates having 60% d. r. c. and the total production of preserved latices of lower d. r. c. were only below 3%. From the table, it is also interesting to note that the latex producing industry was developing fast during the initial years of the decade and was almost stagnant for the next four years. Again the industry started registering a good growth rate from 1978-79 onwards and inspite of this phenomenal growth rate, the demand continued to be much higher than the supply and

Table-1

Production of Preserved Latex and Latex Concentrated During the last Decade

Year	No. of units	Production (drc-tonnes)			
		60%	50%	35%	Total
1970-71	12	5902	41	109	6052
1971-72	12	6435	56	135	6626
1972-73	12	7126	70	120	7316
1973-74	12	8365	101	119	8585
1974-75	13	6197	75	236	6508
1975-76	15	6164	117	71	6352
1976-77	15	8304	127	44	8475
1977-78	16	8783	156	85	9024
1978-79	18	18689	165	94	10948
1979-80	19	12013	124	141	12278
1980-81	21	12898	105	136	13139

Note: The above production figures relate to only factories having centrifuging machines. There is a factory in Kanjirappally under the co-operative sector producing preserved latex and creamed latex and their production during 1980-81 was 87 tonnes(drc). Besides number of small industrial units are found to be purchasing field latex and processing the same as preserved latex concentrates by the creaming process, mostly for their own use.

very high price levels prevailed. Such a situation necessitated a thorough study of all aspects of production and consumption of preserved latex and latex concentrates in the country with a view to formulating the strategy to be adopted by the Rubber Board for ensuring a balanced growth of the industry.

Marketable forms of latices

The various grades and qualities of latices mentioned in the price notifications issued by the Government of India from time to time are the following:

(1) Preserved Normal latex upto 35% concentrates;

(2) Preserved Latex concentrates of 36 % to 50 % (both inclusive);

(3) Preserved Latex concentrates of 51% to 60% (both inclusive) and above.

Among these, preserved normal latex is processed from field latex by adding calculated quantities of the preservative, usually ammonia, followed by bulking; settling and blending into consignments of known dry rubber content and preservative content. With the introduction of preserved latex concentrates into the market, there is not much scope in the production of preserved normal latex on a commercial basis unless there is a local demand because the cost of packing and transportation will be very high per unit quantity of dry rubber when compared to latex concentrates.

Preserved latex concentrates are generally marketed in two concentrations viz.latex between 36 and 50% d. r. c. and latex between 51 and 60% and above d. r. c.

Two major methods namely creaming and centrifuging are practised at present for the production of preserved latex concentrates. These processes are briefly described below.

Production of latex concentrates by creaming

The production of latex concentrates by creaming involves the mixing of a creaming agent solution with properly preserved field latex and then allowing the latex to separate into two layers—an upper layer of concentrated latex and a lower layer of serum containing very little rubber. The lower layer of serum (skim latex) is removed leaving the latex concentrates, which is then tested for its d r. c. and preservative content, and necessary adjustments made, packed and marketed. Though, this is a simple process this method of processing latex into preserved latex concentrates has been superseded by the centrifugal concentration method. However, this method can still be employed with advantage because the equipments required can be fabricated locally at a relatively low investment when compared to imported centrifugal machines and the low cost of processing. The present price of an imported centrifuge machine will come to about Rs. 12 lakhs. This prohibitive landed cost of an imported centrifuging machine clearly establishes the need for small scale latex units to produce creamed latex. In this context it is important to mention that the present study showed that a large number of small scale latex rubber products manufacturing units in Kerala and Tamilnadu are at present producing latex concentrates for their own consumption by adopting this method.

Production of latex concentrates by centrifugation

The production of latex concentrates by centrifugation involves the separation of preserved field latex into two fractions, one containing concentrated latex and the other containing skim latex (5-10% d. r. c.) by a centrifuge machine which consists essentially of a bowl that can rotate at a very fast speed. In practice, the rotating bowl of the centrifuge is fed continuously with latex which results in the continuous collection of concentrated latex that can be drawn out through an outlet at the centre and serum fraction (skim latex) near the circumference from where it can be withdrawn through another outlet. The essential features of a factory to process latex into latex concentrates by centrifugation are a latex reception unit that can act as a feed reservoir for the centrifuge, the centrifuge itself with means of driving them, bulking and storage tanks, provision for packing into drums and means of processing the skim fraction. The skin fraction is generally coagulated with sulphuric acid, creped, dried and marketed as skim rubber.

The quality of preserved latex and latex concentrates produced by the above mentioned processes are to be strictly controlled by laboratory testing before marketing in order to avoid wastage at the product manufacturing units.

Installed capacity and capacity utilization

The study conducted showed that at present centrifuge factories are producing almost all the preserved latex and latex concentrates and marketing the same. However, it was found that majority of the small latex products manufacturing units in Kerala buy field latex and processes the same to preserved latex concentrates by creaming. The exact production and consumption of creamed latex concentrates by these units could not be collected as they are not keeping proper records. Therefore the study was centred on producers of centrifuged latex.

Out of the 21 units under operation-14 and 6 units are found in the States of Kerala and Tamilnadu respectively and the remaining one unit in Karnataka State. In Kerala most of the factories are located in Kottayam, Kozhikode and Trichur districts. Also it is interesting to note that among the new units under establishment one unit each is coming in Karnataka and Tripura respectively. 11 of the existing units are estate factories of which 5 have expansion programmes. Another 4 factories are also under establishment in the estate sector and this will result in about 60 per cent of the installed capacity coming under the estate sector.

The installed capacity of the existing 21 units has been worked out to be about 40,000 M.Tonnes d. r. c. latex concentrates on a 3 shift basis for continuous work. With the completion of the expansion programmes of six units and the 8 new units under establishment, the installed capacity would exceed 50,000 M. T. d.r.c. It is well-known that there are practical difficulties in achieving the installed capacity due to a number of factors, the most important of which is the seasonal variation in the availability of field latex. Production of latex varies from months to months. Also about 2 weeks to one month rest is given to the rubber trees during February/March in most of the plantations and so the production during this period will be very low. During the period June August also, the production will be poor in most of the plantations due to frequent interruptions to tapping. However in large plantations, by using rain guards, continuous production during these months also is ensured. Though it is possible to store the field latex for utilization during the lean periods of production by adding preservatives at the required level, manyof the units may find it difficult to store the raw materials due to the heavy financial investment requirement for proper storage space and the possible loss in the event of adverse price fluctuations etc. Besides, due to electricity and water supply failures, labour unrest etc., effective working days in an year is reduced. Considering all these, it is reasonable to estimate that at least 750 shifts out of the total 1095 in an year could be worked by a factory. This assumption has been well substantiated during the course of the study as revealed by the number of shifts worked by the individual units in 1980-81. On the basis of the above assumption, the total annual achievable capacity of the 21 units under operation has been estimated to be 32,000 M.Tonnes (drc). Also it has to be pointed out in this context that among the 21 units, 6 units have been found implementing expansion programmes and the additional capacity that can be achieved would be about 4,500 M. Tonnes (drc) per annum. Thus the total achievable capacity at the end of 1981-82 would be 36,500 M. Tonnes (drc).

Eight new units which include 4 estate factories are in the various stages of establishment. They have either imported, importing machines or produced old machines. Five of these factories are expected to commence production during 1982-83 The remaining 3 factories may start production within one or two years. The achievable capacity of these units has been estimated to be about 8,000 M. Tonnes (DRC) per year. In other words, the total achievable annual capacity will increase to about 45,000 M Tonnes (drc) by 1983-84.

Installed capacity vis-a-vis used capacity

The machinery used in the factories are all imported centrifuge machines which are well known for their good performance and low incidence of breakdown. Also the power, water and labour requirements for a centrifuge factory is only very little when compared to other types of rubber processing factories. Therefore it is only in the fitness of things to expect a comparatively better capacity utilization in the case of centrifuge factories provided raw materials are available. However the study revealed that the capacity utilization continues to be very poor in most of the units. The achievable capacity and reported production by all the units during the last 3 years are given below:

Year	Achievable capacity drc/MT	Reported production drc/MT	Capacity utilization
1978-79	30,150	10,948	36.3%
1979-80	30,700	12,278	40.0%
1980-81	32 300	13.139	40.7%

The most important reason reported for the poor utilization of capacity by majority of the units was the non-availability of field latex in adequate quantities, particularly during the rainy and wintering season. Lack of funds, power failure and labour unrest are the other constraints faced by these units in achieving their capacity.

(to be contiuned)

BOMBAY TYRES GEARED FOR GROWTH

The performance of Bombay Tyres International Limited (now a wholly owned Indian Company) has been very promising during the first half of the current financial year. The new Management has taken various steps to improve the operations, profitability and quality of the Company's products. Results of the new dynamism are already showing.

For the period ended June' 82 the production was 5.7 lakh units and the turnover Rs. 61.5 crores. This represents an increase of 70% over the corresponding period in 1981 as far as production is concerned. The turnover is higher by 36% over 1981. The Company expects to touch a production figure of 9 lakh units for the year and the turnover is likely to exceed Rs. 100 crores against Rs. 57 in 1981. The Management is confident of the Company's working resulting in reasonable profits this year and hopes to be able to wipe off the accumulated losses.

very high price levels prevailed. Such a situation necessitated a thorough study of all aspects of production and consumption of preserved latex and latex concentrates in the country with a view to formulating the strategy to be adopted by the Rubber Board for ensuring a balanced growth of the industry.

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Among these, preserved normal latex is processed from field latex by adding calculated quantities of the preservative, usually ammonia, followed by bulking; settling and blending into consignments of known dry rubber content and preservative content. With the introduction of preserved latex concentrates into the market, there is not much scope in the production of preserved normal latex on a commercial basis unless there is a local demand because the cost of packing and transportation will be very high per unit quantity of dry rubber when compared to latex concentrates.

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Production of latex concentrates by centrifugation

The production of latex concentrates by centrifugation involves the separation of preserved field latex into two fractions, one containing concentrated latex and the other containing skim latex (5-10% d. r. c.) by a centrifuge machine which consists essentially of a bowl that can rotate at a very fast speed. In practice, the rotating bowl of the centrifuge is fed continuously with latex which results in the continuous collection of concentrated latex that can be drawn out through an outlet at the centre and serum fraction (skim latex) near the circumference from where it can be withdrawn through another outlet. The essential features of a factory to process latex into latex concentrates by centrifugation are a latex reception unit that can act as a feed reservoir for the centrifuge, the centrifuge itself with means of driving them, bulking and storage tanks, provision for packing into drums and means of processing the skim fraction. The skin fraction is generally coagulated with sulphuric acid, creped, dried and marketed as skim rubber.

The quality of preserved latex and latex concentrates produced by the above mentioned processes are to be strictly controlled by laboratory testing before marketing in order to avoid wastage at the product manufacturing units.

Installed capacity and capacity utilization

The study conducted showed that at present centrifuge factories are producing almost all the preserved latex and latex concentrates and marketing the same. However, it was found that majority of the small latex products manufacturing units in Kerala buy field latex and processes the same to preserved latex concentrates by creaming. The exact production and consumption of creamed latex concentrates by these units could not be collected as they are not keeping proper records. Therefore the study was centred on producers of centrifuged latex.

Out of the 21 units under operation–14 and 6 units are found in the States of Kerala and Tamilnadu respectively and the remaining one unit in Karnataka State. In Kerala most of the factories are located in Kottayam, Kozhikode and Trichur districts. Also it is interesting to note that among the new units under establishment one unit each is coming in Karnataka and Tripura respectively. 11 of the existing units are estate factories of which 5 have expansion programmes. Another 4 factories are also under establishment in the estate sector and this will result in about 60 per cent of the installed capacity coming under the estate sector.

The installed capacity of the existing 21 units has been worked out to be about 40,000 M.Tonnes d. r. c. latex concentrates on a 3 shift basis for continuous work. With the completion of the expansion programmes of six units and the 8 new units under establishment, the installed capacity would exceed 50,000 M. T. d.r.c. It is well-known that there are practical difficulties in achieving the installed capacity due to a number of factors, the most important of which is the seasonal variation in the availability of field latex. Production of latex varies from months to months. Also about 2 weeks to one month rest is given to the rubber trees during February/March in most of the plantations and so the production during this period will be very low. During the period June August also, the production will be poor in most of the plantations due to frequent interruptions to tapping. However in large plantations, by using rain guards, continuous production during these months also is ensured. Though it is possible to store the field latex for utilization during the lean periods of production by adding preservatives at the required level, manyof the units may find it difficult to store the raw materials due to the heavy financial investment requirement for proper storage space and the possible loss in the event of adverse price fluctuations etc. Besides, due to electricity and water supply failures, labour unrest etc., effective working days in an year is reduced. Considering all these, it is reasonable to estimate that at least 750 shifts out of the total 1095 in an year could be worked by a factory. This assumption has been well substantiated during the course of the study as revealed by the number of shifts worked by the individual units in 1980-81. On the basis of the above assumption, the total annual achievable capacity of the 21 units under operation has been estimated to be 32,000 M.Tonnes (drc). Also it has to be pointed out in this context that among the 21 units, 6 units have been found implementing expansion programmes and the additional capacity that can be achieved would be about 4,500 M. Tonnes (drc) per annum. Thus the total achievable capacity at the end of 1981-82 would be 36,500 M. Tonnes (drc).

Eight new units which include 4 estate factories are in the various stages of establishment. They have either imported, importing machines or produced old machines. Five of these factories are expected to commence production during 1982-83 The remaining 3 factories may start production within one or two years. The achievable capacity of these units has been estimated to be about 8,000 M. Tonnes (DRC) per year. In other words, the total achievable annual capacity will increase to about 45,000 M. Tonnes (drc) by 1983-84.

Installed capacity vis-a-vis used capacity

The machinery used in the factories are all imported centrifuge machines which are well known for their good performance and low incidence of breakdown. Also the power, water and labour requirements for a centrifuge factory is only very little when compared to other types of rubber processing factories. Therefore it is only in the fitness of things to expect a comparatively better capacity utilization in the case of centrifuge factories provided raw materials are available. However the study revealed that the capacity utilization continues to be very poor in most of the units. The achievable capacity and reported production by all the units during the last 3 years are given below:

Year	Achievable capacity drc/MT	Reported production drc/MT	Capacity utilization
1978-79	30,150	10,948	36.3%
1979-80	30,700	12,278	40.0%
1980-81	32 300	13,139	40.7%

The most important reason reported for the poor utilization of capacity by majority of the units was the non-availability of field latex in adequate quantities, particularly during the rainy and wintering season. Lack of funds, power failure and labour unrest are the other constraints faced by these units in achieving their capacity.

(to be contiuned)

BOMBAY TYRES GEARED FOR GROWTH

The performance of Bombay Tyres International Limited (now a wholly owned Indian Company) has been very promising during the first half of the current financial year. The new Management has taken various steps to improve the operations, profitability and quality of the Company's products. Results of the new dynamism are already showing.

For the period ended June' 82 the production was 5.7 lakh units and the turnover Rs. 61.5 crores. This represents an increase of 70% over the corresponding period in 1981 as far as production is concerned. The turnover is higher by 36% over 1981. The Company expects to touch a production figure of 9 lakh units for the year and the turnover is likely to exceed Rs. 100 crores against Rs. 57 in 1981. The Management is confident of the Company's working resulting in reasonable profits this year and hopes to be able to wipe off the accumulated losses.

TAPPING SHADE BAGS NATIONAL AWARD

PK NARAYANAN

Continuous use for two years has not damaged the tapping shade. Shri. Sreedharan Nair, Anitha Sadanam, Vazhoor reveals his experience to Shri.Philip Abraham (extreme right).

Invention of the PVC made 'TAPPING SHADE' by a rubber smallholder, Mr. Philip Abraham of Anchani Flastic Centre at Vazhoor near Kottayam in Kerala, has won the coveted national Cash Award of Rs. 5000/-this year from the National Research Development Corporation(NRDC). The 'Tapping Shade' which is almost a perfect substitute to the conventional rainguard made of polythene films used for protecting the tapping panel of rubber trees during monsoon, fulfils one of the long felt needs of the Rubber Plantation Industry in India.

In the polythene rain-guarding system the tapping panel of rubber trees is completely kept covered resulting in mould growth leading to the incidence of bark rot disease which warrants frequent fungicidal wash. Besides the polythene rain-guard also needs replacement every year as it does not last for more than a year.

Economic Advantages

On the contrary the tapping shade just extends laterally over the tapping panel thereby keeping the entire tappable bark open, eliminating the chances for bark rot. As the tapping shade is made of a thicker PVC material it could be effectively reused for two or three years. It could be fixed on the tree using a single staple while polythene film needs at least a dozen staples. Tapping shade consumes only less than half of the adhesive required for affixing polythene film. These economic advantages of the tapping shade over the conventional system have made it a superior device.

The tapping shade owes its origin to the observations of the Rubber Research Institute of India that the tapping panel of rubber trees gets wet during rainy months solely due to the rain water that trickles down through the trunk and not due to direct side splashes during rain. If the water trickles down the trunk is diverted and flown out above the tapping panel at a convenient height the bark below would remain dry even during severe rains enabling regular and uninterrupted extraction of crop from rubber trees.

Though the initial investment for fixing tapping shade is slightly higher than that for polythene rain guarding, the reusable quality and total avoidance of bark rot incidence makes the system more economical and feasible.

Boon to Rubber Growers

The invention of this new device is a boon to rubber producers as it will enable uninterrupted extraction of latex from rubber trees, during rainy months. Ease in adoption and economy of the method are added advantages. Widespread acceptance of this device by rubber producers is likely to ensure better arrival of the crop in the market during lean seasons. More than that the total rubber production in the country also would rise up proportionately. At present small holdings are being put under rest during monsoon seasons because they are unable to tap the trees as the unprotected tapping panel gets wet at that time. Rainy months are considered climatically the most congenial for exudation of maximum latex. With the adoption of tapping shade the rubber trees will be subjected to exploitation during this period resulting in increased crop.

Mr. Philip Abraham who has been labouring hard for the past few years to evolve a perfect rain guard has finally achieved his target. The NRDC award is a fitting reward to the enterprising skills of this small farmer. Through this invention he has brought great honour and fame to the farming community at large. □

FOAM RUBBER FOR PLANTING VEGETABLES

Half the world's population doesn't have enough to eat and starvation in the third world has reached epidemic proportions. The problem is there are too many mouths to feed with not nearly enough arable land to go round. Farmers tend their land all year round with only one, or perhaps two crops to show for it.

But now a scientist in Britain believes he has discovered a process that will solve the world's food shortage problems. Using hydroponics, a method of growing plants without soil, Luke Ferguson claims he can increase crop yields by between three and seven times. And the secret lies in foam rubber!

Working on the hydroponics theory for the past twenty years, Ferguson has found that planting vegetables and other crops in diced foam rubber and feeding them chemical nutrients normally provided by soil is a much more effective method of growing.

Soil only contains a certain amount of nutrients that can feed plants—which is why farmers space out their crops when planting—but using hydroponics the farmer can add as much nutrient as he likes. That means plants can be grown closer together thus increasing the yield.

"But that's not the end of the story," says Ferguson. "By using foam rubber instead of soil you can grow plants anywhere. Places that were previously useless, such as deserts, mining slag heaps, and even beaches could be utilised."

He adds: "The process is ideal for countries that have poor soil" Ferguson has been experimenting with his techniques and the results are almost incredible. Each time he plants a vegetable in foam rubber he also plants one in soil to compare their progress "In almost every case the plant in foam rubber has developed at a far greater rate than the one in soil.

"This is because I have been able to feed the plants in foam rubber with exactly the right amount of chemicals they need. For example, I planted two lots of strawberries recently. One in rubber and the other in soil. So far those in rubber have produced about three or four times as much fruit."

Ferguson's ideas go further than just growing plants in rubber. He hopes to set up a plant production line in which foam rubber plots will move along a conveyor belt and be fed by a nutrient stream flowing underneath.

"This would reduce the space needed for growing even further and the farmer would then have total control over his plants. I am convinced that one day all plants will be grown thisway"

HIGHER DEMAND FOR EUROPEAN RUBBER PRODUCTS: FORECAST FOR 1983

A marked rise in demand for rubber products in Western Europe is predicted for 1983, following the difficult trading conditions which have prevailed during the past twelve months. In particular, sales of new car tyres could rise by about 6 per cent in volume, while a growth of 3 per cent is likely for general rubber products, such as belting, piping and rubber consumer goods.

These conclusions emerge from the third edition of "Rubber Markets in Western Europe" which is published by Economic Services. This report provides every year an in-depth analysis of the latest statistical data about exports and imports for a wide range of products in the Western European rubber industry. It is of special assistance to sales directors and marketing managers involved in exporting and provides the latest information about markets in leading European countries.

Over the past eighteen months the overall situation in the European rubber industry has been quite grim and the recession has taken a heavy toll in terms of lower sales for many rubber products. During 1981, overall demand for car tyres in Europe is estimated to have dropped by 10 per cent, while for general rubber products a fall of about 4 per cent has been experienced. In the first half of 1982, the effects of the recession have continued unabated but more stable conditions are reckoned to have prevailed during the latter part of this year when a growth of about 2 per cent is estimated to have been seen.

Best Prospects

The predictions for 1983 have been based on a careful analysis of the latest situation, together with forecasts about the general economy in the leading European countries. For one thing, there will be some speeding up in the rate of Expansion for gross domestic product in some countries and this will lead to higher consumer spending on rubber products. In addition, new car registrations will pick up from the low level which they have reached during 1981-82 and this trend will provide a boost to sales of new car tyres over the next twelve months.

The prospects for rubber products in individual countries will vary considerably in each of the European markets, but the recovery is likely to be fastest in France, West Germany, Sweden and Denmark. The outlook for Italy and the U.K. remains uncertain while in some of the smaller countries such as Belgium and Norway, only limited increases in rubber sales will be seen.

Trade in car tyres currently at a low ebb

Trading conditions in the tyre sector have been worse than expected and demand for car and truck tyres has been much lower than anticipated in most European countries;in this sector,conditions have been very tough in Europe and some countries have cut back their imports by a significant amount.

In particular, imports of car tyres by Britain and Italy were sharply lower and dropped by 15 per cent in 1981. In addition, demand by the Benelux countries has been down while foreign deliveries to France and West Germany were also slightly easier.

Some of the leading exporters of car tyres have managed to stabilise there sales but they have had to fight hard to maintain their turnover in overseas markets over the past twelve months. In the case of Italy and U.K, exports of car tyres were significantly lower but, in contrast, those for France were well maintained and showed a rise of 3 per cent in volume.

The situation for truck tyres was even worse than for passenger car tyres and overall demand has been sharply down in most countries during 1981. In some markets, sales plunged by between 15 and 20 per cent in 1981, and it is believed that the trend in the first half of 1982 has continued to be quite poor.

Truck tyre imports slumped heavily in most markets, particularly in the UK., Denmark and Sweden. French deliveries were also badly affected by the recession while German imports dropped by 4 per cent in this sector.

Fall in general rubber products continues

The fall in demand for general rubber products has continued unabated, though the decline in sales has been more moderate than for tyres. In the case of West Germany and the U.K., sales declined by about 4 per cent in 1981, while for Italy and France a drop of about 10 per cent has been recorded.

Total trade in general rubber products has been sharply hit by falling demand and imports of conveyor belting dropped markedly in many countries. This was particularly the case for West Germany, where they declined by 16 per cent in 1981 compared to a year ago.

Exports of conveyor belting also suffered a decline, though the trend was mixed and some countries managed to buck the trend in particular, sales by West Germany were considerably higher whereas France and the U.K. had a tough time in selling these products in overseas markets.

There was little cheer in consumer rubber products and the latest figures for clothing items, such as household gloves, indicate a further drop in activity. Thus, imports by Italy for gloves declined by over 30 per cent in 1981, while, for Sweden and Switzerland, their deliveries declined by an average of 15 per cent.

Synthetic rubber under pressure

As a result of poor demand for tyres and general rubber products, sales of synthetic rubber have been much lower than anticipated. It has been reported that some European synthetic rubber manufacturers are now operating at only 50 per cent capacity and that a considerable rationalisation programme is under way at the moment, with the possibility of many plant closures.

Consumption of synthetic rubber has declined by between 5 and 10 per cent in most leading European countries and imports have also been considerably easier. For instance, France has seen its imports of SBR fall by 17 per cent while a similar drop has also been experienced by Italy during 1981. The situation in the U.K. has also become quite critical and its overall imports of SBR have been sharply down.

Current situation

During the first half of 1982, the underlying trend for sales for rubber products has been very uncertain and the fall experienced in the previous year continued. Nevertheless, there are now signs of more stability for both tyre and general rubber goods and the recession in some key European markets seems to be bottoming out.

By the end of 1982, conditions are likely to be considerably better and forecasts for the start of 1983 indicate a considerable improvement taking place. The recovery for tyre products should be even more pronounced than for general rubber products, as a result of the expected recovery in new car registrations. Another factor is that the replacement market should also pick up, as the actual mileage travelled per car starts to increase again. □

THE LAST LINK

The last link in the M4 motorway between London and South Wales was completed in 1981 with the opening of the Ogmore Viaduct. The bridge, some 400m long spanning the Ogmore Valley, is mounted on what are believed to be the world's largest natural rubber pot bearings. These bearings play an important role in providing flexibility when dimensional changes occur due to thermal and other movements.

Each of the supporting columns, and the four supports in the bridge abutments, carries a *Rotaflon* pot bearing. A pot bearing contains a rubber disc under constraint which is able to sustain very high stresses: typically pressures of 30MPa. The bearing itself accommodates rotational movements and the incorporation of a low frication sliding surface on the upper surface allows relative movement between the bridge deck and the bearing, and hence the pier or abutment.

The bearings used at Ogmore, incorporating monolithic natural rubber discs 1400 mm in diameter by 102 mm thick, were manufactured by the Andre Rubber Co in Surbiton. The size of the bearings was dictated by the size of the Viaduct itself: it carries a aix-lane motorway of considerable weight; the largest pier bearing must carry 4000 tonnes.

The use of natural rubber pot bearings for the Ogmore Viaduct is described in an article in the current issue of RUBBER DEVELOPMENTS, quarterly journal of the Malaysian Rubber Producers' Research Association. The article notes that with the completion of the Viaduct the M4 now forms a continuous high-speed link between South Wales and England, and comments that this should continue to encourage investment and industrialization in South Wales. It concludes: 'In the context of declining coal and steel production...the effect of the motorway in reducing local unemployment cannot be underestimated. And in achieving this, natural rubber plays a vital role.'

PRODUCE MORE RUBBER

ABID HUSSAIN
Commerce Secretary

Shri. Abid Hussain Commerce Secretary announced that Government of India are showing real interest in the problems of the rubber growers in particular and the plantation industry in general. Shri. Hussain was addressing at a combined meeting of the representatives of large and small growers and Rubber Board officials at Mascot Hotel in Trivandrum on 21st August 1982. He said that there are common interests and objectives and profit and losses are to be shared together. He continued:

"As you know, rubber has played an important role in the industrial development of the country. With the developments which you are seeing in the automobile industry and other rubber based industries, you can see the future and you are going to become more and more important tomorrow. In India we are trying to develop the rubber based industry, and to develop the sector which produces the raw material within the country. It does not mean that we are against giving import entitlements for industrial development which we have initiated in this country. Materials to the extent not available here have got to be brought in by imports. But I want to make it very clear that we would certainly not like to import materials which would be injurious to the growth of industry and the agriculture. While we have got to develop the rubber based industry, it will certainly not be at the expense of the planters or the rubber growers. Our first desire would be to satisfy the tyre manufactures and the other rubber goods producers by offering locally available materials but if locally we are not able to produce things to the entire requirements of the consumers, you will surely agree with me that we have to meet the requirements from outside. But that is a very costly affair. If you look to the economic situation with reference to the balance of payments position, you feel very panicky about the whole thing. It would be the endeavour of the Government not to spend valuable foreign exchange on import of goods execept to the extent necessary. Rubber is a very important and sensitive area not only from the point of view of agriculture but also from the point of view of development of industry. You have got confidence and courage and you have got a very high profile of ambition. We look to you for support and help. We look to you to make a success of your plantations because

Shri Abid Hussain, Commerce Secretary addressing the representatives of large and small growers and the Rubber Board Officials at Mascot Hotel, Trivandrum.

it is out of your success, the success of other industries will emanate. It cannot be that the planters will suffer or the industry will prosper and the planters will remain isolated from the base of the industry. I cannot conceive the development of one sector without the other. Last time when the tyre industry gave me an occasion to meet them in Bombay, I told them that I cannot conceive of any development of rubber industry without the people in rubber plantation.

I have come to you with great hope and expectation. I would like you to tell me how you can develop and improve the production of rubber. As my friend and colleague your Chairman has said that you are determined to improve the rubber prodoction and to improve the rate of progress in the rubber plantation, that has gladdened my heart. But I would like to know more from you. Please do not hesitate to illustrate your problems. May be there are issues connected with research and development. If we find that other countries are doing better, can't we transplant those ideas and technologies to our country? I do not believe in reinvention of things. If a thing has already been achieved, it is good enough. Japan's miraculous success is more due to application of developed tecnhology. We should not hesitate to take developed technology either from America or Germany or Malaysia or Indonesia or elsewhere. Every part of the world is ours. Certainly we will pay the price, if the price has got to be paid. I would not like to multiply endeavours which have already been done elsewhere. Your objective should be how best to improve on it and how best to develop upon it. Let us understand as to how it is affecting us and think what can be done about it. There are certain sacrifices which you have to make; believe me, others have made sacrifices to make you come to the level you have come or I have come. In a democratic society surely there have to be sacrifices. But sacrifices should not be of the order that kills the goose which lays the golden eggs. You may also tell me as to what would you like the Commerce Ministry may do for you. You all know that the Finance Ministry is at the top and everything rests there; they have to make the exercise in resources mobilisation for development expenditure and there may be bottlenecks while pushing through our programmes. We have to remove the bottlenecks. That can be done only if you train us better. A lawyer can win the case in a court only if the client tells all the truth about. In this particular field as friends and partners let us together play a very adventurous role and create happiness all around, for the rubber growers and for the rubber users."

RUBBER SCHEME FOR KONKAN

Rubber plantation on a commercial basis will be undertaken in the Konkan, the backward region of Maharashtra, for the first time.

For this a joint sector project has been sponsored by the State Industrial and Investment Corporation of Maharastra (SICOM), Development Corporation of Konkan (DCK) and the Lalwani Brothers from Kuwait.

An agreement for Rs. 2 crore project on 500 hectares land in Sawantwadi taluka in Sindhudurg district, was signed last week here between DCK and Dr. Suresh Lalwani from Kuwait. The Rubber Board has already recommended Sawantwadi area as the most suitable for rubber plantation in Konkan region. During the first phase of the project plantation of rubber on 50 hectares of land is expected to be undertaken before the next monsoon.

For implementation of the project, a limited company will be registered soon. Dr Suresh Lalwani and his brothers will hold 51 per cent shares of the company and the balance 49 per cent will be subsribed by DCK, SICOM and other State Government agencies. The project has good employment potential and will also introduce new skills and technology for rubber plantation in the region.

Financial Express (Bombay)

HANDBOOK OF NATURAL RUBBER PRODUCTION IN INDIA

A review appeared in *Horticultural Abstracts* (Volume 52, No. 3) published by the Commonwealth Agricultural Bureau.

There is an ever-increasing global demand for rubber, especially as the production of synthetic rubber is not only costly but also dependent on non-renewable, fast-depleting resources. Few will dispute this statement in the foreword of this large handbook published in commemoration of the silver Jubilee of the Rubber Research Institute of India. It consists of chapters by several authors and is intended to collect and present all relevant information on rubber cultivation and processing. It begins with a history of the rubber industry in India and this is followed by a review of secondary rubber-yielding plants. The main part of the book, however, is concerned with the culture and produce of the most important of the rubber yielding plants, *Hevea brasiliensis*, considered under: breeding and improvement; hevea clones; propagation; agraeological requirements; nurseries; field maintenace; nutrition; physiology of latex production; tapping; yield stimulation; diseases of leaf, shoot, stem and root; disorders; plant protection equipment; crop collection and processing; and by-products. There are also chapters on legislation covering rubber plantation labour, the Rubber Board and its activities, and rubber statistics. The Appendix contains such useful data as planting recommendations and a calendar of operations for rubber. There are many monochrome and coloured illustrations, some of the latter regrettably rather fuzzy.

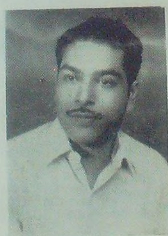
By including much detail, whether on yield stimulation or on management of rubber plantations, the Editorial Board has ensured that this handbook will be widely consulted. It should find a place in the libraries of all organizations involved in the growing or processing of rubber.

D. O. D. BOURKE

D. S. KULKARNI FELICITATED

Mr. D. S Kulkarni, Editor of Rubber News was felicitated in Bombay on his completing sixty years on 30th August 1982. The felicitation function was organised by a committee under the chairmanship of Mr. KM Philip.

OBITUARY



WE report with deep regret the sad demise of Shri. R Ravindran, a member of the Rubber Board at Trivandrum on 10th July, 1982. The death occured due to head injuries as a result of a fall in the bath room of a Tourist Home where he was staying. He was 45.

Shri. Raveendran was a distinguished member of the Board for many years, representing labour interests and was a champion of the workmen's rights and privileges in the Board.

NEWS IN PICTURES

BANK OFFICIALS IN THE RUBBER RESEARCH INSTITUTE OF INDIA

Officers of the State Bank of India undergoing training at the Bank's Rural Development Institute at Hyderabad paid a visit to the Rubber Research Institute of India on 17 th September, 1982. They are seen observing the polybagged rubber seedlings.

NEW REGIONAL OFFICE

Shri. K. Mohanachandran IAS formally inaugurated the new Regional office of the Rubber Board at Changanacherry on 9th September, 1982.

Shri Venugopal, Field Officer taking class in the seminar held at Neyyar Dam. Shri. N. Sreekandan.Nair, Deputy Development Officer, Rev.Father James and Shri. B. Gopinathan Nair are seen in the picture

CENTRE FOR TRAINING IN RUBBER CULTIVATION INAUGURATED

A centre for training in rubber cultivation under the joint auspices of Rubber Board and Marthoma Centre for Rehabilitation and Development was inaugurated at Kolabhagam

near Thiruvalla by Shri. K. Mohanachandran, Chairman, Rubber Board on 19th August, 1982. A meeting arranged in this regard was presided over by Dr. Zackarias Mar Theophilis Bishop of Marthoma Church. Prof. C.T. Mathew welcomed the gathering. Those who addressed the meeting included Shri. E. T. Varghese, Vice Chairman, Rubber Board, Shri. P. Mukundan Menon, Rubber Production Commissioner and Shri.P.K.Narayanan, Public Relations Officer. Rev. Father T. P. Koshy proposed a vote of thanks. A brief lecture on different aspects of rubber cultivation was given by Shri. K. K. Ramachandran Pillai in the 'Farm Clinic' preceded by the inaugural function.

NUNS TO INVOLVE IN RUBBER DEVELOPMENT

As a prelude to a massive programme of imparting training in rubber cultivation, the priests and nuns from various catholic dioceses of Kerala, a half day intensive training was given to a group of 100 nuns at the Missionary Orientation Centre near the Rubber Research Institute of India at Manganam on 29th July, 1982. The training was arranged at the intiative of Rev. Father George Vavanikunnel, Principal MOC and Fr. Antony Mannarkulam. Picture shows Shri. K. K. Ramachandran Pillai taking class during the training. Shri. P. Mukundan Menon Rubber Production Commissioner, and Shri. P. K. Narayanan Public Relations Officer also addressed them during the concluding session.

SEMINAR AT KANJIRATHANAM

Shri. P. C. Thomas MLA inaugurating the seminar at Kanjirathanam held on 29th July, 1982. Tomy Podimattom, Louis Palode, John Vazhuthanapallil, Joy P. Korah, K. K. Ramachandran Pillai and Kumari P. V. Claramma are also seen in the picture.

Shri. M. Sankar, Managing Director of Tripura Forest Development Corporation speaking on the occasion of the inaguration of Soil and Leaf Testing Laboratary started at the Regional Research Centre at Agarthala. Dr. M. V. Pushpadas, Senior Agronomist of the Regional Research Centre, Shri N. P. Thavani, Agricultural Production Commissioner of Tripura and Shri M. K. Ghosh, Forest Conservator are seen.

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The Rubber Board is associated with the post graduate course in rubber technology being conducted by the University of Cochin. The students of the fourth batch are with Shri. P. N. Radhakrishna Pillai, Joint Director of Research and Shri. C. M. George, Project Officer.

The Rubber Research Institute of India is conducting a course on rubber cultivation and estate management. The students are seen with Rubber Board Officials.

The Field Supervisors of the Malanadu Development Society accompanied by Rev. Fr. Mathew Vadakkemuriyil visited the Rubber Research Institute of India. They are with the Director of Research Dr. M. R. Sethuraj.

THE ACTIVITIES OF THE STATE FARMING CORPORATION OF KERALA LIMITED.

The State Farming Corporation of Kerala Ltd, Punalur a State Owned Company was formed in 1972 to plant sugarcane to feed the Mannam Sugar Mills Ltd. at Pandalam. By supplying about 3 lakhs tonnes sugarcane to the Sugar Mills till 1980 in about 4000 ha. of area, the Corporation suffered heavy loss of about Rs. 400 lakhs. So it was decided by the Government to delink it from the Mannam Sugar Mills Ltd. and to start cultivation of other suitable crops. Considering the profitable returns it was decided to convert 2000 hectares of its area in Pathanapuram and Pathanamthitta Taluks in Quilon District to rubber plantations and retain its balance 440 ha. with cashew, coconut etc. The balance area was returned to the Forest Department, being submergible, when the Kallada dam is completed.

Finance

The finance for implementing the Rubber Planting Project is as indicated below:

Source	Rs. in lakhs
1. Western Ghat Development Programme of the Govt. of India	660.25
2. Loan from A. R.D.C.	240.00
3. Subsidy from Rubber Board	60.00
4. Loan and Share Capital from the Government of Kerala	39.75
Total	100.00

Phasing of the planting programme

Year	area in ha
1982-83	450 ha.
1983-84	900 ,,
1984-85	650 ,,
Total:	2000 ha.

Out of the 450 ha. of this year's targetted area planting has already been completed on 400 ha. The work is progressing satisfactorily and the balance 50 ha. will be completed before 20th of August. Planting in the entire area of 2000 ha. is to be done using brown budded plants raised in poly-bags and maintained in polybag nursery for 8 to 10 months. The approximate percentage of different varieties of materials to be planted is as under:

Variety	% of the total number
RRII-105	70%
RRIM-600	20%
GT-1	10%

The polybag nursery of this Corporation is the biggest of its kind in India and this will be largest Rubber Plantation raised using poly-bag plants

Benefits of the Scheme

1. When trees attain full production, annual yield will be 4000 tonnes.
2. 1500 permanent workers and 200 casual workers can be engaged in mature stage.
3. Provides rehabilitation facilities for 150 wandering families of hilltribe in the locality.
4. The annual revenue will be about Rs. 650 lakhs, at an annual expenditure of Rs 250 lakhs. Net annual revenue before tax will be about Rs. 400 lakhs
5. Every kilogram of rubber produced adds 40 ps. to the Government of India being excise duty.
6. Social welfare measures like creches, school, medical facilities, housing etc. will be provided to about 1500 labourers and the staff engaged for the work.

Nurseries

In 1981-82 the Corporation established a budwood multiplication nursery with 20000 budded plants to obtain budwood for budding ordinary seedlings and 8.11 lakhs nos. ordinary seedlings were planted in the seedling nursery. The extent of poly-bag nursery established in 1981-82 was 8 ha. from where we produced about 2 lakhs selected polybag plants for field planting in 1982-83.

ANRPC POSTPONES MEETING

The Association of Natural Rubber Producing Countries has postponed a meeting, originally slated for mid July, that was to discuss member approval and implementation of the group's plan to withhold 350,000 tonnes of NR from the world market over a six-month period in an effort to boost the commodity's sagging market price. The July meeting had been called for following an emergency ANRPC conference in late May, at which the cutback proposal was initially discussed.

ANRPC's proposed action was triggered in early May by the International Natural Rubber Organisation's controversial 1percent downward revision in its agreement's buffer stock price band.

Predictably the plan has come under fire from consumer members of INRO. It has been pointed out by some analysts that the International Natural Rubber Agreement itself, in full force only since April, limits measures such as those being advocated. They said the agreement contains a clause that the buffer stock should be the sole instrument of market intervention for price stabilisation Another clause they said, requires exporters to "ensure continuous availability" of supplies to NR consumers.

Rubber trade sources indicate that the meeting's postponement might reflect a reluctance on the part of some ANRPC members to carry out an action that could be interpreted as a blatant contravention of the articles of INRA.

On the other hand, the lack of agreement on a mutually convenient date for the meeting might have caused the delay, as several of the member nations are involved in holiday periods, including the month-long Moslem Ramadan.

If the ANRPC's eight member countries agree to implement the plan, which is based on a quota system, Malaysia would bear the brunt of the burden. Deputy Primary Industries Minister Encik Bujang Ulis said Malaysia plans to withdraw 175,000 tonnes from the world market "excess." The other half would come primarily from Indonesia (95,000 tonnes), Thailand (45,000 tonnes) and Sri Lanka (15,000 tonnes).

Encik Bujang Ulis said that Malaysian actions would include the setting up of separate stockpiles by government agencies like MARDEC (Malaysian Rubber Development Corp.) and RISDA (Rubber Industry Smallholders Development Authority), as well as by advising plantations and the private sector to set up their own stockpiles.

According to Tan Sri. Dr. B. C Sekhar, leader of Malaysia's delegation to the ANRPC the proposed measures are intended as a supplement to—not a replacement of—the buffer stock operations of INRO.

The announcement of ANRPC's decision was promptly followed by strong support from Malaysia's rubber smallholders. RISDA Secretary General Haji Mohamad Rashid said he hoped the ANRPC would come up with even holder measures, including the possible withdrawal from the International Natural Rubber Agreement.

Although the smallholders produce a significant portion of Malaysian rubber, they said they expected the bulk of the supply cutback to come from local large estates and from government agencies involved in rubber production.

There appear, however, to be several potential obstacles blocking effective implementation of ANRPC's plan Apart from the possibility that such action may be in direct violation of INRA's guidelines, observers also raise questions about the feasibility of stock piling NR and the economic impact that reduced sales would have on the economies of the major producers—Malaysia, Thailand and Indonesia.

Further complicating the implementation of the decision to withhold supplies of NR from the world market was the statement of a senior Thai agricultural ministry official. Thavorn Visetchinda, director of the Rubber Estate Organisation,said Thailand plans to grow an additional 14,000 hectares of rubber between now and 1986 as part of its policy to substitute tapicoa with other crops. He said 32 000 hectares of new rubber plantations will be started in eastern Thiland this year with additional tracts of equal size to come in each following year through 1986.

His statement seems to add credence to the opinions of those informed sources in the trade who believe the delay over implementing the proposed cutbacks partly stems from the fact that, although Malaysia herself is bullish on the scheme, some of the other ANRPC member countries might be less enthusiastic.

DUNLOP SELLS MALAY UNIT

The UK Tyre group Dunlop Holdings has announced the sale of its last assets in Malaysia—a 51 percent stake in Dunlop Malaysian Industries Berhad—to a publicly quoted concern, Pegi Malaysia Berhad, for M $ 298 m (£73m). The sale is unusual in that Dunlop will continue to run the company for the Malaysian operation on a long-term basis. At the same time, Dunlop said it will collect royalties for the use of the company trademarks, which will remain on all company products.

This most recent deal, which Dunlop hopes will be officially approved by the Malaysian government by the end of this year, was partly prompted by the current drive undertaken by Malaysia to increase Malay participation in that country's business. It comes 10 months after Dunlop s controversial sale of plantation estates in Malaysia to an organisation with strong Chinese interests, a move which at the time was sharply criticised by the Malaysian government as an attempt to subvert the 'Bumiputra' scheme for promoting indigenous Malay commercial involvement. The DMIB sales makes the company entirely Malaysian controlled, since the remaining 49 percent of shares were already in local hands.

The sale of Dunlop's last direct Malaysian holding generally is seen as being beneficial to the company, especially in light of its recent financial losses; the proceeds will be put towards corporate financing. Dunlop said it expects the transaction to enhance its attributable after-tax results by about £7m over the course of its next full financial year.

THAILAND OPPOSES

The efforts of the Association of Natural Rubber producing Countries to support the market appear to have run into the sands with the Thai decision not to go along with Malaysia's proposals. But the market just shrugged, and the January/March position on the London terminal market closed at 54.25 pence per kilo on Tuesday of this week, showing a net loss of 0.40 pence on the week.

On returning from Kuala Lumpur Thailand's minister of agriculture, Chuan Leekpai, explained that his opposite number Abdul Manan Othman, had proposed that the rubber producing countries reduce the area planted to rubber, reduce the use of stimulate to produce latex, increase stocks, and adopt new strains of trees.

Most of these proposals run counter to Thai interest, said Chuan. Thailand's 4m acres of rubber plantation are owned by 800,000 separate smallholders, who would be hit by the proposed measures. In contrast, the minister pointed out, Malaysia's plantations are owned by a few big corporation. Furthermore, it was policy in Thailand to switch area from tapioca to rubber.

In contrast Malaysia's smallholders were planning to take a tapping holiday this week to show their support for the rubber producing countries' proposals.

Meanwhile, a special session of the International Natural Rubber Organisation's council will take place later this week.

INDONESIA SEEKS WORLD BANK AID

The Indonesian government is seeking World Bank help to finance the opening of new plantations in Java, Sumatra, Borneo and the Celebes.

According to an Indonesian agriculture ministry official, the project will provide 10,000 farmers with 3.2 hectares of land each, of which two will be provided for producing commodities like rubber, palm oil, coconut, pepper and coffee. The project is designed to boost Indonesia's declining non-oil exports, down some 25 per cent last year.

IVORY COAST NR OUTPUT GROWS

Say the words "Ivory Coast" and what springs to mind? Perhaps cocoa, coffee sugar or pineapples. But rubber? probably not.

It is true that natural rubber production in that West African nation is still in what might be termed an "experimental phase," but the long-standing government of President Felix Houphouet Boigny intends to turn the Ivory Coast into a significant NR exporter in world terms.

Rubber trees were actually planted on a very small scale as far back as 1961, the year the country gained independence from France. At that stage a major French retailing operation went into the business through an Ivory Coast subsidiary, and by 1979 this experimental venture was producing well over 5,000 metric tons of latex annually.

It was in the mid-1970s, however, that the government of Ivory Coast was first attracted to rubber. Oil prices had just increased dramatically, with the effect of making synthetic less competitive with NR. The government preceived a coming increase in the demand for cheaper, natural rubber, on that Ivory Coast producers could help satisfy.

As a result, the country moved into rubber production on a large scale, mainly through two companies with equal ownership by government and private interests: Societe Africaine des Plantations d'Heveas and Societe des Caoutchoucs du Grand-Bereby. These two operations concentrated on the southwestern part of the country, particularly around the town of Grand-Bereby itself. Technical assistance came from the Compagnie Generale des Establishments Michelin, and led to creation of the plantations.

Unfortunately, the government's predictions regarding demand for natural rubber did not take into account the effects of the world recession on the market in general. At the same time as rubber was being launched in the country, the nation's two main sources of revenue, cocoa and coffee, were enjoying quite high prices. (The Ivory Coast is the world's largest exporter of cocoa, and third largest of coffee).

Since then, the prices for these two products have tumbled sharply, placing in jeopardy all of the projects announced for the 1976-80 period by the government. Although Agriculture Minister Denis Bra-Kanon had said in 1979 that the government intended to diversify production so as to be less dependent on cocoa and coffee, the future for rubber (and for the other alternatives started by the government - sugar and soya) looked bleak.

The nation's 1979 trade figures balanced, but the government was locked into paying its cocoa and coffee producers an artificially high price, despite the fall in world prices for the two commodities. As a result there was little cash left to help the infant rubber industry.

Eventually help came in the form of financial assistance from such international organisations as the World Bank and the European Development Fund. This influx of money has meant that rubber acreage is constantly increasing although not at the speed that had been originally forecast by the government.

At the end of 1981, rubber plantations covered 74,100 acres, with 33,350 acres at the country's largest plantation at Grand-Bereby. Total latex production last year reached 20,000 metric tons, of which 95 per cent was exported.

New technology currently being employed at Grand-Bereby should allow producers there to reduce the period of immaturity of the rubber trees, and therefore bring them into production sooner. Some 5,930 acres are presently being tapped, and officials estimate that when the full 33,350 acres are in production, output will be 1.5 times the current total for all of the country's rubber exports.

Meanwhile, the government is promoting the establishment of smaller, 1,235 acre plantations in villages surrounding Grand-Bereby, which are usually set up with their own research units in order to help local people over come initial technical problems.

Although the vast majority of production is exported through the Southwestern ports of San Pedro, there are potential customers for refined rubber domestically, and there are plans to develop secondary production of latex further, so that the domestic needs can be served. Currently the manufacture of shoes, mattresses, cellular cushions, pharmaceutical instruments and retreaded tires takes place within the boarders of the Ivory Coast, but the vast majority of the rubber that is required still has to be imported.

Although the Ivory Coast is going to remain a small producer of rubber for the remainder of this decade, accounting for only 0.5 per cent of world production at present, its latex output is now the highest in Africa. And, observers say, after the extraordinary expansion that has taken place in other fields since the country's independence, the possibilities for it becoming a significant source of natural rubber someday seem good.

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THE QUARTER

Dissemination of knowledge is possible in many ways in the media of communication. A new method of personal contact programme which is evolved and implemented by the Board since 1980 is "Sasthradarsan". Under this programme rubber growers scattered in different rubber growing areas arrive at the Rubber Research Institute of India to acquaint themselves with the new experiments in the field of rubber research. The Rubber Research Institute of India has been carrying out research for the last 25 years for the benefit of the rubber growers. Whatever be the field of research, the technology should flow from "Lab to Land" for its effective implementation. The "Sas hradarsan" programme is the realisation of the aforesaid idea.

The visiting growers are provided with the days food and they are shown all divisions of the Rubber Research Institute of India. So far about 2000 growers have visited Rubber Research Institute of India under this programme. Sasthradarsan is in short' 'seeing and believing".

KUTTANAD TO GROW RUBBER

If the level of water in the furrows adjacent to the ridges could be constantly regulated and kept at least 4 to 5 feet below the ridges, rubber could come up well in the Holland style 'R' Block and similar rice land groups in Kuttanad. An exploratory team from the Rubber Board consisting of M/s. ET Varghese, Vice Chairman, KC Joseph, member, P. Mukundan Menon, Rubber Production Commissioner, Dr. MR Sethu Raj, Director, Rubber Research Institute of India, MG Jagadish Das, Joint Rubber Production Commissioner, Dr. SN Potti, Dy. Director, Rubber Research Institute of India, PK Narayanan Public Relations Officer and AV Thankapppan Nair, Dy. Dev. Officer, Changanacherry, which travelled through the major farming areas of Kuttanad such as 'R' Block, Kainadi, Vadakke Arayiram, Pulimcunnu, Nedumudi, and Kainakari on 20th October and met several leading paddy cultivators individually and in groups to ascertain their views about the proposal to plant rubber in suitable pockets in Kuttanad has gone back with the impression that sizable area could be identified for rubber in Kuttanad in the wake of the fading fortunes of paddy cultivation in this once renowned 'rice bowl'. The team also visited the 20 year old rubber estate at Kainadi belonging to Mr. ET Varghese. The trees there are yielding well and have put up satisfactory girth.

Several small growers of paddy came forward and expressed their willingness to the team to try rubber cultivation in the reclaimed garden lands they owned. The convenors of paddy land groups of Vadakke Arayiram and Irupathinalayiram warmly welcomed the idea and have decided to convene general body meetings of their members on 4th November 1982 at Kainadi and Kannadi to discuss the feasibility of the proposition of planting rubber in Kuttanad availing the technical know how and financial assistance from the Rubber Board. Technical experts of the Board would also be attending these meetings.

Shri KC Joseph, planter member of the Rubber Board and Managing Director of Kuttanad Rubber Company has already initiated steps to plant rubber during the ensuing planting season in an area of 12 acres near Nedumudi under the guidance of the Rubber Board. He also intends to establish a rubber nursery in Kuttanad for making available high yielding rubber seedlings raised in polythene bags.

The farming community of Kuttanad who have gone poor because of the consistently uneconomic nature of paddy cultivation crave for a change and large scale rubber planting may offer an alternative. The special endeavour initiated by Shri ET Varghese, Vice Chairman of the Rubber Board who is also a Kuttanad farmer, is likely to set a new trend.

Rubb Board bull. 18, No. 2

NATURAL AND SYNTHETIC RUBBER PRICE: A RELATIVE ASSESSMENT IN THE INDIAN AND INTERNATIONAL MARKET

E. V. THOMAS

Rubber is an important industrial raw material and almost all the countries in the world are having one or the other type of rubber industries. World total consumption of all rubbers today is 12.2 M (Million) tonnes. Out of this the share of natural rubber is only around 30 percent. Countries like USA consume 2.65 M tonnes of all rubbers as against 0.23 M. tonnes in India. Per capita consumption of rubber in USA is almost forty times that of India.

Major rubber consuming countries are USA, Japan, UK, France, Germany and Russia. Countries like USA also maintains stock pile of natural rubber to ensure a trouble free supply of this material. All important consuming countries have by now set up their own general purpose synthetic rubber manufacturing industries. But most of these developed countries procure Natural Rubber from the South East Asian producers. It is interesting to note that the prices of all commodities of commercial importance were steadily increasing in the international market after the oil crisis in 1973, but in natural rubber instead of an increase, a decline in price was observed in recent years. In this article, an attempt is made to analyse the reasons for this and a detailed examination of the relative position of the Indian raw rubber industry is also concurrently made.

Rubber consumed in the world today can be categorised into three groups.

Thus as the world rubber consumption increases, the share of natural rubber decreases, mainly owing to the reduced availability of this material. There are many areas of applications where natural rubber can be conveniently replaced with SBR or with blends of SBR and BR.

Natural and Synthetic Rubber availability in India

India at present produces natural rubber and three types of synthetic rubbers. The details of production of these rubbers for the past four years are given in Table 1 below. It may be seen from the table that the natural rubber production in the country was steadily increasing, whereas the synthetic rubber production showed a very unhealthy trend.

The installed capacity of the SBR plant is 30,000 tonnes and that of the poly butadiene plant is 20,000 tonnes. It may be seen from the above that the synthetic plants were not utilising even 50 percent of their installed capacity in many years.

Table II below gives consumption of rubber in the country for the past four years.

It is clear from Table-II that the SBR consumption in the country was marginally increasing though its production was not showing a proper growth. The balance quantity of SBR required in the country was procured through imports. The consumption of SBR in 1978-'79 and 1981-'82 more or less remained at the same level, while NR consumption recorded around 11 percent growth during the same period. Had a proportionate growth in SBR consumption been recorded around 34,000 tonnes of it would have been consumed in 1981-82. Polybutadiene industry also ought to have showed a better production record. In truck treads and in almost all heavy duty rubber products around 20 to 25 percent of natural rubber could be replaced by this material. The production record of the public sector plant at Baroda is painfully low and the consumption of this item is not picking up in the country. NBR (Nitrile rubber) production also was not growing as can be seen from the first Table. On the whole the production pattern of all the synthetic rubber industries in India are erratic and un-reliable.

From the above discussion it is clear that import of new rubber, particulary natural rubber to this country became necessary mainly owing to the unsteady growth of the Indian synthetic rubber industry. At least 25,000

Table-1*

Year	Types of Rubber Production in tonnes			
	NR	SBR	BR	others
1978-'79	1,35,297	22,461	5,395	198
1979-'80	1,48,470	20,269	8,347	908
1980-'81	1,53,100	12,603	4,423	148
1981-'82	1,52,870	16,561	11,416	522

*Source: Indian Rubber Statistical news of the Rubber Board.

Table-II*

Year	Types of rubber consumption in tonnes		
	NR	SBR	BR and others
1978-'79	1,64,524	24,725	12 875
1979-'80	1,65,245	22,778	17,810
1980-'81	1,73,630	25,125	20.075
1981-'82	1,86,920	23,355	23,090

*Source: Indian Rubber Statistical News of the Rubber Board.

tonnes more of synthetic rubbers, (SBR & BR) could have been produced by the Indian Synthetic rubber industries during 1981-82 had the factories operated on their installed capacity.

In Table-III import of natural rubber to this country, and the unused production capacity in the Indian synthetic rubber plants are shown.

The Indian SBR producing industry has an installed capacity of 30,000 tonnes. If good demand exist they can exceed this capacity as was shown in the year 1971-72 when they produced 32,911 tonnes (Indian Rubber Statistics-Vol 16. p. 39). Recently this plant has acquired licence for doubling their production capacity. There are other entrepreuners also trying to establish

Table-III

Year	Natural Rubber imported in tonnes	Unused production capacity in synthetic rubber plants in tonnes	
		SBR	BR
1978-79	14,750	8,000	9,000
1979-80	32,200	10,000	7,000
1980-81	9,250	11,500	13,000
1981-82	40,050	14,000	9,000
Total for 4 years	96,250	43,500	38,000

It may be seen from the above that in the course of past four years, India imported 96,250 tonnes of natural rubber at a time when the SBR and BR plants in the country had an idle capacity of around 81,500 tonnes. It can be seen that natural rubber share in the world rubber industry can be easily replaced in part by the SBR and BR type of synthetic rubbers. So the country could have avoided import of over 85 percent of NR had a judicious planning in production and consumption of natural and synthetic rubber was evolved.

general purpose synthetic rubber plants However, granting of such licences also should be made only after a careful assessment of the requirements. On no account a condition of the type now prevailing should be allowed. That is the country is importing rubber even when it had enough unused capacity for general purpose synthetic rubber production as detailed above.

Price of natural and synthetic rubber in India

For the purpose of discussion, it is proposed to include under this only the price of one grade of synthetic rubber namely SBR 1502. Natural rubber price shows appreciable variation, but an average price of the grade RSS-III in each year is taken here. Details of the variation in price of NR and SBR in India for the past four years is given in Table IV below.

It may be seen from the above table that the SBR price in India became higher than that of natural rubber from 1979onwards. The reason for a good number of small industrialists to switch over to the use of natural rubber in place of SBR was primarily on consideration of this. There may be any number of reasons for the Indian producers of SBR to justify this price. But for the consumers of raw rubber there are two main points for consideration at the time of selection of the polymer. There are the cost of the raw material and the suitability of the raw material for the production of articles which can meet the service requirements.

The switch over to natural rubber by Indian rubber consumers is thus primarily due to cost factors. There are some complaints on quality of some of the

Table-IV

Year	Price for 100 kg. rubber in Indian Rupees	
	SBR-1502	RSS-III (NR)
1978	915	979 00
1979	1110	1046.00
1980	1507	1250 00
1981	1670	1450 00

grades of synthetic rubbers produced here. But these are not of a serious nature. The reason for the high cost of synthetic rubber produced may have to be examined and by suitable remedial action, it has to be brought in par with that of natural rubber.

Price of natural and synthetic rubber in the International market

In Table-V below price of natural and synthetic rubber in the International market for the past four years is given. Rubber price variations in the past international market also is very much and so what is given here is the average price in London Market rubber. (The grades mostly used by the tyre industry)

In this context, it may also be observed that the producers of SBR are mostly in the developed countries, like USA, Japan, Germany or UK. These rubbers are also consumed mostly in the country of origin. So the producers get a fair price as there is adequate producer-consumer dialogue and proper understanding of each others problems. The natural rubber coming to London, New York or Tokyo markets is produced in South East Asian countries which are either developing or less developed countries (LDC). It may be seen from table V that the price

Table-V*

Year	Price per tonne In £ sterling in London Market	
	SBR—1502	RSS—III NR
1978	545.0	540.4
1979	617.7	625.3
1980	697.0	637.6
1981	749.0	533.8

* Source: Statistical Bulletin IRSG Vol.36 No 6/7

of natural rubber in London market is only 60 percent of the price for SBR-1502. In all sense of the term natural rubber is a better rubber than SBR-1502. Performance properties of a tyre or a conveyor belt or any heavy duty product designed with NR will be superior to those designed with SBR-1502. So the price paid to natural rubber is not based on quality consideration.

Thus natural rubber price in the international market shows a steady decline. The reasons for this are analysed and explained by various experts. In a recent report, it is stated that the present low price of natural rubber in the international market is related to the recession in the world rubber goods manufacturing industry. It is stated that the passenger car tyre industry had to reduce production by 13 percent in many parts of Europe. Truck tyre production also was reduced in many consuming countries. The low price of natural rubber is attributed to these and allied reasons. (Rub. Develop Vol. 35 No. 1, 1982) A point that will strike one instantly is why such a recessionary situation is not affecting the price of synthetic rubbers (Table V may be seen). It is to be observed that SBR is available in London market at a price of around Rs. 15,730 a tonne as against Rs. 11,210 for RSS-III grade natural

It is to be assumed that the poor price realisation for natural rubber is due to the poor holding capacity of the NR producers. It is interesting to mention here that the SBR producers control their production in line with the requirements. Table VI gives the installed capacity of SBR-1502 in different countries and the percentage utilisation of these for the year 1980.

Thus the price is controlled by the producers of SBR through a mechanism of regulated supply. Such a system is difficult to adopt for the NR producers as a vast majority of them are very small or marginal agriculturists. But the Governments concerned should evolve schemes for stock piling large quantities of rubber in their territory itself. The present price of natural rubber in the international market is totally unremunerative.

The author had served as an expert member of a study team constituted by the Association of Natural Rubber Producing Countries (ANRPC) for the examination of the processing and marketing conditions in member Countries. This study was undertaken during October/November 1981 and details were collected from all important producing countries through visits and discussions. The farm gate price realised by rubber growers in all ANRPC countries excepting in India at present is not remunerative. Steps are being taken by member Governments to improve the conditions of rubber growers. The International Rubber Organization

Table-VI*

Country	SBR Production capacity in tonnes	SBR Production in tonnes	Percentage utilisation of capacity
U.S.A.	17,14,000	10,74,300	63.0
France	7,43,000**	4,87,290**	66.0
Japan	8,87,000	4,50,900	52.0
U.K.	5,09,000**	1,89,807**	38.0

* Source: IRSG Rubber Statistical Bulletin Vol. 36 No. 6/7 1982

** Include production of all types of synthetic rubbers as separate figures for SBR are not available.

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1981	749.0	533.8

* Source: Statistical Bulletin IRSG Vol.36 No 6/7

Thus natural rubber price in the international market shows a steady decline. The reasons for this are analysed and explained by various experts. In a recent report, it is stated that the present low price of natural rubber in the international market is related to the recession in the world rubber goods manufacturing industry. It is stated that the passenger car tyre industry had to reduce production by 13 percent in many parts of Europe. Truck tyre production also was reduced in many consuming countries. The low price of natural rubber is attributed to these and allied reasons. (Rub. Develop Vol. 35 No. 1. 1982) A point that will strike one instantly is why such a recessionary situation is not affecting the price of synthetic rubbers (Table V may be seen). It is to be observed that SBR is available in London market at a price of around Rs. 15,730 a tonne as against Rs. 11,210 for RSS-III grade natural of natural rubber in London market is only 60 percent of the price for SBR-1502. In all sense of the term natural rubber is a better rubber than SBR-1502. Performance properties of a tyre or a conveyor belt or any heavy duty product designed with NR will be superior to those designed with SBR-1502. So the price paid to natural rubber is not based on quality consideration.

It is to be assumed that the poor price realisation for natural rubber is due to the poor holding capacity of the NR producers. It is interesting to mention here that the SBR producers control their production in line with the requirements. Table VI gives the installed capacity of SBR-1502 in different countries and the percentage utilisation of these for the year 1980.

Thus the price is controlled by the producers of SBR through a mechanism of regulated supply. Such a system is difficult to adopt for the NR producers as a vast majority of them are very small or marginal agriculturists. But the Governments concerned should evolve schemes for stock piling large quantities of rubber in their territory itself. The present price of natural rubber in the international market is totally unremunerative.

The author had served as an expert member of a study team constituted by the Association of Natural Rubber Producing Countries (ANRPC) for the examination of the processing and marketing conditions in member Countries. This study was undertaken during October/November 1981 and details were collected from all important producing countries through visits and discussions. The farm gate price realised by rubber growers in all ANRPC countries excepting in India at present is not remunerative. Steps are being taken by member Governments to improve the conditions of rubber growers. The International Rubber Organization

Table-VI*

Country	SBR Production capacity in tonnes	SBR Production in tonnes	Percentage utilisation of capacity
U.S.A.	17,14,000	10,74,300	63.0
France	7,43,000**	4,87,290**	66.0
Japan	8,87,000	4,50,900	52.0
U.K.	5,09,000**	1,89,807**	38.0

* Source: IRSG Rubber Statistical Bulletin Vol. 36 No. 6/7 1982

** Include production of all types of synthetic rubbers as separate figures for SBR are not available.

(INRO) established recently is an attempt in this line. But the over representation of the consuming countries in this body might act as a deterrent in its effective functioning So far it has not proved its effectiveness.

Natural rubber production cost in Malaysia, the biggest producer has risen very high. The tapping cost in small holdings has risen as high as 50 percent and the tappers prefer to do share tapping. Many holdings are forced to keep their plantations without tapping. The almost stagnant production levels in Malaysia for the past few years in spite of the large scale planting of high yielding rubber varieties adopted from 1960s give adequate proof for this. Many estates have abandoned rubber plantations and resorted to alternative crops like Cocoa or Oil palm. The conditions in Indonesia, Thailand and Sri Lanka are worse. The worst affected place is Papua New Guinea which fortunately is not a major producer.

Table-VII below gives the details of producers of natural rubber in South East Asian countries and farm gate price now realised by them.

The rubber planters, particularly the small holdings in all these countries are in a deplorable state of despair. Malaysia has started a number of schemes to mitigate the sufferings of the rubber growers. In other countries also several schemes are being introduced for this purpose. But the benefits of these schemes are still outside the reach of a vast majority of small farmers.

The Indian producers and consumers should realise the factual position in the international rubber business. It may not be correct to conclude that the natural rubber price in India is high. It is certainly higher than that prevailing in other rubber producing countries. But in these countries there is not enough rubber consuming industries and the price of their raw material is fixed by consumers in the Western World. The Indian rubber consuming industries are giving a comparable price to both natural and synthetic rubbers produced in the country. In fact the product prices are also fixed on considerations of rubber price at these levels. The natural rubber producing industry, has grown so well in India mainly because of the remunerative price that was assured to the growers. Large scale inports or unrestricted production of synthetic rubbers can affect adversely its demand and supply position in the country. Decisions on these may be taken only on considerations of the Nation's long standing interests. At present there is need for the following in the country.

(1) The reasons for the high price of SBR in the country has to be found out and it has to be brought in par with that of NR prices.

(ii) A proper advisory machinery has to be set up for evolving policies for regulating synthetic rubber production and import of natural rubber.

Natural rubber producing industry acts as means of livelihood for millions of poor farmers and helps in development of vast areas of marginal lands. It also helps in maintaining the ecological balance by serving as a man made forest. So maintenance of this industry at economic levels is a need of the century.

Reproduced from the 'Economic Times' dated 29th October 1982.

Table-VII

Country	Total area under rubber plantations as Millions of ha-	Total production Millions of tonnes in 1981	Percentage under small holdings	Average size of small farms in ha.	Farm gate price during Oct-Nov. 1981 per kg.drc in terms of Indian Rupee
Malaysia	2.0	1.527	65.0	2.3	6.00
Indonesia	2.32	1.020	80.0	1.5	7.40
Thailand	1.50	0.495	95.0	2.5	7.20
Sri Lanka	0.227	0.133	30.0	...	5.00

TEST-TUBE TREES

Indian scientists have succeeded in growing rubber, eucalyptus and rosewood trees in test-tube using a technique that promises to be a boon to the afforestation programme. The technology for rapid clonal multiplication of mature forest trees through tissue culture has been developed at the National Chemical Laboratory (NCL) in Pune.

—Times of India

1. NATURAL RUBBER TO MEET TECHNOLOGICAL CHANGES

Tan Sri Dr. BC Sekhar

Dr BC Sekhar, Controller of Research and Chairman of Malaysian Rubber Research & Development Board, Kuala Lumpur delivered two lectures at the seminar on SMR GP held on 5 October at Hotel Oberoi Towers, Bombay Both the talks highlighted the qualities of Natural Rubber as a powerful material to meet the challenges of the time. We are reproducing his key-note address and his summing up lecture made at the seminar.

As far as the consuming industry is concerned, there have been some basic changes. From the point of view of consumption, some seventy percent of natural rubber goes into transportation. So when we talk of natural rubber we must talk in terms of tyres, and we must talk about the technological changes in tyres.

Tyre Technology

For many, many years the American industry decided to forget the existence of radial construction of tyres, and thought if they continued to forget that it would go away. But the fact is that radial construction tyres have come to stay. There is almost a parallelism if you remember that for many years America refused to recognise China; but China did not go away. Neither the radial ply tyres.

If you think in terms of what is taking place because of radial construction of tyres, you will see how much impact it is making to natural rubber. Firstly, radial construction have made it a fact that tyres out-live the car. There are very few people who actually change the tyres in the West when they are using radial construction tyres as far as mileage is concerned. So there is no more talk about the mileage of the tyre. It is something of the order of 50-60,000 kms as the average, and much more in relation to careful driving on the roads that you have in the West. This means that people are now looking at new features.

Safety

Firstly, the question of safety comes in. Secondly, the question of the petrol consumption comes in. So the most important feature in tyres now is not how many miles you get, but what is the rolling resistance, and because of rolling resistance what is the amount of petrol consumed by using the tyre. So, in fact technological changes that impinge on the tyre industry are largely oriented to improving the rolling resistance of tyres. Here of course, we are on a very good wicket, because the rubber with the best rolling resistance is natural rubber. But if you put all natural rubber in a tread, it is not a question of mileage - because mileage can always be sacrificed - if you think in terms of the cost of petrol. So what you do sacrifice is traction, skid resistance, and with too much natural rubber in the tread, you lose out on skid resistance. Therefore natural rubber cannot really go back into the passenger car tread. But the question arises, can we put a proportion of natural rubber into the tread so that you make a compromise between mileage, traction, as well as rolling resistance. These things have come into the scene, and I believe there are at present, because of price and other considerations, possibilities of natural rubber coming back into even passenger car treads to a certain proportion.

Radial Construction Tyres

There is another feature also which is appearing. In the construction of radial tyres the old technology has changed. If you remember, many of the technologists in tyre factories say: "You give me cheap rubber, and I have the technology to make tyres." It's fine; this was all right with cross ply tyres. Now with radial ply tyres, that situation does not hold. They have found that they need to have precision, standards, consistancy, safety standards met by control in every bit of material that goes to make tyres.

The people who have had the longest experience with radial tyres is Michelin, because they brought this about. Now there is a lot of myth in relation to the Michelin tyre technology. They buy special rubbers they have special wires - steel wires, which they make themselves. Michelin do not buy their steel wires, but in every place they have got a factory, they have also a steel wire factory. They even probably buy special chemicals - not necessarily from Bayer; they will make sure that they buy from seven or eight different people and they will blend them together - all this to provide a certain measure of consistancy and myth, and make it difficult for Goodyear, Firestone, Generals and others to understand what makes the Michelin tyres to tick. But the situation has changed now. You have Bridgestone who claim that their tyres are better than Michelin. You have goodyear who claim that they now have succeeded in overtaking Michelin. All these have come into being, but what has impinged on us is that Goodyear no more talk in terms of buying cheap rubber for their tyres because they have superior technology. They are now looking at the type of rubber that they purchased to put into their tyres, not knowing exactly what the standards are or what the quality criteria, is. What they are then saying is "Let us buy exactly what Michelin buy," and you will find there is a certain amount of tendency to buy thick sheets which is the 'Michelin Sheet' coagulated with acetic acid, matured and smoke dried. These are purchased to see whether they will actually meet the criterion, but progressively they are understanding better; it is the control of viscosity, control of breakdown, control of cure which probably provides Michelin with the sort of standards they require. So here again, the question of specifications and standards of rubbers have not become very important. This is another feature but then there are two other factors that come up. Firstly, the factor in the West is the question of environment – carbon black is becoming a material which is difficult to handle. It is polluting. It does not contribute to quality of life of the workers, so there is a certain amount of reluctance to deal with it. They rather see the carbon black inside the rubber, so that they do not have to deal with the black separately. Computer technology is coming in. They do not wish to see that these things are added separately into the system; they want to make sure everything is computerised, so the type of raw materials that come in has to be metered which means that perhaps natural rubber or any other polymeric material will have to appear in a powdered form incorporating black – free flowing carbon black. SBR or any other polymeric material has got to come in. Secondly they do not wish to use heavy capital equipment - the Banbury.

They want to get rid of the Banbury, and you have heard of all these machines that are coming in the Mix and other types of one shot process of extrusions. Now these things are going to come, whether one likes it or not. So we have a number of stages. The first stage in fact was the SMR as far as Malaysia was concerned. And that was only the beginning. The second stage we hope, is the SMR GP concept which will be presented to you by the three speakers – the elements of control that are being introduced into it, and why it is being designed in that manner.

The third one obviously will have to be a free flowing carbon black natural rubber powder which will have to come. We are working with it. We in fact have in the laboratory a free flowing powder. We are working with the Germans on this. We also know that synthetic rubber can be produced in powder form already; that will be the third one.

Free – Flowing Powdered Rubber

And finally the fourth one hopefully will be a mixture of a blend of NR and SR in free flowing powder form so that ultimately you can accrue the properties you require for the tread and the rest of the tyres. Now these are basically, I would imagine, the type of developments that are of consequence in the immediate years ahead from the consumer side. Natural rubber will have to be considered as an industrial performance material, whether they go into tyres, whether they go into engineering applications, whether they go into any other types of applications. It will have to be specified and designed for the specific use to which natural rubber is put.

Price

Right, if this is what we have to face, then the question is what has the synthetic rubber industry to offer? Is there a competition for natural rubber in this respect? As you know, conventionally, the position has been almost one as far as natural rubber is concerned from a techno economic point of view. Cost wise there is no synthetic rubber that could compete with natural rubber. The Chairman talked about the happy news of the natural rubber prices coming down in Kerala, but I think the manufacturers should not be too happy because what comes down must necessarily go up. And the situation is, at the moment there is a world impasse, an economic recession all over, and as soon as this is over, the realistic price for natural rubber today in comparison with synthetic rubber which is selling at of the order of M.S 3.50 to MS 4 per kg. If I convert that into Indian rupees, that is about Rs 14 to Rs. 16 a kg. That is the realistic price on the basis of value for the material.

Now that must come about when the recession alters. As to when that recession will disappear, different people have different attitudes and forecasts. Now my personal belief is that it has been down too long and as you know, the buffer stock since being in, has bought some 230,000 MT, and no producing industry can continue to stand the strain of depressed prices. So either by natural forces these prices will move up or artificially they will be pushed up, because there will be definitely a production cut back the supply and demand balance will be altered in the world outside. Of course, the Indian situation is slightly different, but all I am saying is that you should not look at these prices of Rs. 14/– or Rs. 16/– as something which is unnatural for natural rubber. It is very natural.

Synthetic Rubber

Now having said that, let us just simply trace the question of synthetic rubber, that is available. There is no change in SBR if we move from emulsion SBR to solution SBR. It is just an improvement. There is no change in solution polybutadiene. There again the same comparison with natural rubber holds. There is no difference in cis-polyisoprene. The same equation that isoprene is not a bi-product, it has to be a main material, and the cost will be higher; even if the cost is higher technically it is not as good as natural rubber, because it is still not 100% cis, and it has not got the type of green strength that natural rubber has and that situation holds still.

The Russians are talking about "Mark IV"; "Mark III" did not make it; Mark IV is now in the laboratory, and this will continue to imitate natural rubber to the full but neither price nor technology is really a strength as far as natural cis-polyisoprene is concerned. Then you have EPDM, which again has become a special material. It has really not competed with natural rubber in the general purpose area. And then we could talk in terms of the LIM process (Liquid injection Moulding) of tyres, and this is using polyurethane. This has made its appearance from time to time. Now it has appeared again. And they have suggested that this is the simplest method in the West where you simply pour the solution, mould the tyre in a one shot process and your tyre comes out. But soon enough they found that this cannot be.

So the newer developments are that it has now got the parts for the carcass, it has got the tread, it has the bead wire, it has even got the steel cords, and it is also being reinforced. So you are now back to almost conventional tyres using the urethane and the LIM process. Now this tyre suffers from what is called the 'panic stop'. If you stop the tyre suddenly, there is a hot spot, and then the thing starts failing. I don't think that the LIM process is going to be applicable either in passenger car tyres, truck tyres, or any of these vehicles which have to stop suddenly and start moving at any speed. The only area in which the LIM process will come in is allegedly the agricultural area. When you are in the field you are only running around, and you don't have to stop suddenly, and in those areas the LIM process will sell. They are selling some tyres in that area.

But there are two other developments in the synthetic rubber industry Now if you remember, sometime ago the synthetic rubber industry came out with trans-poly-pentenamer. This was supposed to be a very versatile rubber and this was between Germany and Italy – the Bayer and the ANIC system who produced this material. The Germans gave it up, and the Italians took it. Eventually the trans-poly-pentenamer with all its attractions finally virtually disappeared, because it did not stand up to the promise.

A new material has now appeared on the scene – trans-polyoctenamer, the poly-octadiene. And apparently if you mix it with rubbers, it will give you better rolling resistanee, and better processing properties. This has just come into the scene. We have evaluated it, we have looked at it. It is possible even in combination with natural rubber this might have some place. But it is not going to replace natural rubber.

But the Shell have come out with a new type of polyvinyl butadiene, with some styrene in it, and this polyvinyl butadiene, is just a 1–2 polymer of butadiene and it has some styrene added to it. I believe there is some 10% styrene in the Shell material. Huls material is 100% polyvinyl butadiene. These rubbers seem to have some unique characteristics. They have good rolling resistance, good traction, good wear resistance, but the two areas of properties they fail to mention are adhesion as well as hot tear. And I believe that these rubbers are not so hot in these areas. Now if you then mix it up with natural rubber, may be it will improve in adhesion, and it will improve in hot tear. If this combination works, then again it will assist natural rubber in getting into tread and other areas of application, rather than compete against natural rubber.

So in effect, if we consider all the synthetic rubbers that are available, none of them has actually changed the situation in relation to natural rubber. They have only added, if you like further strength to it.

Petroleum

There is a certain amount of euphoria all over in that petroleum prices have come down. And there is talk now that there is quite a bit of petroleum around in the world at large. They never felt that this will be available. And because of that slowly there is miscalculation once more on the petrochemical industry side, that the price situation might alter. But it is the considered thought in many circles that this euphoria will soon disappear. The basic concept of what is a material which is slowly but certainly being used up is going to manifest itself and the petroleum prices will again start moving up. Energy cost will be a criteria, although petrochemical industry by itself will have to be around for quite some time, to deal with the overall raw material shortage. Well, this is as much as I want to speak in terms of the synthetic rubber industry, and its survey, and if we move now as to what is taking place in the natural rubber industry in answer to this, it would complete the picture that I am trying to build up.

Guayule

Firstly, just as much as you hear where you produce natural rubber also in Kerala and other states, you know that the capacity of Hevea to produce more is yet to be fully exploited. And in this area the only competitor from the biological source is Guayule rubber, at present native in Mexico and in some parts of the United States. There have been suggestions by the U. S. Government and by the large tyre companies that they are going to invest money in Guayule cultivation, because they have come to a decision that they need cis-polyisoprene for strategic and other reasons and it has to be a biological source because the synthetic cis-polyisoprene does not compete and one source which could be backed is Guayule. As you know, Guayule does produce natural rubber of a type. It has not got the same green strength as natural rubber has. It is more skin to synthetic cis-polyisoprene. It is a material which is entirely soluble in solvents, which is unlike natural rubber. It has to be extracted – grown and extracted – through the high involvement of energy. It is a peculiar dichotomy that they are facing there. It is to be grown in an arid areas. And yet it needs to be watered in a controlled fashion. And it is an area where there is no water. So you have to bring in the water, and these conditions they have tried to meet.

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Firstly, just as much as you hear where you produce natural rubber also in Kerala and other states, you know that the capacity of Hevea to produce more is yet to be fully exploited. And in this area the only competitor from the biological source is Guayule rubber, at present native in Mexico and in some parts of the United States. There have been suggestions by the U. S. Government and by the large tyre companies that they are going to invest money in Guayule cultivation, because they have come to a decision that they need cis-polyisoprene for strategic and other reasons and it has to be a biological source because the synthetic cis-polyisoprene does not compete and one source which could be backed is Guayule. As you know, Guayule does produce natural rubber of a type. It has not got the same green strength as natural rubber has. It is more akin to synthetic cis-polyisoprene. It is a material which is entirely soluble in solvents, which is unlike natural rubber. It has to be extracted – grown and extracted – through the high involvement of energy. It is a peculiar dichotomy that they are facing there. It is to be grown in an arid areas. And yet it needs to be watered in a controlled fashion. And it is an area where there is no water. So you have to bring in the water, and these conditions they have tried to meet.

In the final analysis, the large tyre companies have given up and said that provided the U. S.

Government is prepared to subsidise the production of Guayule they could be interested. If they are not interested to subsidise it, then the tyre companies are not interested. To me this is more telling than anything else about the commercial techno-economic viability of Guayule.

But yet, I am sure that there are parts in India playing around with Guayule, parts in Australia, parts in Israel, there are even parts in Kuwait. There is someone in Kuwait who is working on Guayule. They feel that when the oil is used up, they have some other material source. They feel that Kuwait climate and soil conditions are sufficiently dry and arid where Guayule could come in. But we feel that having looked at it in the overall analysis Guayule will not compete.

Natural Rubber

We have to look at Hevea as the source in the long term of cis-polyisoprene. And it is this conviction that has led the producing countries to group together and accept a dynamic production policy. It has been accepted in the last three, four years, and it is this policy that has come under question. It has come under question because in the last one and a half years the supply - demand has been against the producers, the price has come down and as I said, the international buffer stock already holds over 230,000 MT, the price still remains in the dolorums. But be this as it may.

Shortage

The World Bank has made their calculations, and they say by 1990, there will be a shortage of more than 1,000,000 MT of natural rubber. That is their figure. But we believe that natural rubber in the past has lost default of supplies. It should not lose in the same manner in the future. And if we are optimistic that the quality of life in the developing world is going to improve, then the most certainly, the per capita con sumption of Natural Rubber inethe developing world must go up. And I think tha both China and India remain at the level of 0.4 to 0.5 kg per person. As the target at the moment, (if this can be 1 to 1.5 kg natural rubber) maintains growth, then this is adequate to use more than a million tons of natural rubber in addition to what is available now. These are things that we must consider in terms of supply.

Genetic Engineering

So the new materials that we have brought from Brazil in co-operation with all the research institutes are for the long term. In other words, the breeding efficiency has got to be enlarged, that we must approach nearer the 9000 kg/hectare per year which is a theoretical maximum for Hevea. At the moment, as you know, we have only reached about 3000 kg/hectare per year. So the research institutes have, as far as R & D is concerned, all been involved in genetic engineering. They have worked with tissue culture, and now are working in the frontiers to see whether something could be done to make a quantum jump as far as yield is concerned. This is something which the natural rubber industry cannot but be involved in, because in other agricultural processes genetic engineering is making a lot of promises. And so we have just started working in that area.

Automated Tapping

We are also working in the areas of automation of tapping, because as the quality of life improves, then you need to have workers and their quality of life must improve, so automation of tapping is around the corner. And we believe that in January of 1983 there will be large scale trials conducted in Malaysia using new tapping techniques which will be much more automated than it has been for rhe last 100 years of the natural rubber history.

Three Part Tree

Now one of the important approaches which will become manifest in the years ahead is the idea of the three part tree. The three part tree is not a concept, for the purpose of increasing yield, or reducing the incidence of leaf diseases or wind damage, but now what is taking place is that the scientists are finding that by combining the right type of trunk with the right type of crown, you can change the viscosity of the rubber. Now this is important in an energy dependent industry, as by combining this, by keeping your yield levels high, you can produce rubber with one viscosity and thus produce a uniform material. Again if you consider the SMR GP concept, you will understand why this type of cons stant viscosity is so very important It is being looked at as to how this can be given to the planters, that the planters while optimising on yield can produce a uniform viscosity material

Reaforestation

Now there are very many other areas of natural rubber research and development which become attractive as far as consumer technology is concerned. One or two of them are important. In the coming decade or two the question of materials will become critical. And timber is also a material which is going to be very scarce. There is a lot of talk that bio-mass being used for energy purposes. But no one has given serious thought what natural rubber could do. Natural rubber could do two things. Hevea Brasiliensis could be used in the reaforestation process. Forests are being inundated and good timber is being removed. And we are putting back species which take 16 to 20 years to grow and for 16 to 20 years you get nothing from it, and at the end of it you cut it for timber. Now if you were to put Hevea in that place instead, at the end of 16 to 20 years you get your timber, and we know it is light hard wood - and if you compress it you can make it hard wood - but after four years, for the next sixteen years you can take latex out of it, if the price is right. If the price is not right you can leave the rubber tree to grow. So you are actually growing rubber fo timber, and taking rubber as

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If you look back in the history of the plantation industry everywhere and I am quite well acquainted with the plantation industry in this country as well and look at some of the lessons that have to be learnt, the plantation industry in this country has shown a resilience to meet with the challenges,

Now if you think in terms of the expansion that it has gone through - the capacity expansion that Indian production has gone through - in the case of production, it has exceeded that of Sri Lanka, and India has the capacity to expand further. And if there needs to be a challenge for the producers in the South, all they have to do is to look at China. China has suddenly become a major producer of natural rubber in spite of all the problems that they have.

Antagonism

So I think the producing industry has responded. But my experience has been that there seems to be a traditional antagonism (for reasons unknown to me, but in all these years I have seen this). The manufacturers feel that their interests are in conflict with the producers, and the producers feel that their interests are in conflict with the manufacturers, and the synthetic rubber industry at one stage was also involved in this triangular problem, and suddenly some explosion - I believe in one of the factories, and after that all sorts of difficulties that came up in the synthetic sector and then the things came down.

The manufacturing base has in effect, excelled in their performance, if you look at Asia as a whole. Indian technological base-industrial base-is only second to Japan. And to that extent the manufacturing industry has served the producers of natural rubber also exceedingly well, and it is important to appreciate this. The relationship between manufacturers and producers is symbiotic, not parasitic.

And if it is this appreciation, the production sector immediately felt that there was external interference in the buffer stock. There is no need for external interference. You can have a buffer stock which is internal, entirely internal. When there is excess production, that can be bought into the buffer stock. And when there is excess consumption, that buffer stock can be released. And if that release is not enough, you can bring in external inputs to ensure, for the time being, that the manufacturing expansion is not inhibited. When the production expansion takes place, it has got a market. I think it has got to be seen in that sort of a light.

We must know what the consumer requires. So whether it is bi-product in times when the price is high. So what is not available for NR today is elasticity of supply, while the bulk is now grown for natural rubber you have a bank in the reaforestation process, and the bank of trees are there for utilisation when prices are high. This is another method of ensuring optimum consumption, but also providing the necessary elasticity in supply to put stability in the system. That is one aspect that is being given serious thought in Malaysia and other producing countries.

Feed Stock

Another aspect is that if we consider natural rubber as a feed stock for other types of polymers, and one of them which is also important in this country where you do not have these materials, are the special purpose synthetic rubbers. We have the chlorobutyl which is to be used in inner liners. You have the nitrile rubbers which are for solvent resistance. Now all these have to be imported and they are expensive materials. Now we know that by taking natural rubber and epoxidising it, we can impart to this modified material, gas impermitability, oil resistance almost as good and sometimes better than nitrile rubber, better than butyl rubber as far as permiability is concerned, yet having some of the other characteristics of natural rubber which are desirable. Now not all the evaluation is complete in this material. This has got to be looked at. We are now seriously working with this modified rubber with consumers and evaluating it. We have excited a lot of consumers in relation to this rubber and hopefully most of the problems will be solved, and this material will now start becoming an important new course of special purpose NR in the synthetic rubber field. If you will remember, many years ago the agression was on the SR industry on to natural rubber. I think the position is being reversed – there will be agression on the part of NR in the SR and they will have to compete with natural rubber in quality, in quantity and cost. This is what is taking place, not just in general purpose area but also in special purpose area. And as far as the natural rubber industry is concerned, it is not looking at synthetic rubber as a competitor, but as just another material. Can we then enter into the spectrum of properties that are necessary for the consumers, and which end of the spectrum natural rubber can come in as a general purpose material and which end it can come in as a special purpose material. There are enough potentials that are shown as far as it is concerned.

Government is prepared to subsidise the production of Guayule they could be interested. If they are not interested to subsidise it, then the tyre companies are not interested. To me this is more telling than anything else about the commerc[illegible] [illegible]nic-economic viability of G[illegible].

But yet, I am sure that there are parts in India playing around with Guayule, parts in Australia, parts in Israel, there are even parts in Kuwait. There is someone in Kuwait who is working on Guayule. They feel that when the oil is used up, they have some other material source. They feel that Kuwait climate and soil conditions are sufficiently dry and arid where Guayule could come in. But we feel that having looked at it in the overall analysis Guayule will not compete.

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synthetic rubber, natural rubber, or what have you, the important thing is to expand the manufacturing base inside and outside India, and it is to our interest. I am not talking about Malaysia. Malaysian interest will be better served by an expanding manufacturing base. Quite obviously, an expanding manufacturing base will also serve the interests of the producing interests in the South. So to that extent there should not be any conflict.

MARDEC

Now in this area of buffer stocking, and price stabilisation, if there is a role – and now I am talking about the producing sector in Malaysia – you would wish the producing sector to play, it is here that MARDEC, as a government organisation, has shown willingness to play a role. It is on your invitation, not on the basis of anything that they require, and as I said 10,000 MT will not solve any of MARDEC's problems or any of the producer problems in Malaysia. What it will do is, it will have a base, it will show certain experiences which needs to be brought in, and some newer innovations.

We do have a Malaysian Rubber Bureau in this country, also with the same optimism. The optimism is that there is quite a few million people in this country only second to China as far as population is concerned. We in Malaysia feel sufficiently optimistic that the Indian development process and the improvement in the quality of life will not be too retarded. It will really go ahead, and if it goes ahead, and the small car industry expands, your consumption of total polymers would be such – Bombay High or no Bombay High – you will be importing rubber. And I have disputed that with the Rubber Board for many years. They have said that they can produce all the rubber that is required, and I have said that it can't be, because the Indian context is such a large context, the population is so big, the development process is so wide, the industrial base is only second to Japan, and so there is no reason why there should not be an optimistic forecast, of an expanding rubber requirement. And in that area we are looking foreward, and that is why Dr Matthan is operating the Malaysian Rubber Bureau here, not because we want to assist the Rubber Board in India to sell their rubber, because they are quite capable of selling their rubber. It is for him to be ready for bringing in rubber from Malaysia into this context.

Future

So with that sort of conclusion, perhaps this Seminar, I think, has given you information on this new type of rubber – SMR GP. And if STC starts buying rubber again – when your requirement is there – you don't have to go and buy RSS 3, 4 and 5, and find gloves, scissors and various other things in them. You could get the standardised rubber – and now you have a more consistant viscosity controlled rubber – which will meet your future requirements.

This is the message that has been passed by this Seminar, and also the preparedness of the Government of Malaysia, through MARDEC, to play a role here to assist the development of the industry in this country, and it is within the interests of the Rubber Board, the producers in Kerala, and the manufacturers all over India. □

(1. Natural rubber to meet...)

Vibration Isolation

Last but not least, let me tell you this:

Recently we held a conference on natural rubber in protection of buildings against earthqaake. The reason why one gave it this publicity is not because it has got a tremendous use for natural rubber in all these buildings. But it is an area – from an engineering and from a precision sense and also from a human point of view – which shows that natural rubber can be used in a wide array of applications. And I believe, that for the first time at the end of that Conference, the government made a decision to put up a building in California mounted on large blocks of natural rubber, designed to isolate the building from earthquake. Our labs have been involved in the design of the material, and are still associated with it, and hopefully, when this thing taken place, natural rubber is placed in that sort of applications, where it is then being considered as something which provides engineering specifications and a material which can confirm to the exact science that have to be applied into the calculations, I think natural rubber would have arrived.

As far as this Seminar is concerned – SMR GP – the second step our move towards tailor specifying natural rubber to specific end uses, you will see the logic of the movement from the general purpose rubber to SMR GP, this being considered as the first forward step from SMR to sophisticated processing, and standardisation methods become necessary in this computer dominated world which we are going to face tomorrow. □

VARSITY TO GROW RUBBER SUBSTITUTE

The Central Goverment's Department of Science and Technology has entrusted the Madurai Kamaraj University here with the responsibility of cultivating the 'Guayule plant', which would yield a substitute for rubber on an experimental basis in Tamil Nadu.

Rubb Board bull 18, No. 2

POLYBAGGING REDUCES IMMATURITY OF RUBBER

PK NARAYANAN

Rubber plants take seven years to attain tappable girth under normal conditions, when planted direct to the field. This could be brought down to five and a half years, if budded stumps are first raised in polythene bags six to seven months in advance and transferred to the field during planting season. A budded stump so grown would have attained 200 to 250 cm height and five to six whorls of leaves during its six to seven months life in a polybag.

A healthy population of polybagged rubber plants enables one to pick and choose the best and uniformly grown plants. Planting uniformly grown plants results in simultaneous maturity. It also ensures a higher percentage of survival and minimises chances for vacancies in the field. This method also do away with the 'replanting shock' normally suffered while transplanting.

Budded rubber stumps are suggested to be raised in polybags preferably in November - December, so as to attain adequate growth for planting in June - July. Black polythene bags of size 65 cm x 35 cm having a thickness of 500 gauge are suggested for raising budded rubber stumps. Black polythene is used to take advantage of the geo-tropic character of plant roots. (If high Molecular High Density Poly Ethylene (HMHDPE) is used even 300 gauge would be sufficient) The bags should have 10 or 12 punch holes in the bottom two-third portion so as to facilitate proper drainage during irrigation. Clayloam soil devoid of pebbles and roots is the best suited to fill the polybags so that the soilcore would remain well bound and firm around the roots of the plant while transplanting, thus eliminating any possible disturbance to the plant and roots.

Mussorie Phos at the rate of 50 gms is mixed with the top 20 cm soil contained in every bag. Budded stumps (green budded or brown budded) are then planted in the centre of each bag with their side roots safely covered and adequately watered to keep the entire soil moist.

25 cm wide, 30 cm deep and conveniently long trenches are then dug and the bags kept in it with a spacing of 200 cm. Two such twin parallel trenches dug with one foot in between them form one row. The next set of twin trenches are to be made 75 cm away from the first set. Such a wide spacing between twin trenches provides a pathway for facilitating irrigation, inspection, plant protection etc.

The polybags carrying the budded stumps should be kept in the twin trenches with the bud patch facing the pathways, so that the sprouts grow freely in opposite direction without overlapping. The hollow space in the trenches unoccupied by the polybag should be filled with the soil, so that the bags remain firm in the trenches in an upright position.

Regular watering of the bags is necessary to keep the soil in the bags moist. The buds start sprouting in 10–15 days. Sprouted plants require partial shade which could be provided by erecting a pandal over them at a height of about 250 cms. The seedlings may be supplied with small doses of fertilizer mixture of NPK Mg analysis 10:10:4:1.5, at the rate of 10--15 gms per bag and mixed with the top soil in the bag. This may be repeated once in two months. All shoots other than the one from the bud patch should be pruned off. The sprouted bud should be allowed to grow free of branches up to a height of 250 cms from the bud union.

To enable selection of best seedlings from the polybagged population, it is advisable to raise 25 to 30% of such plants in excess. Polybagged plants should be raised either at the site where it is intended to be transplanted or at the immediate neighbourhood in order to get over the ordeal of transporting heavy bags to the planting site lest the grown up plants would be subjected to severe shake. While planting polybagged rubber plants particular care should be exercised to see that only plants with fully matured apex leaf whorls are used, as tender foliage tend to shed.

The tender shoots should be given preventive spray with 1% Bordeaux mixture against possible attack of shoot rot and dusting with sulpher where symptoms of powdery mildew occur.

As an incentive to those who use polybagged rubber plants for planting, the Rubber Board has relaxed the terms of the Rubber Plantation Development scheme with provision to disburse the loan and subsidy due for the first and second years to be paid during the first year itself. Also while reimbursing the cost of planting materials to the small holders, the extra cost incurred for polybagging would also be paid back by the Rubber Board.

Planting with polybagged rubber plants is economical as it reduces immaturity and cost of maintenance.

SUBSIDY CEILING ON RUBBER UP

The subsidy scheme for rubber goods exporters has been liberalised. This is intended to further neutralise the difference between the international and indigenous price of rubber that go into export production.

The ceiling on subsidy will go up from Rs. 300 to Rs. 450 a quintal and the subsidy will be available to merchant exports and cover additional export items, according to decision taken by the Union Commerce Ministry.

The amount of subsidy released under the scheme has been Rs. 1 crore a year. The scheme forms part of the government's comprehensive policy on natural rubber. The policy also aims at increasing production through developmental programmes initiated by the Rubber Board.

A Cash Subsidy of Rs. 5000 per hectare for small growers and Rs. 3000 per hectare for large growers are being given under the Rubber Plantation Development Scheme. For comparatively weaker small growers, the cost of planting material and half the cost of fertilisers re-imbursed.

A soil conservation subsidy of Rs. 150 a hectare is also given. In addition, these growers are eligible for a term loan of Rs. 15,000 per hectare through the Agriculture Re-finance and Development Corporation (ARDC). The loan carries an interest subsidy at three per cent.

There is also a World Bank assisted scheme to improve processing of smallholders' rubber. It envisages the establishment of nine block rubber factories and expansion of one existing factory.

—Business Standard

GUAYULE–A SUPPLIMENTARY SOURCE OF NATURAL RUBBER

Dr. R K. MATTHAN*

INTRODUCTION

Of nearly two thousand plant species believed to contain rubber, only two have been continuing sources of natural rubber. 'Hevea Brasiliensis' is of course well known as 'Natural Rubber', the other 'Parthenium Argentatum Gray' or Guayule (pronounced Wy-oo-lee) is not of commercial significance today, though in 1910 it provided 10% of the world's natural rubber supply.

The oil energy crisis of the 1970's has influenced man's consciousness of the need to rely more on renewable resoruces and hydrocarbon producing plants are naturally on top of this list Specifically in the case of elastomers, the fear of shortage of natural rubber has turned the spotlight on the other commercially viable alternative of yesteryear-Guayule.

In India, the need to supplement current natural rubber supply has become very appeared. The consumption demands of the rubber industry are very likely to outstrip the possible expansion of natural rubber supply from Hevea Brasiliensis from traditional and non-traditional area of exploitation. Imports can be relied upon to some extent, as the present surplus and ready availability of natural rubber need not necessarily be an accepted pattern of the international situation in future.

In such a changed circumstance can Guayule offer a source of supplementary elastomer in the coming decades? There are a number of questions to be examined.

(1) How and where can it be grown?
(2) Is the agricultural output viable to sustain the farmer?
(3) Is the product technically acceptable.
(4) Is it likely to be economically priced, at least around the level of Indian natural rubber prices?
(5) What steps are necessary to evaluate these aspects to its logical conclusions?

This review article provides the background to Guayule and its relevance and limitations for India. This can serve as a starting point for informed debate on the relative merits of aggressively pursuing a developmet policy and programme for Guayule.

AGRICULTURAL ASPECTS

The Plant

Guayule is a member of the Sunflower family, Compositae and belongs to the genus 'Parthenium'. Of the sixteen species of 'Parthenium', Guayule is known as 'Parthenium Argentatum' because of the silvery sheen of its leaves.

The plant develops a tap root which can penetrate 20' into the soil with fibrous lateral roots which can extend 10'. The root between enables the plant to absorb moisture from a large volume of desert soil and withstand drought. In the case of prolonged severe drought the plant becomes dormant in order to survive.

The rubber in the plant is not in ducts as in 'Hevea Brasiliensis' but in single thin-walled cells (Figure No. 1) which are mainly located in the outer layers and in new grown tissue. The rest is in the roots, and there is no rubber in the leaves.

As the plant produces no natural antioxidant, the rubber rapidly degrades on exposure to air. The native Guayule bush has about 10% of its dry weight as rubber but considerable genetic variability is possible and with it the amount of dry rubber available can also vary. The popular, cultivated strains produced 20% rubber as dry weight after four years. Rubber content can vary due to environmental conditions.

Resin ducts are found in the plant and 10–15% of the plant weight is resin.

Plant pollination is by wind and insects, and tiny seeds are produced at a prolific rate. There appears to be considerable potential for producing high yielding hybridised varieties through selective plant breeding. Recent advances in genetic engineering, if applied hold promise for high yielder Guayule strains to be produced.

Climate Needs and Irrigation

Past research has shown that for commercial rubber production Guayule requires a minimum 11–25 in (280–640 mm) of rain per annum. 16–18 in (410–610 mm) is more ideal for a long rotation (4–8 years). If rainfall is below 14 in, supplemental irrigation is

* Editor, POLYMER REVIEW

Figure 1—GUAYULE PLANT

recommended, while if it exceeds 25 in (640 mm) vegetation rather than rubber growth is favoured. A definite dry season is necessary and the plants are frost sensitive.

Soils

Sandy loam well drained soils suit Guayule best. It does not grow well in well compacted and poorly drained soils. Guayule t condition for maximum rubber production has not been determined definitively. Soil salt tolerance level of the shrub is reported to be poor.

Field Production

A suitably irrigated Guayule plantation can be brought to economic harvest size in 3 years. Guayule is amenable to mechanised agriculture. In practise commercial Guayule is produced from nursery grown seedlings transplanted to the field, as field survival is precarious in the seedling stage, especially because weeds tend to smother the seeds.

Pest Control

While wild Guayule is resistant to diseases and pest, the cultivated plants are susceptable to both. Common diseases include cotton root-rot, charcoal rot, dieback and 'phytophthora' (due to water logging).

Insects such as grasshopper damage plantation Guayule, and hence insecticide protection of the plant is necessary.

Harvesting

Guayule can be harvested-roots and all. However, the method of mowing the shrub leaving the root and 2" above ground appears promising. The residual roots produce new growth by resprouting new shrubs which grow at a very rapid rate. This method can eliminate one replanting.

TECHNICAL ASPECTS

Composition

A typical harvested Guayule shrub composition is given in Table-1.

Table—1
Typical Shrub Composition

		% Range
Moisture	...	45 – 60
Rubber	...	8 – 26
Resin	...	5 – 15
Bagasse	...	50 – 55
Leaves	...	15 – 20
Cork	...	1 – 3
Water Soluble	...	10 – 12
Dirt and Rust	...	Variable

Commercial Guayule Extraction

The process employed in Mexico to extract rubber from Guayule is shown schematically in Figure No. 2.

The important feature in any Guayule extraction process is the separation of Guayule from the debris of wood, bagasse, etc and to deresinate Guayule with warm acetone. As acetone is an industrial solvent it must be recovered and reutilised.

Quality

The typical non-rubbers in Guayule are shown in Table-2.

Table—2

Non-Rubber Constituents of Process Guayule

Dirt	...	0 007
Nitrogen	...	0 160
Ash	...	0.790
Copper	...	Trace
Manganese	...	0
Volatile Matter	...	1.000

This would meet the present SMR 5 specifications of natural rubber.

The microstructural analysis of Guayule shows it as Cis-1, 4 Polyisoprene i.e. similar to natural rubber from Hevea.

Mechanical Properties

Table – 3 shows the mechanical properties of Guayule and the similarity to Hevea.

Processing Characteristics

The Comparative data of vulcanisates of Guayule and Hevea rubber are shown in Table-4.

Table—4

Properties of Vulcanized Guayule Rubber*

	Hevea (SMR-5	Guayule
Initial Viscosity (lbs.-in)	5.5	5.0
Minimum Viscosity (lbs.-in.)	4 0	3.7
Minimum Viscosity (lbs.-in.)	35.0	25.0
T_{s5}, min.	7.0	10.5
T_{c} (90), min.	19 0	25.0
Cure Rate (lbs.-in min.)	5.3	2.5
Cure time at 284°F (140°C), min.	19	25
Modulus at 300 percent (psi)	1,770	1,050
Modulus at 500 percent (psi)	—	2,455
Tensile Strength (psi)	4,050	3,645
Elongation (percent)	490	635
Set at Break (percent)	13	14
Beshore Rebound (percent)	48	40
Shore a Hardness	60	54
Swelling Index (g. benzene imbibed/g. rubber)	2 94	3.44
M_c	9,500	13,000
Tear Strength (ppi)	436	178

* Vulcanized using recipe 2A given in ASTM D 3184-71. The vulcanization characteristics of each stock were determined on a Monsanto Rheometer 284°F (140°C) using ASTM D 2084-71 T. Measurements courtesy of H. L. Stephens

This indicates that Guayule can be processed as easily as Hevea natural rubber.

The properties of gum filled Guayule rubber compounds have been extensively reported.* The influence of resin content present in Guayule rubber in blends (of Guayule with natural and synthetic rubber) has been studied* and the peptising effect of Guayule resin (on Guayule rubber and natural rubber) has been observed.

Table—3

Properties of Raw Guayule Rubber

	Guayule*	Hevea (SMR-5)
Mooney Viscosity (ML-1+4 at 212°F.[100 C]	105	85
Antioxidant (percent BHT)	0 6	
Acetone solubles (percent)	2	2.8
Wallace Rapid Plasticity (Po)	47.5	
Plasticity Retention Index (percent)	41	60
Tack‡		
Rubber to rubber (psi)	9.5	8 5
Rubber to metal (psi)	4.25	5 0
Rubber-black masterbatch (psi)	8 25	11.5
Rubber-black masterbatch to metal (psi)	5.25	4.0
Green Strength (psi at 100 percent elongation)	20±0.05	20±0.05

* These figures are based on early samples from the pilot plant at Saltillo, Mexico. They are likely to change as the extraction and purification methods are refined.

‡ Determined using a Monsanto el-Tak apparatus. Table courtesy of H.L. Stephens

ECONOMIC EVALUATION

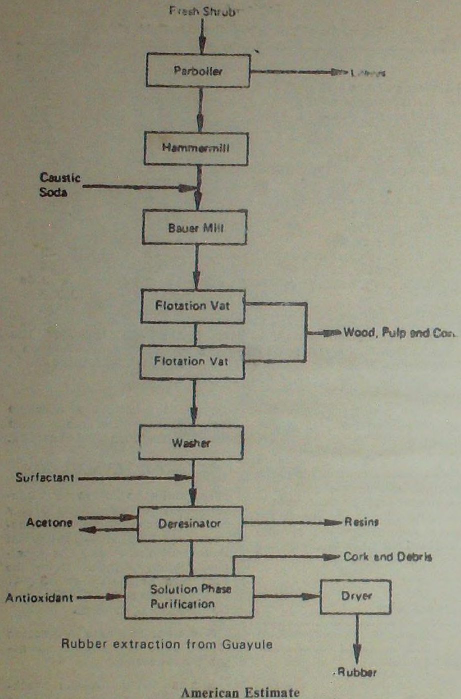
The earlier estimates of producing Guayule have been largely based upon the operational experience of the Inter-Continental Rubber company and the Emergency Rubber Project. Here the cost was estimated at U$ 0.41 per kg between 1931-36 and U$ 0.56 per kg in 1946.

A current estimate projection for a 11,000 MTA project envisages the following:

It is estimated that the break-even at 10% rubber content in the Guayule shrub, is at about 20,500 MT per annum.

At a rubber cost of US 1254/MT (Rs. 11 913/MT) a 5.4% return on investment is received.

However these costs must be viewed as typical to an American style of large farming operation which may not be applicable in the Indian context, where one envisages a large labour force for planting, harvesting, segregation and other agricultural operations.



Rubber extraction from Guayule

American Estimate

		US$ (Millions)	(Rupees) Crores
i.	Processing Unit Investment Cost	27.3 Million	25.93 Crores
ii.	Nursery Capital	1.4 Million	1.33 Crores
iii.	Raw Materials Cost including U$ 4.3 million nursery operation cost	5.3 Million	5.04 Crores
iv.	Total estimated production cost	10.8 Million	
	Cost MT	952.0	(Rs. 9,044)

Australian Estimate

A recent estimate made for the Australian Government is reproduced in Table-5.

Table-6 estimates the break-even levels of per acre production at various rubber prices:

Hence in today's international context the yield would have to be around 1300 kg/acre to be economically viable. If the Indian scene is taken the project could breakeven at an yield of about 725 kg per acre if the same costing structure was applicable with a raw rubber price of Rs. 17/kg.

Current Status in India

In India the following Institutions are involved in the preliminary Research and Development of Guayule

i Bio Centre, Ahmedabad
ii National Botanical Research Institute, Lucknow
iii Central Arid Zone Research Institute
iv. Central Salt and Marine Research Institute, Bhavanagar
v. Indian Institute of Petroleum, Dehra Dun
vi. University of Madurai, Madurai

The Bio Centre has been asked by the Department of Science and Technology to act as the Headquarters of the All India Co-ordinated Project (AICP) on Guayule. At Gandhinagar 10 acres of Guayule plantation with different varieties has been established and about 95 different varieties of seedlings including high yielders have been obtained.

About 200,000 seedlings have been established from the base seeds and these are being transferred to about 10.15 test plots in various parts of the country to establish the conditions of best yield of rubber.

CONCLUSION

In evaluating the need for Guayule production in India it is clear that the number of aspects have to be studied in depth. This includes the following:

Table—5

Total Production Cost

		Case A Aus. $*	Case B Aus. $*
Total production cost	...	1,099	1,099
Processing—(.235/lb × 1500 lb rubber)	...	353	
(.235/lb × 3000 lb rubber)	...		705
Sub-Total	...	1,452	1,804
Less By-product value—			
(.244/lb × 1500 lb rubber)	...	366	
(.244/lb × 3000 lb rubber)	...		732
Total Costs	...	1,086	1,072
Break-even price for rubber	...		
(1500 lb/A)	...	0.724	
(3000 lb/A)	...		0.357
11/30/81 NY Price of rubber .485	...	0.422	0.422
Loss lb	...	<0 302>	
Loss A	...	< $657 >	
Profit/lb	...		0.065
Profit/A	...		$ 195

*Aus. $1 = Rs. 9.10

Table—6

Per Acre Income Above Costs

Price/Kg. (Rs.) Yield Kg/Acre	9.66	12.10	14.52	16.94	19.36	21.78	24.2
455	—7590	6490	—5390	—4290	—3190	—2090	— 990
680	—5346	—3696	—2046	— 396	1254	2094	4554
910	—3091	— 891	1309	3509	5709	7909	10,109
1140	— 847	1903	4653	7403	10,153	12,903	15,653
1365	1408	4708	8008	11,308	14,608	17,908	21,208

the people in these economically backward regions.

4 If the techno-economic and socio-economic factors are favourable, a long range plan spread over a decade to bring substantial acreages will have to be evolved principally by Government, but with the possible co-operation of large industries either singly or jointly. International financing through agencies such as Asian Development Bank and World Bank will have to be organised.

5 It is apparent that the present efforts, though well directed, are wholly inadequate to develop to levels where in the national and international agencies will volunterily support the efforts. The efforts have to be rapidly scaled up to be meaningful and relevant. The manufacturing industry has to take a lead in this respect in its own longterm interest.

1 Projected deficit in rubber requirement in the country between 1985 and 2000. We will have to examine the expansion of existing Natural Rubber supplies from traditional areas with improved agricultural inputs, expansion into non-traditional areas (significant results cannot be expected till the 1990's) and establishment of new synthetic rubber capacity. A price trend will have to be forecast because the economics of Guayule production is critically linked to the price realisation.

2 The detailed techno-economic of Guayule production both in the agricultural production and the factory processing aspects have to be studied in depth to determine the viable levels of production areas, yields and investment levels.

3 The socio-economic impact of large scale Guayule plantation in selected semiarid regions of India as in Rajasthan, Tamil Nadu, Gujarat, Andra Pradesh Madhya Pradesh etc., has to be carried out because one of the justifications made out is the socio-economic impact on

6 The industry should take the initiative to set up a well qualified multidisciplinary team of agricultural, techno-economic experts of Guayule as a supplementary source of natural rubber in India in 1990's and should receive the attention it needs, so that a decade from now the industry should be able to look back and not regret its decisions augment to rubber supplies for its needs.

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SOFT RUBBER SMOOTHS NEWSPRINT PRODUCTION

One of the fastest-running newsprint machines in the world is supported on natural rubber bearings to isolate it from vibrations. Such vibration, transmitted *via* the finely synchronised Fourdrinier paper-making machine to the newsprint itself, forming a visible ripple pattern in the paper.

The specially-designed bearings are being used in two modern Canadian plants operated by the large paper making concern, the Bowater group. In seeking a method of isolating the offending vibrations (frequency about 11 Hz and mainly horizontal), Bowater sought the help of engineering consultants Bowater Technical Services Ltd Kent, who in turn approached the Malaysian Rubber Producers' Research Association for assistance. MRPRA's engineers suggested the use of bearings similar to those developed to isolate buildings from the devastating effects of earthquakes: high vertical and low shear stiffness are required in both cases. A similar vulcanizate was used, a soft rubber based on an oil-extended grade of Malaysian natural rubber. Layers of this rubber were bonded to steel plates.

Following laboratory tests at MRPRA, Bowater was satisfied that the bearings met its specifications, and a number of bearings were manufactured at Bowater using the soft natural rubber compound supplied by MRPRA The bearings have now been in position for some months, and have virtually eliminated the ripple pattern previously evident in the paper.

The development of the natural rubber bearings to meet Bowater's special requirements is described in an article concludes that for a company 'at the forefront of newsprint production', natural rubber is 'helping to preserve the reputation of the paper making machine as a finely synchronised piece of equipment'.

GETTING A GRIP ON BUILDING BLOCKS

Modern load-bearing building blocks made from cement, cellulose and sand come in a wide variety of shapes and sizes, but they have one thing in common an extremely abrasive surface that makes handling difficult. One UK company has overcome the problem by lining the grips of all handling equipment with natural rubber.

Ligncite (North London) Ltd of Essex uses mechanical grabs to transfer stacks of blocks during the curing process and in delivery. Rubber lining of the jaws of these grabs allows sufficient grip and friction to prevent slippage of the blocks and spreads the load imposed by the grips. In resisting continual abrasion of the rough surface of the blocks, natural rubber was found to be superior to a number of synthetic elastomers. The rubber used is manufactured as a D-section extrusion by the UK company BTR Ltd: known as 'barge rubber' it was originally used as a fender material for river barges

The use of natural rubber in this demanding application is described in an article of RUBBER DEVELOPMENTS, quarterly journal of the Malaysian Rubber Producers' Research Association. It is claimed that the rubber grip can last in excess of years, even in continuous service, and replacement is a simple operation.

RUBBER FOOTWEAR INDUSTRY-A CASE STUDY OF KERALA

P M MATHEW*

Manufacturing of rubber based goods in India made its beginning by 1920 with the setting up of the first factory in Calcutta. Subsequently, a few such industrial units manufacturing items like rubber footwear, cycle and automobile tyres and tubes and other general goods were set up in the small, medium and large scale sector. The advent of the World War II gave further fillip to the industry in India to meet the war time needs.

The history of rubber based manufacturing units in Kerala is a little more than four decades old. The first unit, viz., the Trivandrum Rubber Works, estate owned enterprise for the manufacture of cycle tyres and tubes, rubber wares and foam rubber goods was set up in 1935. The second medium scale unit was set up at Kottayam. The growth of rubber based industries in the state during the first decade after independence was tardy despite the fact that Kerala held almost complete monopoly in the sphere of natural rubber production constituting 92.46 per cent of the all-India production.

The small scale rubber goods manufacturing industry is an area hitherto uninvestigatad except for a recent survey conducted by the Small Industries Service Institute, Trichur. This study taken up at the instance of the Government of Kerala attempts at examining the present status of the industry to identify the constraints in the growth of the industry, and suggests certain measures for its development on new lines.

The Directory of Small Scale Industrial Units in Kerala published by the Directorate of Industries and Commerce, Government of Kerala, also gives a census of rubber based units in the small sector, with their productwise number, employment and investment in plant and machinery.

According to 1980 data, there were about 280 registered units manufacturing various rubber based items. Their overall investment in plant and machinery in these units was about Rs. 250 lakhs. The direct employment provided by these units was estimated at 3200 persons besides a good number of indirectly employed.

However, the scope and reliability of such data are doubtful to a certain extent because of various reasons: Firstly, the study covers only registered units and the number of unregistered units is likely to be much higher than those existing in the registered sector. Secondly, many of the registered units have ceased to exist after getting registration and these units also have been included in the census. Thirdly, since the study covers only registered units, which are likely to be in a better financial position than the smaller units, the study may not be truly representative of the problems of the industry as a whole.

This paper examines the present status of rubber footwear industry which is the biggest among the small scale rubber goods manufacturing industry in Kerala, the factors determining its profitability, and its problems and prospects.

The rubber footwear industry constituting, units manufacturing

Table 1

Rubber Based Industries in Kerala

Sl. No.	Item	Number of units	Percentage
1	Footwear items including MC Sheets, Khattai sheets, hawai sheets/chappals	85	30.35
2	Dipped goods	76	27.14
3	Tread rubber	40	14.28
4	Moulded goods	35	12.50
5	Cycle tyres and tubes	8	2.85
6	Foam products	4	1.42
7	Battery containers	4	1.42
8	Rubber thread	3	1.07
9	Hose pipes	2	0.7
10	Mattings	2	0.7
11	Rubberised coir products	2	0.7
12	Miscellaneous items	15	5.35
	Total	280	100

Source: Small Scale Industries Service Institute, Trichur.

*Indian Institute for Regional Development Studies, Kottayam-686027.

MC sheets, Hawai sheets, Khattai sheets, straps etc. originated in Kerala in 1951. Formerly, the full requirements of rubber chappals in Kerala were met by imports, mainly by multinationals like the Bata Company. The growth of the industry was almost stagnant upto 1970; however the 1970s was a period of tremendous growth. More than 80 per cent of the total number of units started during this period.

Another important feature of the growth of the rubber footwear industry in Kerala is that the rate of growth of the number of units is the highest in Kottayam district (61.9%), followed by Ernakulam (11.9%), and Trichur (8.33%). Malappuram and Idikki the industrially backward districts, stands at the lowest position with only 2.3 per cent of the state total.

Any meaningful productwise analysis of the growth of the industry cannot be done because such data are not available. However, it is observed that the number of units manufacturing hawai sheets, straps and assembling them were increasing on at a higher rate than others. However, it is understood that the number of units vertically integrated (ie, units engaged both in the manufacture of materials and their shaping into final products) are the few large units; whereas a large number of unregistered small uints are engaged in the assembling of materials produced by the other units. The latter units can be run on a cottage basis because only a few simple tools are required for this.

Cost of Production and Profitability

The cost of production in a commercial sense should take into account cost of direct material, and direct labour forming prime cost, cost of other direct inputs like electricity, water supply, supervision, taxes, insurance and depreciation etc forming administrative costs, selling and distribution costs and the financial costs like interest on fixed and working capital. About a dozen materials are used in the production of hawai sheets and straps. In the case of MC sheets also the materials are almost the same except that their mix vary. As shown in Table 1, clay and crumb (hawai cuttings milled into crumb form) constitute the main materials quantitywise, whereas, in value terms, the first and second cost items among materials are blowing agents and natural rubber. Here, natural rubber is costed at current market rates, assuming that the units consumes both best quality lot and scrap rubber on a 50-50 basis.

An analysis of the cost-volume-profit relationship in a sample firm can give a better understanding of the profitability position of the industry in general. It can also be an excellent instrument panel for one's guidance in controlling his business. The unit under reference is run by a Co-operative society.

The break-even volume is the number of units of product which must be sold to earn enough revenue just to cover all expenses – both fixed and variable. Since the rubber footwear manufactur-

Table 2

Pattern of Growth of Rubber Footwear Industry—Districtwise Data

Period	Kottayam	Calicut	Ernakulam	Idikki	Malappuram	Quilon	Trichur	Trivandrum	Total
Before 1960	1	—	—	—	—	—	1	—	2
1960–65	4	—	1	—	—	1	—	—	6
1965–70	6	—	—	—	2	—	—	—	8
1970–75	26	4	8	—	—	—	2	—	40
1975 and after	15	2	1	2	—	2	4	2	28
Total	52	6	10	2	2	3	7	2	84

Source: Directory of Small Scale Industrial Units in Kerala, Directorate of Industries and Commerce, Government of Kerala (1980).

Table 3

Material Cost Break-up for Hawai Chappal Soles

Materials	Quantity required for 1 kg compound (in grammes)	Percentage	Value (in Rs)	Percentaga
Natural rubber	166	16.6	1.82	42.72
Crumb	266	26.6	0.26	5.66
Clay	498	49.8	0.498	10.84
Stearic acid	0.120	0 01	0.0015	10 84
Zinc oxide	0.301	0 03	0 0015	0.03
Vulcafer	0.060	0.006	0.0018	0.039
Sulphur	0.017	0.001	0.00005	0.001
Colour	0.007	0.0003	0.001	0.02
Titanium dioxide	0.024	0.032	0.0003	0.006
Blouring agent	70	7	1.68	36 60
Total	1000	100	4.26	100

ing firm is a multiproduct firm, the break-even point can be worked out only in terms of total rupee sales, using the following formula.

$$Rb = \frac{F}{1 - \frac{V}{S}}$$

Where, Rb is break-even sales revenue,
F is total fixed costs
V is variable cost
S is selling price

in the case of a co-operative factory. In the case of many private units, it is found that scrap rubber alone is used, thereby reducing material cost by about 50 per cent.

Blowing agents and other chemicals, though quantitatively insignificant contribute significantly to the total cost in value items. Also there has been substantial increase in their prices in recent years. Larger units

Table 4

Break-even Analysis for a Hawai Chappal Materials Manufacturing Unit in the Co-operative Sector

Sales per annum	— 50 000 sheets @ Rs 15	750,000
	— 25,000 dozens of strat @ Rs.6	150,000
		900,000
	Less Sales expenses	72 000
		8,28,000
Variable costs	Materials	597,000
	Wages and Salaries	25,000
	Electricity	16,500
	Interest	11 638
		640,138
Fixed costs	The contribution ratio is: (828000—640138/828000	= 0.22
	$B E P = \frac{25850}{0.22} =$ Rs. 117,500	

An important factor contributing to the profitability of these firms is the respective cost reduction measures adopted by them. The strategies regarding the rubber mix varies from unit to unit, and this is an important factor determining their profitability. Many of the units have their own sister concerns dealing in natural rubber or have some other purchase arrangement that they can procure natural rubber at much better rates than that is quoted in the market. Some of the units purchase at throw away prices the banbury wastes of large and medium scale industrial units (especially tyre companies) and use it as their raw material, saving all taxes on raw rubber thereto. The above assumption of mixing of lot rubber and scarp rubber on a 50-50 basis is found

having their own experienced chemists and access to cheap technology, have been able to substitute many of the costly items of chemicals with cheaper ones.

A far more important factor contributing to the profitability of units is vertical integration, ie., the consecutive involvement in the stages, which precede and/or succeed its present stage. The bulk of the sole and strap manufacturing units supply them directly to other bigger units. Some of them supply it on a regular basis to big reputed companies like Bata, Carona etc. A sizeable quantity of such materials produced in Kerala, go outside the state, assembled using the relatively cheap labour available there, and brought back to the domestic market. However, some of the bigger units in Kerala having their own sister concerns for procurement of raw materials at cheaper rate, also employ contract labour for assembling of footwear materials into chappals. Women and child labour are largely employed in this activity. The assembling charges varies from 10 to 15 paise per pair. The value added at the assembling stage is substantially higher than that at the manufacturing stage. However, most of the units sell the manufactured materials as it is in order to avert a risk. Recently, a few of the larger units have mechanised the assembling process, reducing the assembling charges to a level less than 5 paise per pair.

Some of the larger units having easy access to cheap rubber wastes like froth, skim rubber etc, use these instead of lot rubber, thereby substantially reducing the material cost.

A good number of smaller units do a substantial part of the manufacturing on a job work basis. Investment in a modern mixing mill in which natural rubber is masticated and mixed with other materials, is rather lumpy and costly for these units and, therefore the mixing is done elsewhere. However, in the case of larger units where production capacity is much higher, they easily tap the economies of scale by erecting a mill. It is also to be noted that production capacity varies according to the size of the roller and the level of mechanization.

The present tax policy of the Government of Kerala also has much to do with the prospects of the existing units. Sales tax exemption is granted to small scale units set up after 1-4-1979 for a period of 5 years as a promotional measure. This relief is however limited to an amount equivalent to 90 per cent of the value of their gross fixed investment. As a result, many of the larger established units have *theoretically* wound up their already existing firms and have formed new firms, in order to avail of the tax exemption. This has raised the profitability position of these units, whereas, the other units are struggling for survival at the face of cut-throat competition. One of the Kottayam-based hawai chappal manufacturing units owned by an industrial co-operative society and which has a reputation for the quality of its products, is found to be so struggling for survival. And it is interesting to note that this unit started in 1958, is the second hawai chappal manufacturing unit in the state, and the first one in the co-operative sector.

Problems and Prospects

The various incentives and concessions provided by the government and financial institutions, and because of the fact that investment in this industry assures a quick return, the rubber footwear industry in Kerala witnessed a virtual boom in the 1970s. However, in the light of the recent cut-throat competition in the market and escalation in costs, the quality of the product has been fast deteriorating. The units in the co-operative sector are found to be maintaining relatively better quality standards, but if the present trend goes on they will have to wind up their business in the near future. Quality deterioration is so sharp in the industry because the poorer sections of the community, who purchase the bulk of the product, are more price conscious than quality conscious. Some governmental agency should take charge of quality control in the industry, and it should see that the specified quality standards are maintained. A better assurance for maintainance of quality standards would be promotion of co-operative sector units.

Inadequate data regarding the number of units and their production has been a crucial deterrent to the balanced growth of the industry. Such data are vital from the point of view of policy making and for serving the interests of the consumers.

The rubber footwear industry has been the best example of the weak product policy of the central and state governments in the small scale sector of the rubber manufacturing industry. Mushrooming of new units has been virtually a problem in the industry. At the same time, some of the simple items like, horn bulbs and other automobile components are not produced in the state at all. On the basis of a thorough market study, a suitable product policy in the rubber goods manufacturing industry should be evolved and further incentives and pressures to entrepreneurs should be based on such a study.

Cost reduction should be an important area where the governmental agencies should intervene. Common Facility Service Centres, like the one in Changanacherry should be set up in different parts of the state, which can offer the smaller units better technology and other facilities. These centres can also take charge of the quality control measures.

Contribution to entrepreneurship is one of the major social obligation of small scale units in the private sector. However, despite all incentives provided by the government for the same, trading interest, rather than entrepreneurship is growing in this industry. Contract labour and job work are on the increase in this industry. This trend will not contribute to the long run industrialisation needs of Kerala. Units doing job work for large industrial houses should not be provided with the various concessions and incentives. Similarly, a central marketing agency should procure the product of the small manufacturers, and sold at reasonable rates. This can serve the interests of both the small manufacturers and the consumers.

The rubber footwear industry is the best example of biased growth of rubber goods manufacturing industry in the country. Strict control over the production, and quality of the product should be the core of all future public policy in rubber footwear industry. Such a policy can better serve the interests of small manufacturers and of the consumers. □

UNHOLY COW

The smallholder's spade hit something with a dull thud. The mass excavated turned out to be rubber. Investigations unfolded the puzzle.

The former owner had kept a few heads of milch cattle. One morning, a hungry cow lazed into the yard, liked the flavour of fresh latex, and sipped in a full drum of the rubbery milk. The breakfast over, the satisfied beast went to chew the cud. The gong did not bring the beast to dinner; the day's breakfast was too filling.

The latex had coagulated in the beast's belly, and even the strong digestive chemicals were no match to change the rubber into a moveable mass, and out of the cow's system. The next morning the planter saw the cow dead.

He gave it a fitting burial, stuck a wooden cross at the grave - the cow was not holy Hindu - and sincerely moaned.

Time assimilated the wooden cross and the cow's mortal remains, but the last breakfast remained indestructible.

NEWS IN PICTURES

'SASTHRA DARSAN' FROM MODI VILLAGE

Under the 'Sasthradarsan' programme, rubber growers scattered in different parts of the rubber growing tracks get an opportunity to acquaint themselves with the latest developments in the scientific and technological aspects of rubber cultivation. The invited group of growers are able to see the experiments while going round the various divisions of the Rubber Research Institute of India.

"Sasthradarsan" programme was started in 1980 when the RRII celebrated its Silver Jubilee.

The rubber growers from the adopted village of Modi Development Project visited the RRII under the Sasthradarsan Programme. Modi Rubber Development project proposes to send groups of rubber growers every three months for this programme.

Shri KN Sankaran inaugurated the Agricultural Seminar at Padiyottuchal.

RUBBER NURSERY AT THONNACKAL HARIJAN COLONY

Thonnackal Harijan Colony is situated on a 360 acre plot. There are a total of 172 Harijan families in the colony. A new scheme initiated there by the Harijan Welfare Department with the co-operation of the Rubber Board envisages to plant rubber in the colony. According to the scheme each family would plant rubber in two acres. A rubber nursery has also been started recently in 10 acres.

The Picture (right) shows Chief Minister Shri K Karunakaran inaugurating the rubber nursery. Shri MG Jagadish Das, Jt Rubber Production Commissioner is also seen.

Shri KK Balakrishnan, Transport Minister is planting a budded stump in polybag.

VIETNAM DELEGATION IN RRII

A high power delegation from Vietnam under the leadership of Mr.Maichi Tho visited the Rubber Research Institute of India on 20th October 1982 and requested India's help for the expansion Rubber Plantations there.

Shri K Mohanachandran IAS Chairman discussing with Mr. Maichi Tho with the aid of the intrepreter. Mr.Maichi Tho explains the damage caused to the rubber plantations in Vietnam as a result of the American bombing during war time.

RUBBER SEMINAR ORGANISED BY RANNI LIONS CLUB

Though recently established, Ranni Lions Club devotes much of its time for developmental as well as agricultural activities. Ranni is predominently a rubber area and therefore much has to be done for modernisation of rubber plantations there. The object of the Ranni Lions Club is also no other than making an attempt in this direction and they organised a rubber seminar on 11th October 1982.

Shri K Mohanachandran, Chairman, Rubber Board inaugurated the seminar at PJT Hall organised by the Ranni Lions Club with the active co-operation of Shaw Wallace & Company. It was presided over by the former Lions Governor of the District Mr Jacob Stephen. The Speakers included Shri ET Varghese, Vice Chairman, Rubber Board, Shri P Mukundan Menon Rubber Production Commissioner and Shri PK Narayanan, Public Relations Officer. Shri N Raghunathan Nair, Superintendent Central Experiment Station, Chethackal welcomed the gathering and Shri Sunny Abraham proposed a vote of thanks.

news and notes

LT. GOVERNOR IN RRDS

Lt. Governor of Andaman & Nicobar Islands Shri ML Kampani visited Rubber Research-cum-Development Station, Saithankari on 20th November 1982. He was accompanied by the Chief Secretary, the Development Commissioner, the Sr. Soil Conservation Officer (Rehabilitation), and the General Manager, Forest Plantation and Development Corporation.

Shri P Mukundan Menon, Rubber Production Commissioner who was on a short visit to the RRDS and Shri Maxwell, Asst. Development Officer in charge of the Station welcomed the distinguished guests. Shri Menon in his talks with the Lt. Governor apprised him the various steps taken by the Board towards development of the station. The distinguished guests were shown tapping, processing of latex etc. Shri Menon also explained them the salient aspects of the new Rubber Plantation Development Scheme and said that the prospects for the expansion of rubber cultivation in the island are good.

Lt. Governor inaugurated the 3rd smoke house constructed there and expressed his satisfaction over the functioning of the station. Lt. Governor also spent some time with the workers of the station and enquired about their welfare.

Planting was commenced in RRDS in 1965 and a total area of 202.34 ha was brought under rubber during the period from 1965-1968. 37 families of Indian repatriates from Burma have been rehabilitated in this station. Tapping commenced in 1972. Now, the whole area is brought under tapping and growth and yield performance are satisfactory. The average yield obtained is 1000 kg/ha. The latex is processed into sheet rubber and marketed in Port Blair.

Sri P Mukundan Menon, Rubber Production Commissioner explaining to the Lt. Governor, Chief Secretary and Development Commissioner the salient features of rubber cultivation at the RRDS, Saithankari.

NATURAL RUBBER RECONDITIONS CONVEYOR BELTS

Natural rubber is indispensable for all types of mining operations: in the form of off-the-road tyres, abrasion resistant linings, machinery mountings and, not least, conveyor belting: it plays a vital role. A mining company in India has now developed a new process which will make natural rubber covered conveyor belts last even longer, with considerable cost savings.

The government owned Neyveli Lignite Corporation Ltd extracts 6.5 million tonnes/annum of lignite at an open cast mining complex south of Madras. It currently uses about 50 km of textile and steel cord reinforced natural rubber belting which is expensive to replace when worn: the cost has been estimated as high as 35 per cent of equipment costs. For this reason the Corporation set up, in 1976, a belt reconditioning shop where both types of belting are recovered. Since then the shot has reconditioned over 20 km of conveyor belting using about 60 tonnes/annum of high quality natural rubber compound.

The relatively simple reconditioning process adopted at Neyveli is described in an article in the current issue of RUBBER DEVELOPMENTS, quarterly journal of the Malaysian Rubber Producers' Research Association. The article states that the reconditioned belting shows 60-70 per cent of the service life of new conveyor belts and the estimated saving is 20-40 per cent. Strict specifications are laid down for all new conveyor belts purchased to ensure that the carcass will withstand the process.

Expansion of the mine in the near future will mean a doubling of the length of natural rubber conveyor belting currently in use. Some will come from local manufacturers; several thousand metres will be supplied by the UK company BTR Belting Ltd, of Leyland, Lancs. The contract was secured in the face of strong international competition.

MALAYSIAN GLOVE PLANT SET TO EXPAND

Malaysia is the world's leading exporter of natural rubber household gloves. This has been achieved with the help of a UK-based company, LRC, International Ltd: attracted by Malaysian government incentives, it set up a glove manufacturing plant there in 1978. LRC (Malaysia) Sdn Bhd is currently producing about 20 million pairs/annum for export and is trading successfully despite the worldwide recession. In fact the Malaysian economic climate is so attractive that LRC is transferring additional glove manufacturing capacity from the UK over the next two years, bringing the annual production rate up to 65 million pairs/annum.

The modern production facilities of the Malaysian factory outline the attractions of Malaysia as a base for rubber goods manufacturing: abundant supplies of natural rubber at a good price, at a good cheap local labour force, government incentives including tax holidays, and a time span of only 12 months between leasing land for the factory and production of the first gloves. The parent company was able to provide the necessary expertise in factory design and construction manufacturing technology and marketing of the finished product. The combination of this expertise and Malaysia as a manufacturing base has ensured the success of LRC (Malaysia) Sdn Bhd.

HOMF GROWN FUELS

Brazil, which already dilutes much of its gasoline with fuel alcohol from sugar cane, is now looking into the possibilities of growing its own diesel fuel too.

Vegetable oils such as soybean, rapeseed, and peanut, can all be converted to make diesel oil. But the most likely contender for Brazil's "diesel plantations" is palm oil. It has been shown to produce close to 2 tonnes per hectare—about nine times more than soybean or peanut.

The palm has other advantages. It grows well on poor soils, and it can be harvested year 'round thus providing both steady work and regular production.

But it will be some time before Brazil can stop importing expensive, petroleum-based diesel oil. More research is still needed to solve problems such as excessive carbonation and fumes. And just to meet present demands for diesel fuel-about 21 billion litres a year-would require some 370 million hectares of plantations and an estimated investment of $25 billion. Now that's not peanuts!

BIOGAS SURVEY

Biogas--methane produced by fermenting organic wastes--has been touted by some experts as an ideal energy source for rural areas of the developing countries. It is cheap and clean, and the necessary ingredients are readily available. And yet, by no means all biogas programmes have been successful.

To find out why, and to gain knowledge needed to expand biogas production, studies were conducted in four Asian countries. Supported by grants from Canada's International Development Research Centre (IDRC), researchers in Bangladesh, Korea, the Philippines and Thailand visited biogas plants all over their respective countries. Their concern was not just with technical problems, but with the social and economic aspects of using biogas energy.

One of the major constraints they found was cost. Even though it is an inexpensive system, a biogas digester requires some capital investment, often too much for small-scale farmers. Thus biogas was more widely used among the more prosperous farmers. However, farmers with a little capital often choose to invest in a small tractor to replace their animals, thus cutting of the supply of "product". The researchers also found that people often prefer to use cow dung and plant wastes directly as fertilizer, or burn them as fuel.

These and many other findings of the research teams will help governments produce more effective plans for the development and promotion of biogas technology.

WINDMILL WINDS UP

A windmill that can regulate its own power output has been invented by engineers at Australia's University of New South Wales. Its inventors claim it can pump three or four times as much water as a conventional windmill.

The key to the high performance of the Mono Wind Turbine, as the new machine is called, is a computer-designed clutch that lets it take advantage of whatever wind is available. The turbine is able to "store up" the wind's energy until there is enough power to engage the clutch and start the pump.

The machine's enthusiastic inventors say it is not just more efficient than a conventional windmill, it also requires less maintenance, making it eminently suitable for use in remote areas of developing countries. Not to put too fine a point on it, they add that the Mono Wind Turbine will shortly render other windmills obsolete.

The inventors have some grounds for their confidence. The turbine recently won first prize in it class at the 1982 Technology Exchange Fair in the USA. Commercial production is expected to begin later this year.

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(Business standard)

DR. C. S. VENKITARAMAN

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PJ THOMAS
NEW CHAIRMAN

Shri PJ Thomas (Vakayar Estate, Konni) former MLA of Konni and erstwhile President of the Kerala State Karshaka Congress (Farmer's Wing of KPCC (I) took over as Chairman of the Rubber Board on 2nd February 1983.

Born on 17th April 1925 at Nariapuram near Thumpamon in Pathanamthitta District of Kerala, Shri Thomas hails from a traditional farming community of rubber growers. A graduate from Loyola College under the Madras University, Shri Thomas plunged into the 'Quit India' movement during his student days and since then had been involving himself in the socio-political activities in Kerala. He has represented the Konni Constituency in the Kerala Legislature consecutively for three times viz., 1965, 1970 and 1977 as a nominee of the Indian National Congress. Besides, he has been the Vice President of Konni Panchayath from 1952 to 1958 and its President from 1958 to 1977.

During his career in the Kerala Legislature Shri Thomas was associated with several bodies like Public Undertakings Committee, Public Accounts Committee, Committee on Petitions, Committes on Subordinate Legislation etc. From 1962 to 1977,he had served as Chairman of the Konni NES-Block Development Committee. He is also the Chairman of the Standing and Appointments Committee of the Catholicate College at Pathanamthitta.

In 1973 Shri Thomas travelled extensively in the USSR as leader of a cultural delegation at the invitation of the USSR Government.

Son of late P. C. Jacob, Shri Thomas, who is a progressive rubber grower himself, brings to his new office the rich practical experience and wisdom of an enlightened farmer. His indepth acquaintance with the techno-economic problems of the rubber industry is an added advantage.

Shri Thomas is happily married and has a son and two daughters.

FAREWELL TO MOHANACHANDRAN

Shri P. J. Thomas, the new Chairman of the Rubber Board, has categorically stated that he would strive hard to bring prosperity both for the rubber growers and for the rubber plantation industry in India. He was speaking at a meeting organised on the evening of 2nd February 1983 to bid farewell to Shri Mohanachandran, outgoing Chairman of the Rubber Board. Shri Thomas stated that during his tenure of office as Chairman he would serve the industry with dedication.

Dr. M R. Sethuraj, Director of Research who welcomed the distinguished guests, gave a brief account of the progress of activities in the Board during the Chairmanship of Shri Mohanachandran. S/Shri C. P. G. Nair, President, Rubber Board Employees Union, P. M A. Karim, President, Rubber Board Staff Association, Joy P. Korah, Secretary, Rubber Board Officers Association, C. Krishan Nair, Secretary, Rubber Board Stenographers Guild, Sunny Varghese, Vice President, Technical Officers Union and Dr K. Jayaratnam, President, Research Guild, spoke in appreciation of the services rendered by Shri Mohanachandran as Chairman of the Rubber Board. The meeting also accorded a warm welcome to Shri P. J. Thomas who had taken over charge as Chairman from Shri Mohanachandran, earlier in the day

Responding to the praises and appreciations Shri Mohanachandran recollected the intimate contacts he had with the different sectors of the rubber plantation industry. He gratefully remembered the co-operation extended to him by the officers and staff and said that whatever he could do in the Board was with the earnest support he got from all quarters.

Shri V. Bhaskara Pillai, Secretary, Rubber Board who proposed the vote of thanks, ruminated the halcyon days he was fortunate enough to serve the Board during the stewardship of Shri Mohanachandran and congratulated all the staff organisations for their active co-operation in making the function a success

RECEPTION TO PJ THOMAS

Earlier warm reception was accorded to the new Chairman when he arrived at the Head Office accompanied by S/Shri Ommen Chandy, Dy. Leader of the Congress Legislative Party, Kurian Joy President, DCC, Kottayam, T.K. Gopalakrishna Panicker Vice President, DCC, Kottayam and P. D. George President, District INTUC and Member, Rubber Board and other party colleagues. A large gathering of friends and well wishers assembled at the Public Library maiden to receive him. Besides his colleagues in the Congress Party, Shri E. T. Varghese Vice Chairman of the Rubber Board, Representatives of the staff organisations which included S/Shri C. P. G. Nair, Sankaranarayanan, Joy P. Korah and others garlanded him and presented him bouquets. Later he addressed the partymen, colleagues and friends who assembled there.

"The forest is peculiar organism, of unlimited kindness and benevolence, that makes demands for its sustenance and extends generously the products of its life activity; it affords protection to all beings, offering shade even to the axeman who destroys it." Lord Budha

SOCIAL FORESTRY

"When the 20-Point Programme was first announced in 1975, I had cautioned you not to expect miracles. Then, as now, there is only one magic which can remove poverty—and that is hard work, helped by a clear sense of purpose and discipline. On a steep road there is no time or place for pause. Our national motto is "Sathyameva Jayate" — Truth alone Wins. In our daily lives we should adopt an additional motto: "Shramaeva Jayate." Dedication to truth and toil is the bedrock of respect, progress and prosperity.

Our economy is on the move. It is in our hands to maintain the improvement to lighten the burdens of our millions. This programme is for each one of you, and for this nation which is ours to serve, to cherish and to build. I seek your wholehearted co-operation in making the programme a success."

Prime Minister Shrimathi Indira Gandhi

Love of trees and flowers is ingrained in the nature of man and has found vivid expression in his literature and arts from times immemorial. Judged from the viewpoints of physical beauty and aesthetic values as also the innumerable economic advantages that they offer, plantation of trees today has assumed added importance. Cherished for the greenery and shade they provide, trees are a perennial source of fuel, timber, fodder, fruit and a host of other products. Besides; they act as a deterrent to soil erosion and provide natural protection against floods.

Great religious sanctity has also been attached to the plantation of trees. Chapter 59 of the "Matsya Purana" vividly described the ceremony of planting trees which was then called 'Vrikshotsava" and heavenly bliss was assured to the person planting even a single sapling.

Our history contains numerous descriptions of forests in various places of our country. Foreign travellers who visited our country from time to time described the existence of dense forests. Forests were part of our history and played a significant role in building up our traditions and civilisation. Unfortunately, when one goes to the countryside now, what is seen is many stretches of barren hills and land.

The destruction of forests started with the advance of civilisation, first for cultivation and later for various forest products to meet the requirements of civilisation. In the process, man has destroyed forests indiscriminately and cleared them up to great heights. Our forests were also reduced on account of huge projects like hydro-electric projects, setting up of heavy industries, rehabilitating refugees and displaced persons from project

The Revised 20-Point Programme seeks to impart greater dynamism to some key social and economic programmes included in the Sixth Plan. In broad terms it concretizes what the Sixth Plan means for us all, particularly for the weaker sections. Special emphasis is being given to programmes to assist specific target groups through the integrated rural development programme, the Scheduled Castes Component plan and hill and tribal sub-plans, the slum improvement programme and also allotment of house sites to rural families.

While the thrust of the Revised 20-Point Programme continues to be on providing better living cnoditions for the less previleged sections of the population, the programme as a whole aims at all-round improvement in productivity.

Each title in this series is designed to explain and document a different facet of national endeavour as embodied in the Revised 20-Point Programme.

areas, for cultivation and residential purposes. At present our country has only about 75 million hectares of forest land, which comes to 23 per cent of the total land area. Even this forest area is not fully covered by trees. Only 30 percent of the area is productive.

Our requirement of timber is going up fast with the increased economic activities in the country. Besides the requirements of fire-wood and construction material, timber is required for defence, railways and other construction works, pulp-wood for paper and raw material for plywood and rayon factories. Softwood is required for matches, slates and such industries.

Need for Social Forestry

Since forests are now found only in hills and hilly areas, there is an impression among many people that forests need be confined only to those places and that people in general have nothing to do with the development of forests, and that it is the duty of the Forest Department to supply timber, fuel, — etc. This is a wrong impression. It is no doubt the responsibility of the Forest Department to afforest all the degraded reserve-forest lands. However, there are large stretches of waste land outside the reserve forests also; and to plant trees on those lands is the responsibility of and in the interest of the people. The objective of Social Forestry is to involve the people in raising their own forests on their own lands and for their own benefit.

Here it is important to mention the need for producing more and more firewood, which is a basic necessity of life in rural areas and the less affluent pockets of urban areas. Since there is a wide gap between demand and supply for fuel-wood, the solution to this problem is only to increase production by bringing more and more areas under green-cover. This programme of bringing more areas under green-cover has to play a vital role and hence the concept of social forestry.

The lands which are available outside forest areas can be broadly classified as government waste lands other than Reserve Forests and private lands. Among the private waste lands are included areas like communal waste lands revenue *porambokes*, tank fore-shores, road margins, canal bunds, river bunds, railway track sides and common areas of irrigation projects, sea coasts, etc. Unproductive agricultural lands, homesteads etc., come under the category of private lands. In addition, trees can be planted in the premises of schools, offices, factories and such institutions.

Early in the seventies, recognising the urgent need to fill the wide gap between demand and supply and make the country self-sufficient in firewood, timber and other industrial raw-material, the National Commission on Agriculture recommended to the Government the launching of various social forestry programmes on a large scale. The Government readily accepted the recommenpations and launched a treeplanting programme all over India under the national slogan "Make India Green."

According to the social Forestry Programme enunciated by the Government, farm forestry which envisages planting of trees on private agricultural lands or on their bunds and boundaries is a

Annexure I

Number of Seedlings to be raised in the country during 1981-82 and 1982-83

(Number in lakhs)

State/U. Ts.	1981-82		1982-83
	Target	Achievement.	
Andhra Pradesh	508.13	479.50	1420
Assam	40 00	N.A.	269
Bihar	578.11	553.40	900
Gujarat	1534.44	1484.00	2330
Haryana	624.85	592.00	1200
Himachal Pradesh	454.77	N.A.	400
Jammu & Kashmir	135 00	N.A.	200
Karnataka	1742 66	1414.00	1975
Kerala	162.50	50 86	450
Madhya Pradesh	3550 00	2456.00	2500
Maharashtra	701.13	776.39	1200
Manipur	69 60	N.A.	66
Meghalaya	29.50	31.40	75
Nagaland	41.91	N.A.	100
Orissa	529.95	607.41	950
Punjab	220.00	262.91	600
Rajasthan	270.00	285.82	350
Sikkim	56 00	N.A.	44
Tamil Nadu	1183.34	660.92	1100
Tripura	126 30	14.26	—
Uttar Pradesh	1209.00	763.00	2100
West Bengal	420.00	350.00	—
A & N Islands	4.36	18.27	80
Arunachal Pradesh	94.92	N.A.	110
D & N Haveli	9.39	9.51	15
Delhi	25.00	N.A.	40
Goa, Daman & Diu	12.89	N.A.	20
Mizoram	204 52	N.A.	100
Total States & U. Ts.	13538.27	10809.65	18585

N.A.: Not Available

Annexure II

Plantation/Target of Social Forestry During 198.-82 and 1982-83

(Areas in hectares)

State/U. Ts	1981-82	1982-83
Andhra Pradesh	13,500	15,000
Assam	7,500	1,200
Bihar	10,400	18,000
Gujarat	30,400	45,400
Haryana	12,000	19,000
Himachal Pradesh	7,100	13,000
Jammu & Kashmir	6,200	4,000
Karnataka	10,900	42,000
Kerala	4,400	5,000
Madhya Pradesh	35,600	72 000
Maharashtra	26,600	23 000
Manipur	2,000	2,000
Megnalaya	2,100	1,000
Nagaland	2,200	1,200
Orissa	28 200	18,000
Punjab	10,480	8,000
Rajasthan	17,500	8,000
Sikkim	1,100	1,600
Tamil Nadu	25,400	35,000
Tripura	800	3,800
Uttar Pradesh	12,500	40,000
West Bengal	12,700	18,400
A & N Islands	150	400
Arunachal Pradesh	7,500	3,000
Chandigarh	300	—
D & N Haveli	200	300
Delhi	500	700
Goa Daman & Diu	150	400
Mizoram	1,000	6,000
Pondicherry	20	—
Total States & U. Ts.	2,89,400	4,00,000

part of Social Forestry. The seedlings to be planted under farm forestry are supplied by the Forest Departments In addition under Social Forestry, the Forest Departments also raise plantations on village common lands along the sides of roads, railway lines and canals.

Under New 20-Point Programme

Under the New 20-Point Programme, social forestry has assumed greater importance. The Union Ministry of Agriculture (which looks after forestry) as also the State Forest Departments have geared up to achieve the targets fixed for social forestry which would benefit the poorer sections of society. In Point No. 12 of the New Programme, the need for re-doubling the efforts for making India green has been highlighted.

Efforts are being made to ensure the planting of the maximum number ofseedlings under various programmes by the goverment departments as well as the public. Annexure I gives information regarding the targets fixed and the achievements made in various States/Union Territories. For the year 1982-83 a national target of 200 crore seedlings, as against 135 38 crores for 1981-82, has been fixed.

Under Social Forestry (including farm forestry), the target ifixed for 1981-82 in various States/UTs was 2.89 lakh hectares. The target for the year 1982-83 has been fixed at 4 lakh hectares. A statement giving the State-wise distribution of these targets is given in Annexure II.

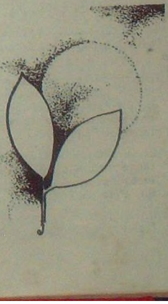
In addition to the above two schemes, it has been decided to collect good quality seeds from trees of common plantation species like teak, khair, sal pines, shisham, etc , so that the productivity of the plantations will increase. A target of 500 tonnes of good qnality seeds to be collected from such trees has been fixed for the whole country.

In order to ensure that the targets proposed for 1982-83 are fully achieved, constant consultations between Union and State Government officials are held and bottlenecks (wherever found) are removed promptly.

Vanamahotsava

The annual festival of planting trees on a nationwide scale was started in 1950. It seeks to focus attention on the virtues and benefits of tree planting by investing it with a popular appeal. In the first week of July every year, Vanamahotsava Week is celebrated by planting saplings. In view of the new impetus received for tree planting under the New 20-Point Programme, and the enthusiasm and awareness of the people for this social cause, it is hoped that the dream of making India green will soon become a reality.

This script is based on a paper issued by the Research and Reference Division, Min. of I & B., Govt. of India.



USE OF BLOCK RUBBER IN TYRE MANUFACTURE

A discussion between technical personnel of the Rubber Board and tyre manufacturers was held at the Rubber Research Institute of India last year. The requirements of the tyre manufacturing industry were reviewed at the meeting. It was well recognised that much technological advances had taken place in the tyre manufacturing scene in the industrially developed countries. The present situation calls for similar advances by our tyre industry as well.

It was emphasised that the absorption of technological advances by our tyre manufacturers may depend to a great extent on the availability of technologically acceptable grades of rubber by them. The following write up on the use of block rubber in tyre manufacture was served as the background paper for the discussion.

Introduction

The Rubber Board is implementing the Rubber Processing Component of the Kerala Agricultural Development Project (KADP), aided by the IDA of the World Bank which consists of the following important programmes.

1. Expansion of an existing crumb rubber factory owned by the Palai Marketing Co-operative Society to a 10 tonne/day factory.
2. Establishment of 9 new 10 tonne per day crumb rubber factories by Co-operative Societies dealing in rubber.
3. Development of marketing facilities by the Kerala State Co-operative Rubber Marketing Federation (KRMF), the apex body of the Co-operative Societies dealing in rubber.

The main objective of the project is to improve the quality of rubber production in India, by upgrading about 25,000 tonnes of low grade rubber produced by about 50,000 small holders into higher value technically specified rubber. Through the implementation of the project it is hoped that the rubber consumers in the country, particularly the tyre manufacturers, can get assured regular supplies of technologically acceptable grades of natural rubber having assurance of standards, freedom from adulteration, good packing and declared weight. The small rubber growers on the other hand can get better returns to their produces and freedom from the botheration of processing and marketing without proper facilities. Also through the successful implementation of the Project, the nation can benefit by avoiding wastage of rubber through the vagaries in the processing operation carried out by individual small holders and by saving much energy in the drying of rubber

The expansion work of the factory owned by the Palai Marketing Co-operative Society (PMCS) and the establishment work of 2 new 10 tonne/day factories one at Kanjirappally and the other at Kozhikode are now almost completed and these 3 factories may start producion within a couple of months. Therefore, the Board decided that it will be only in the fitness of things to hold a conference of the technical personnel of the tyre industry with a view to discussing the requirements of the tyre industry and arriving at a decision on the product mix to be planned in the first 3 factories to ensure maximum benefits to the industry. The present conference was arranged with this end in view.

II. Important points for discussion

(i) The disadvantages of using the conventionally processed rubber for tyre manufacture and the ways and means of overcoming these.

NR is now being produced in India mostly in the following types.

- Ribbed Smoked Sheets
- Pale Crepes
- Estate Brown Crepes and
- Remilled Crepes

Each of these type is sub-divided into grades by a system of visual grading which gives the consumer very little information regarding the behaviour of the rubber when he uses it in the factory. Although this system of visual grading has found to be of some use in the case of Ribbed Smoked Sheets and Pale Crepes in ascertaining the quality of rubber, it appears that in the case of Estate Brown Crepes and Remilled Crepes produced in commercial crepe factories, the grading adopting the present system cannot serve much purpose. A study conducted by the Rubber Board showed that in the production of Estate Brown Crepes and Remilled Crepes commercial crepe mills invariably adopt the technique of blending with skim rubber and/or earth scrap depending upon the appearance required for the grade to be produced. Since the tyre industry is the major consumer of these types of rubbers, it is only but natural to expect lot of quality problems in the manufacture of tyres using latest technology. Therefore it will be beneficial to review the marketing practices and to identify the draw backs. To overcome the draw backs, only possible solution appears to be, to provide to the tyre sector, grades of rubber having assurance of standards, freedom from adulteration, good packing and declared weight. The possibility of making a good beginning for the provision of the different grades of rubber acceptable to the tyre manufacturers from the 3 modern factories may therefore be discussed in detail and conclusion drawn with a view to enabling the management of these 3 factories and the Rubber Board to take concrete steps in fulfilling the requirements of the tyre sector to the maximum extent possible.

(ii) The standards being followed for the Technical Specification of Natural Rubber in India

Marketing of Natural Rubber with technical specification was started commercially in 1965 in Malaysia. However in India a humble beginning was made only in 1974. The specifications for the purpose drawn out by the ISI are given below

The progress in the production and marketing of natural rubber with technical specification has been very poor in the country mainly due to the following reasons:

(a) Lack of facilities for the technical specification.

(b) Resistance to take licence from the I. S. I. by the producers.

(c) Non-avaiabilty of price incentives for technically specified rubbers

In the project under implementation, adequate facilities have already been developed for technical specification and the 3 units will be marketing their produces with ISI mark as per the provisions in Rubber Rules. Therefore, it will be possible for the tyre sector to get ISI marked block rubber from these factories. In this context it will be relevant to discuss the present Indian Standard Specification for Raw Natural Rubber and to assess their adequacy and acceptability to the tyre section. Modifications if any, required can also be identified.

(iii) Grade wise requirements of block rubber by the Tyre manufacturing industry

It is well recognised that much technological advances have recently taken place in the tyre manufacturing scene in the industrially developed countries and this situation calls for similar

IS: 4588-1977

Indian Standard

SPECIFICATION FOF RUBBER, RAW, NATURAL

Table 1 Chemical Requirements for Natural Rubber

Sl. No.	Characteristic	Requirement for				
		ISNR 5 Special	ISNR 5	ISNR 10	ISNR 20	ISNR 50
(i)	Dirt content, % by mass, Max	0.05	0.05	0.10	0.20	0.50
(ii)	Volatile matter, % by mass, Max	1.0	1.0	1.0	1.0	1.0
(iii)	Ash, % by mass, Max	0.6	0.6	0.75	1.0	1.5
(iv)	Nitrogen, % by mass Max	0.7	0.7	0.7	0.7	0.7
(v)	Initial plasticity Min	30	30	30	20	30
(vi)	Plasticity retention Index (PRI), Min	80	60	50	40	30

advances by our tyre industry as well. The absorption of the technological advances by our tyre manufacturers may depend to a great extent on the availability of technologically acceptable grades of rubber by them. Therefore it will be very pertinent to discuss the grade requirements of the tyre industry with a view to finding out the different grades of block rubber required by each of the companies. This information can help the management of the 3 factories to plan their product mix and grade wise production. The 3 factories may produce about 2000 M Tonnes of block rubber during 1982-83 and thereafter the production will go up gradually to 7500 M Tonnes.

(iv) Requirements of Speciality Rubbers by the tyre industry

In recent years much developments have taken place in the processing of natural rubber. As a result, techniques have been perfected in producing viscosity stablized rubbers, oil extended rubbers superior processing and/or process aid rubbers, tyre rubber etc which can be considered as tailor cut products. The layout of the 3 factories which will start production soon is a flexible one wherein any of the above referred speciality rubbers can be produced if needed. The factories have got attached testing laboratories and technical knowhow can be given to them by the Rubber Board. Therefore it may be desirable to discuss the prospects of producing speciality rubbers in these 3 factories if required by the tyre industry.

(v) Marketing procedure

Natural rubber is transported to tyre factories mostly by trucks which can carry 10 tonnes. The daily capacity of each factory is also 10 tonnes. The rubber produced in the factories will have to be marketed by the Kerala State Co-operative Rubber Marketing Federation, which will be developing adequate facilities for marketing under the World Bank assisted project. The Federation with its marketing infrastructure and expertise can arrange regular supplies of fresh block rubber to tyre factories on an agreed price formula based on the average lot sheet price. Such marketing arrangements can be of very great help for the tyre manufacturing units in reducing their inventory carrying costs. Therefore it will be worthwhile to discuss the marketing procedures that can be adopted for the marketing of the block rubber produced in the 3 factories with a view to enabling the Marketing Federation to plan their marketing strategies.

III. Conclusion

The efforts of the Rubber Board and the Kerala Government in modernising the processing of the rubber produced by the small rubber growers under the World Bank assisted project can bring about much economic benefits to the tyre manufacturing units in the country as well as to the vast number of small rubber growers, provided there exists mutual co-operation. Therefore based on the concensus arrived in the discussions on the above mentioned points decisions and recommendations may be drawn up for ensuring maximum benefits to all concerned. □

ALL RRI TESTS ARE VITAL

The Malaysian Rubber Research and Development Board said that all experiments carried out by Rubber Research Institute stations including that in Bukit Ibam in Pachang of the highest priority.

In a statement it added that the experiments are also done with great significance to the future of the natural rubber industry and through that the national economy of this country.

Policy

"These experiments range from those involving a short duration to those necessitating long years of observation and experimentation.

"Needless to say, unintended interruption to the operation of these experiments would mean a serious set-back to the industry and in many cases, the loss of time entailed could be materially and progressively expensive to the future of the rubber industry," it said.

The statement said it has therefore been and will continue to be the policy of the Board to ensure that there is no unintended interruption of whatever nature to affect its field stations.

"Towards this and, the Board will not be prepared to consider any proposal for the lease of any part of its field stations for uses and purposes other than for natural research and development purposes

"The Board will, therefore, continue to adhere to its policy and will not entertain any proposals for the use of any part of its field stations" the statement said.

New Straits Times (Malaysia)

NATURAL RUBBER IN ENGINEERING

As an engineering material Natural Rubber has vast potential. An approach to this unexploited scene would reveal numerous and diversified uses for NR. The Engineers and Designers of the Country should realise the fact that the varied uses of NR if applied to engineering technology may prove to be a breakthrough. Though generally the Engineers are not slow especially in finding out new applications, much efforts have to be put in for extension research in this field. Fire tests recently carried out on experimental building mounts have showed that adequate fire resistance is obtained. The article is reproduced from 'Rubber Reporter.'

PB LINDLEY AND ADW LEAVER

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The engineering applications of NR are ever increasing both in diversity and extent, a clear indication of its usefulness to those engineers who understand it and know how to design with it. The dearth of teaching of this subject in the formal education of the majority of engineers may give the impression that there is a lack of design information but this is not so—see for example references 1–8. This paper is a brief guide to the engineering properties and design features of natural rubber using a few selected applications for the purpose of illustration.

Vulcanization and Compounding

Raw rubber has to be 'vulcanized' in order to become a useful elastic material, stable over a reasonably wide temperature range. Before vulcanization various chemicals and other materials are added to the rubber in order to impart desirable properties. The vulcanization or curing process is carried out under pressure in metal moulds at temperatures between 140 and 180°C for times varying from minutes to hours depending upon the type of vulcanizing system being used and the size of the component. During vulcanization the long chain molecules are crosslinked together with (usually) sulphur molecules. Vulcanizates containing no fillers are referred to as gum rubbers but are not widely used. The most common filler is carbon black, which improves processing of the compound and increases the stiffness and some strength properties of the vulcanizate.

Load-Deformation Characteristics

Rubber, with a Poisson's ratio close to 0.5, is relatively incompressible. Its high value of bulk modulus of about 2000 MPa (125 ton/in^2) is some three orders of magnitude greater than its shear modulus, typically 0.7 MPa (100 lb/in^2) for an engineering rubber. Young's modulus is three times the shear modulus.

When designing rubber components the appropriate modulus must be used. In shear a rubber block with parallel loading surfaces bonded to metal has an essentially linear relation between load (F) and deflexion (x) up to about 80 percent strain. The shear stiffness Ks is given by

$$Ks = F/x = GA/t$$

where G is the shear modulus, A the cross-sectional area and t the thickness of the rubber block. In shear there is little tendency for the rubber to change its volume.

This is not the case in compression where, because of the high bulk modulus, the rubber block bulges at the sides trying to maintain a constant volume. The closer the bonded surfaces (for a given A) the greater the restriction to bulging, a measure of which is the shape factor, S, defined as the ratio of cross-sectional area to total force-free areas. Because of the change in block dimensions during compression the $F-x$ curve is non-linear, markedly so at high strains. At low strains, up to about 10 percent, linearity can be assumed for most design purposes, the compression stiffness of a block being

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The hardness of a rubber vulcanizate is a rough guide to its Young's modulus. Hardness, usually expressed in International Rubber Hardness Degree (IRHD), is determined by the elastic penetration into the rubber of an indentor under a specific load and is therefore related to the elastic moduli of the materials[10].

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The curves in *Figure 1* are for rubbers of different hardnesses.

Rubber is used in various modes of deformation compression, shear, torsion[3] bucking[4] and combinations of these. Combined compress on and shear is used in many applications. One example is the rubber chevron spring used for the suspension of some London Transport underground railway rolling stock, shown in *Figure 2*. Loads of widely differing magnitudes in three directions have to be accommodated; hence the spring is designed to have a different stiffness in each direction. This is achieved by using angled steel plates to which layers of rubber are bonded. The natural rubber spring provides a significant reduction in weight and maintenance over conventional steel systems.

Effect of Temperature

Over the working temperature range —20° to +70°C in which most rubber engineering components are required to perform, the modulus of gum rubber under static loading conditions is approximately proportional to the absolute temperature. This is the Gough—Joule effect. Fillers tend to reduce the effect, and under dynamic deformation may even give a negative temperature dependence. Allowance may need to be made for the temperature dependence of stiffness and also for thermal expansion and contraction when designing components for use over a wide temperature range[6].

At temperatures below about —20°C the stiffness of a rubber vulcanizate is determined by two other phenomena. Low temperature crystallization takes place[11] which results in an increase in stiffness over a period of time. For natural rubber the effect is most rapid at —25° C and, with the correct design formulation and vulcanization conditions, significant stiffening can be avoided for many months. A temperature rise of about 30 deg C causes the crystallization to disappear.

As the temperature is further depressed there is a transition to the brittle, glassy state[12], the modulus increasing a thousandfold. This variation in stiffness is reversible, the vulcanizate immediately becoming rubbery again when warmed. The glass transition temperature for static behaviour is —70° C for natural rubber and somewhat higher for most synthetic rubbers[12].

A particulary severe low temperature environment is encountered by the rubber bushes used on spacerdamper units for overhead electricity transmission lines in Canada[13]. The installation is required to withstand temperatures of the order of —50° C and also long periods at temperatures about —25°C. The material used is NR containing a minor proportion of SBR together with a plasticizer to improve low temperature performance.

The physical properties of a vulcannizate remain reversible provided no chemical changes take place. At high service temperatures which approach those used for vulcanization, about 140° C, a rapid loss of mechanical properties (*ie* reversion) can occur. Conventional natural rubber vulcanizates can be used up to about 70° C. The need to withstand higher temperatures continuously is not commonly required of rubber engineering components but by the use of special compounding techniques[14], natural rubber can be used up to 100° C and, intermittently, even higher.

Weathering resistance

Just as many common articles of thin mild steel sheet can deteriorate relatively rapidly when exposed out-of-doors so can many common articles of thin rubber. When a steel component has an important role to play in an engineering application, however, it may well be significantly thicker section and of a different composition with vastly superior resistance to the atmosphere. Exactly the same can be said for natural rubber engineering components. Such components contain antioxidants which give excellent resistance to oxidative degradation, carbon black to give protection against ultra-violet radiation and antiozonants and/or waxes to provide resistance to ozone cracking. Complete immunity is not always possible, but it often is. The bridge bearings on the Pelham Bridge in Lincoln show no sign of surface deterioration after twenty years.

The bulk of thick rubber components is a reservoir for the protective agents which migrate to the surface to replace those which have reacted there with oxygen and ozone. The effect of ozone on inadequately protected rubber is to initiate cracks at the surface where there are tensile stresses. In unprotected rubber in tension, the minimum strain for ozone cracking is about 5—10 per cent and the rate at which the cracks grow is propo tional to the ozone concentration. Normal protection increases the critical strain for outdoor exposure to over 100 per cent[15]. A high severity test requires no cracking at 20 per cent strain, 40° C and an ozone concentration of 200 parts per hundred million (pphm) for 3 days; on such a test suitably protected natural rubber shows no cracking after 30 days. World-wide, the ozone concentration is about 3 pphm except in a few areas such as Los Angeles where it may be ten times higher.

Complete protection against ozone cracking is less readily achieved by protection agents for rubber subjected to continuously dynamic deformations when cracks grow at about 0.25 mm per year[16].

The most effective protection against ozone cracking in a rubber component is to design it so that there are no tensile stresses at the surface in the deformed state. Even when this is not possible most engineering components are used in deformation modes which result in tensile stresses being restricted to the surface regions so that cracks cannot propagate into the bulk. The significance of design in providing ozone resistance may be judged from the fact that natural rubber springs were giving very good performance in

MODI VILLAGE: AN EXPERIMENT IN RURAL DEVELOPMENT

Development Programmes are the tools of social change through which new ideas are introduced into a social system so that the per capita incomes and levels of living are improved as modern methods of production are accepted. Modernisation is the process by which the traditional ways of life could be changed. This silent process which eliminates ignorance and elevates a mass to a production oriented programme needs due recognition. The success of the programme largely depends on helping the farmers to gain proper understanding of the latest technology through effective means of communication so that it could be understood, accepted and adopted without much time lag. An experiment which influences the outlook and way of life of small rubber growers in Akalakunnam village, a prominent rubber growing area situated about 25 Km east of Kottayam town is now gaining momentum. It could change the tradition bound practices of the rubber growers and enlighten them to achieve better production in their holdings. Akalakunnam is now an adopted village of the Rubber Development Project of the Modi Rubber Ltd.

Shri. Mathew Uthirakulam believes that bee keeping will add to the income of the small grower.

How it works?

The Modi Rubber Ltd. Modinagar decided to set apart some funds for scientific development work related to rubber small holdings in 1978 and thus Modi Rubber Development Project started its operations in April, 1979. The Project being managed and implemented by Modi Rubber Ltd at Akalakunnam serves as a catalyst for the quick implementation of the development programmes already launched by the Rubber Board. It aims at the overall betterment of the living conditions of 1685 small rubber growers spread over in different areas of the village. The rubber growers of the village speak high of the invaluable services rendered by the Project. How does it happen? The rubber gorwers say that the Field personnel of the Project visit every holding once in 45 days, give advice and help them to adopt systematic cultural practices. Most of the rubber growers assembled at a Seminar held on 5/3/83 at Akalakunnam have agreed that the new experiment of Modi towards rural development would bring appreciable results. The number of rubber growers who attended the meeting was itself an indication of the response to the programmes launched by the Project. This has enabled us to visit a couple of small holdings under the jurisdiction of the Project.

Productivity conscious small grower

Shri Raveendran Nair, Kollamparambil Lakkattoor is a promi-

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As the temperature is further depressed there is a transition to the brittle, glassy state[19], the modulus increasing a thousandfold. This variation in stiffness is reversible, the vulcanizate immediately becoming rubbery again when warmed The glass transition temperature for static behaviour is—70° C for natural rubber and somewhat higher for most synthetic rubbers[12].

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The physical properties of a vulcannizate remain reversible provided no chemical changes take place. At high service temperatures which approach those used for vulcanization, about 140° C, a rapid loss of mechanical properties (*ie* reversion) can occur. Conventional natural rubber vulcanizates can be used up to about 70° C. The need to withstand higher temperatures continuously is not commonly required of rubber engineering components but by the use of special compounding techniques[14], natural rubber can be used up to 100° C and, intermittently, even higher.

Weathering resistance

Just as many common articles of thin mild steel sheet can deteriorate relatively rapidly when exposed out-of-doors so can many common articles of thin rubber. When a steel component has an important role to play in an engineering application, however, it may well be significantly thicker section and of a different composition with vastly superior resistance to the atmosphere. Exactly the same can be said for natural rubber engineering components. Such components contain antioxidants which give excellent resistance to oxidative degradation, carbon black to give protection against ultra-violet radiation and antiozonants and/or waxes to provide resistance to ozone cracking. Complete immunity is not always possible, but it often is. The bridge bearings on the Pelham Bridge in Lincoln show no sign of surface deterioration after twenty years.

The bulk of thick rubber components is a reservoir for the protective agents which migrate to the surface to replace those which have reacted there with oxygen and ozone. The effect of ozone on inadequately protected rubber is to initiate cracks at the surface where there are tensile stresses. In unprotected rubber in tension, the minimum strain for ozone cracking is about 5—10 per cent. and the rate at which the cracks grow is propotional to the ozone concentration. Normal protection increases the critical strain for outdoor exposure to over 100 per cent[15]. A high severity test requires no cracking at 20 per cent strain, 40° C and an ozone concentration of 200 parts per hundred million (pphm) for 3 days; on such a test suitably protected natural rubber shows no cracking after 30 days World-wide, the ozone concentration is about 3 pphm except in a few areas such as Los Angeles where it may be ten times higher.

Complete protection against ozone cracking is less readily achieved by protection agents for rubber subjected to continuously dynamic deformations when cracks grow at about 0.25 mm per year[16].

The most effective protection against ozone cracking in a rubber component is to design it so that there are no tensile stresses at the surface in the deformed state. Even when this is not possible most engineering components are used in deformation modes which result in tensile stresses being restricted to the surface regions so that cracks cannot propagate into the bulk The significance of design in providing ozone resistance may be judged from the fact that natural rubber springs were giving very good performance in

MODI VILLAGE: AN EXPERIMENT IN RURAL DEVELOPMENT

Development Programmes are the tools of social change through which new ideas are introduced into a social system so that the per capita incomes and levels of living are improved as modern methods of production are accepted. Modernisation is the process by which the traditional ways of life could be changed. This silent process which eliminates ignorance and elevates a mass to a production oriented programme needs due recognition. The success of the programme largely depends on helping the farmers to gain proper understanding of the latest technology through effective means of communication so that it could be understood, accepted and adopted without much time lag. An experiment which influences the outlook and way of life of small rubber growers in Akalakunnam village, a prominent rubber growing area situated about 25 Km east of Kottayam town is now gaining momentum. It could change the tradition bound practices of the rubber growers and enlighten them to achieve better production in their holdings. Akalakunnam is now an adopted village of the Rubber Development Project of the Modi Rubber Ltd.

How it works?

The Modi Rubber Ltd. Modinagar decided to set apart some funds for scientific development work related to rubber small holdings in 1978 and thus Modi Rubber Development Project started its operations in April, 1979. The Project being managed and implemented by Modi Rubber Ltd at Akalakunnam serves as a catalyst for the quick implementation of the development programmes already launched by the Rubber Board. It aims at the overall betterment of the living conditions of 1685 small rubber growers spread over in different areas of the village. The rubber growers of the village speak high of the invaluable services rendered by the Project. How does it happen? The rubber gorwers say that the Field personnel of the Project visit every holding once in 45 days, give advice and help them to adopt systematic cultural practices. Most of the rubber growers assembled at a Seminar held on 5/3/83 at Akalakunnam have agreed that the new experiment of Modi towards rural development would bring appreciable results. The number of rubber growers who attended the meeting was itself an indication of the response to the programmes launched by the Project. This has enabled us to visit a couple of small holdings under the jurisdiction of the Project.

Shri. Mathew Uthirakulam believes that bee keeping will add to the income of the small grower.

Productivity conscious small grower

Shri Raveendran Nair, Kollamparambil Lakkattoor is a promi-

The curves in *Figure 1* are for rubbers of different hardnesses.

Rubber is used in various modes of deformation compression, shear, torsion[3] bucking[4] and combinations of these. Combined compress on and shear is used in many applications. One example is the rubber chevron spring used for the suspension of some London Transport underground railway rolling stock, shown in *Figure 2*. Loads of widely differing magnitudes in three directions have to be accommodated; hence the spring is designed to have a different stiffness in each direction. This is achieved by using angled steel plates to which layers of rubber are bonded. The natural rubber spring provides a significant reduction in weight and maintenance over conventional steel systems.

Effect of Temperature

Over the working temperature range—20° to +70°C in which most rubber engineering components are required to perform, the modulus of gum rubber under static loading conditions is approximately proportional to the absolute temperature. This is the Gough—Joule effect. Fillers tend to reduce the effect, and under dynamic deformation may even give a negative temperature dependence. Allowance may need to be made for the temperature dependence of stiffness and also for thermal expansion and contraction when designing components for use over a wide temperature range[5].

At temperatures below about—20°C the stiffness of a rubber vulcanizate is determined by two other phenomena. Low temperature crystallization takes place[11] which results in an increase in stiffness over a period of time. For natural rubber the effect is most rapid at −25° C and, with the correct design formulation and vulcanization conditions, significant stiffening can be avoided for many months A temperature rise of about 30 deg C causes the crystallization to disappear.

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Shri. Raveendran Nair in his rubber Nursery

sing young rubber grower noted for his hard work and dedication. He belongs to a family which started cultivating rubber 50 years ago. Though traditionally a rubber growing family, Raveendran Nair inherited only 6½ acres of rubber which his father replanted early in 1961 using Tjir I seedlings availing Board's subsidy. Shri Nair promptly attended to the various upkeep operations with the result he could commence tapping in about 7 years time. In all, about 1100 trees were there and he could get on an average, a yield of 12 Kg per day. He continued to get this yield till 1972 and thereafter it declined. The Field Officer of Modi Rubber Ltd Shri Rajkumar while on a routine visit once advised him to replant his holding again with high yielding materials preferably with polybag plants which reduces immaturity and cost of maintenance.

Decision for replanting

Convinced by the persuasion, Shri Raveendran Nair decided to replant his holding. The trees were felled. The replanting operations such as lining, pitting etc are in progress. For this, he receives constant attention and technical guidance from the Modi Project Officials. He has also established a nursery having 1623 RRII 105 high yielding budded plants in polybags. Shri Raveendran Nair is of the view that only by improving productivity, rubber planting could be made economical. He also believes that his prosperity depends on replanting with high yielding planting materials.

Rubber growing family

Another small grower whom we met is Shri Mathew Uthirakulam popularly known as 'Mathewsar.' Being a retired Headmaster, he gets enough time to concentrate on rubber cultivation. He is also familiar with all aspects of rubber cultivation. As he is aware of the benefits of the polybag planting, he has recently raised a small nursery with 460 polybag plants. He hopes that his future planting would be with polybag plants.

Shri Mathew Uthirakulam is one of the early rubber growers of the locality. Rubber planting was started by his family as early as in 1948 using ordinary clonal seedlings. Now he has 5 acres under tapping. The stand per acre is 200 trees, where the per acre turnover is 16 sheets a day. He has also replanted an area of 3½ acres in 1979 using RRIM 600 and RRII 105 materials. Bee keeping is also done in the estate, which he feels, would add to the income of the small grower.

He maintains the holding systematically. Cover crop viz -

A demonstration plot of the Project

Pueraria has been well established in the entire area. He is grateful to Modi's Field Officer, Shri Baby Augus ine, for his guidance and advice at each stage of his operations in his holdings. Shri Mathew Uthirakulam concludes that the services of the Modi Rubber Ltd contribute a great deal in modernising his holding.

A new trend

The jurisdiction of the Project comprises the whole of Akalakunnam village and certain peripheral areas of Elikulam, Anicaud and Kooropada villages. The Project looks after about 2603 holdings and 1685 small holders. The total area covered by the Project is 1483 hectares. The main objective of the scheme is to create an awareness among the small holders on the modern scientific methods of rubber cultivation. The Project has also developed the technical know-how to guide the small growers through extension activities and established a rubber nursery at Ponkunnam which is maitnained in a scientific manner. This nursery could supply budgrafts and polybag plants of all improved varieties at reasonable price to the growers.

The Project also maintains a 5 hectare demonstration plot of mature and immature rubber. A slaughter tapping area is also maintained separately by the Project to demonstrate the correct technique of stimulant application.

Modi has set the trend. The small rubber growers of Akalakunnam village have evinced keen interest in all the activities of the Project. As a result, rubber small holders of the neighbouring villages have requested the Project authorities to expand their jurisdiction further.

Shri V.K.Bhaskaran Nair, retired Director of Research, RRII and the Project Officer of Modi Rubber Ltd is co-ordinating the various extension/advisory activities of the Project.

—ARAVINDAN
Publicity Officer

FINANCIAL AID FOR RUBBER PLANTING

The Rubber Board is implementing an integrated scheme for the promotion of large scale new planting and replanting of rubber by extending liberal cash subsidy and long term loan at reduced rate of interest adequate to cover almost the full cost of raising a rubber plantation up to the level of maturity. The scale of finance offered is Rs. 15,000/- per hectare with the ratio of subsidy and loan linked at variable rates depending on the size of the holding brought under rubber.

For holdings between 0 20 to 6 00 hectares, the subsidy payable is Rs. 6,980/- per hectare while the credit component is Rs 8,020/- In the case of units between 6.00 to 20 hectares, the rate of subsidy is Rs. 5,000/- and loan Rs. 10,000/- per hectar. For large holdings above 20 hectares, the subsidy is limited to Rs. 3,000/- per hectare and loan Rs 12 000/- per hectare. The total financial assistance to all the three categories is Rs 15 000/-per hectare, but the rate of subsidy tapers as the size of holding enlarges. The difference is made good by correspondingly increasing the loan component. The principle followed is that the growers with limited resources should receive maximum cash subsidy.

The subsidy component is paid by the Rubber Board to the growers through the Banks of their choice, while they are free to avail the eligible loan from the same Bank if they so choose. 3% of the interest on the loan will be borne by the Rubber Board except in the case of large growers who replant under this Scheme.

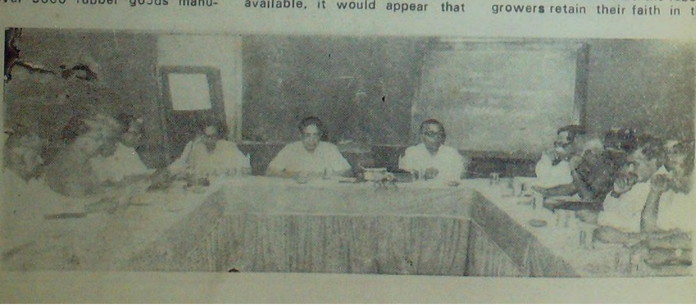
More, about this Programme can be known from the respective Regional Offices of the Rubber Board. Those interested in participating in this Scheme during the current year are advised to file their applications before 31st May, 1983 in duplicate alongwith survey plans of the area proposed to be new planted or replanted, in prescribed forms which can be collected free of cost from any of the Regional Offices or Field Offices of the Rubber Board.

before 3 1st May,

A CALL FOR STABLE PRICE AND BETTER RELATIONS

Shri P. J. Thomas, Chairman, Rubber Board has reminded the rubber producing industry and the rubber goods manufacturing industry that they are the two sides of the same coin. In India, he said that practically the entire rubber produced is consumed. Shri Thomas was delivering the introductory speech in the import-export committee of the Rubber Board at Madras on 28th February 1983. This means that the rubber producing industry can develop only if the rubber goods manufacturing industry in the country grows. Chairman said that during the period 1970-77, the natural rubber industry had to pass through very difficult times due to the comparatively poor performance of the rubber goods manufacturing industry. He continued:

"As a consequence of this, prices for natural rubber during the period was ruling at uneconomic levels and rubber growers lost faith in the future of the industry. This resulted in the reduction of the extent of new plantings/replantings done in the country to a low level. One of the main reasons for the poor performance of the Natural Rubber Industry during the period 1977-78 to 1981-82 resulting in an agonisiag shortage of rubber was this. I understand that due to the set back of the Natural Rubber industry during the past 5 years, the rubber goods manufacturing Industry had to face lot of inconveniences. The erratic supply of raw rubber, widely fluctuating prices and the soaring prices at times, all acted as constraints for the industry. We have today over 3000 rubber goods manufacturing units in the country. Out of this, 12 auto tyre manufacturing units alone consume nearly 60% of the total rubber consumed in the country. Though we imported rubber during the period of the set back in the Natural Rubber Industry, all of you know that due to the various problems such as difficulties in taking decision on quality and quantity of rubber to be imported, untimely arrival of the rubber and difficulties for the distribution of the rubber among the industrial units etc., the rubber goods manufacturing industry, particularly the small industry units had to suffer a lot. Now, I am very happy to note that after a set back for about 5 years the NR industry has again started growing as it used to be during the sixties and seventies. In fact from the figures available, it would appear that the growth in production during 1982-83 over the previous year is of the order of 9% as against the rate of growth of 4% in the natural rubber consumption. In this connection, I am happy to point out that due to the very vigorous steps taken by the Rubber Board since the onset of the set back for NR industry in 1978, we could bring over 60,000 hectares of new plantings/replantings with high yielding materials. Also substantial achievements have been made during the period in popularising modern methods and practices geared to increasing productivity from the existing plantations. In view of all these developments, I am confident that our NR industry can continue to record the same level of growth hereafter, provided we can ensure that the rubber growers retain their faith in the



long term prospects of the industry. I, therefore, would like to invite your kind attention on how we can do this. In this connection, I would like you to consider 3 important factors of particular relevance.

Composition

The first concerns on the need for ensuring regular supply of the different types and grades of natural rubber at reasonable prices to the rubber goods manufacturing industry. My friends in the rubber producing industry, I hope will appreciate that if acute shortages, highly fluctuating prices and soaring of prices at times for the different types and grades of NR are going to be there, the development of the Rubber consuming industry would be adversely affected. I have no doubt in my mind that any set back in the Rubber consuming industry, in the long run will surely affect the development of the NR industry.

The second factor, I wish to mention is the composition of the NR industry and the rubber consuming industry. We have today over 2.30 lakh plantation units, out of which there are only 553 large plantations of above 20 hectares. The small holdings constitute about 77% and they produce over 70% of the total production. In the rubber consuming industry though dominated by small scale units on the other hand, the large 12 auto tyre companies alone consume about 60% of the total rubber.

From these, I hope that you will appreciate the fact that our NR industry is mainly a small man oriented one and for this reason it is woven deeply and intricately into the economic and social fabric of the rubber growing regions in the country. I am also not forgetting the fact that the rubber consuming industry also constitutes a very large small industry sector which is very vulnerable. Under such circumstances I consider that it would be tragic if the above basic facts are not better appreciated and reckoned with both in its pragmatic and humanitarian aspects by all concerned.

Synthetic Rubber

The last point I wish to mention is that during the last 5 years our synthetic rubber producing industry's performance was rather erratic and during the last 2 years the capacity utilisation in the two factories was below 50%. This created a lot of problems in ensuring a balanced supply-demand situation in the country. The synthetic rubbers we are producing are mainly serving a complimentary rather than a competitive role. As such it will be very helpful for the development of the NR industry and the rubber consuming industry if the two factories can maintain a constant level of production.

From what I have said so far, I hope you will agree with me when I say that it is absolutely essential for us to ensure that both the NR industry and the Rubber Goods Manufacturing industry are developing in an orderly way. To ensure the orderly development of both the sectors of the industry, I feel that it is necessary to maintain a somewhat stable price for the different types and grades of Natural Rubber. The prices should be remunerative for the rubber growers and reasonable for the rubber goods manufacturers. To evolve such a pricing system, I think it will be possible to design a formula wherein we can take into consideration all the important factors like cost of developing one hectare of rubber into maturity, cost of maintenance of one hectare of mature rubber, cost of processing average productivity etc. I suggest the representatives of the manufactures and producers should sit together and evolve such a formula. If you all agree the Rubber Board can act as a mediator between the producers and manufacturers for arriving at correct figures for fixing the prices and tolerance limits periodically. In this connection, I would like to mention that as a result of adopting such a formula for fixing the wage rates of plantation workers, we were not having much labour unrest during the last few years. Therefore I once again urge that we should have an amicable settlement on NR prices between the producers and manufacturers." □

FIRESTONE

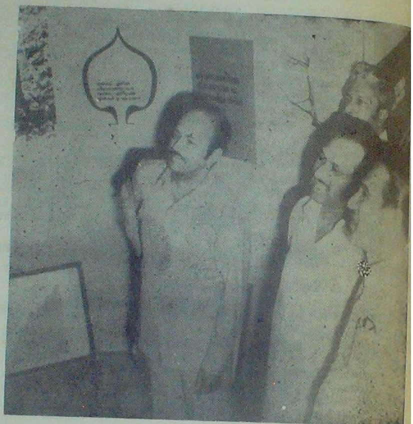
Firestone chose Prescott, AR, as the site for its multi-million dollar EPDM roofing plant. The new factory will have more than 250,000 square feet of production space and produce more than 400 million square feet of roofing per year. The plant will utilize portions of an existing Firestone facility that formerly produced hose. Production is expected to begin next year and the plant will employ approximately 200 people.

(Rubber World)

FARM AND HOME OF AKASHAVANI TRICHUR 15th ANNIVERSARY AT ALATHUR

NEWS IN PICTURES

The 15th Anniversary of the Farm and Home Programme of Akashavani, Trichur was celebrated from 22nd January to 26th January 1983 at Alathur. An exhibition was also organised in connection with the anniversary. The Rubber Board participated in the weeklong programme A one day seminar on rubber was held on 24th January, 1983 The Rubber Board has also put up a pavilion.



The former Chairman Shri. Mohanachandran visited the Board's pavilion at Alathur

A view of the participants of the Rubber Seminar.

The hous
wives assembled the

The variety programmes included Ganamela by Smt. Madhuri, well-known play back singer.

FARMERS MEET

Rubber trees provided shelter for a farmer's meet at Andoor near Marangattupally. The meeting was arranged in a rubber estate on 19th February 1983. Forenoon session was devoted to rubber cultivation. Senior officials of the Rubber Board participated in the discussions.

The rubber seminar at Karikkattoor was inaugurated by Shri K. G. Madhavan Nair, President, Manimala Panchayat.

SASTRADARSAN

A group of rubber growers visited the Rubber Research Institute of India and its experimental plot under the auspices of Marthoma Centre for Rehabilitation and Development, Thelliyoor. Rev Fr.T.P. Koshy was the leader of the group

Rubber Development Project of Modi Rubber Ltd arranged a Sasthradarsan Programme. A good number of growers visited Rubber Research Institute of India under this Programme. Shri. V.K. Bhaskaran Nair, Project Officer of Modi and Shri P. N. Radhakrishna Pillay Jt. Director of Research were present on the occasion.

news and notes

THE PENTAGON ATTEMPTS TO RESCUE A GUAYULE RUBBER INDUSTRY LAGGING

An article under the above heading by Mr Leslie Baird reviews the present position of guayule development programmes in the U, S. A. The introduction reads:

As long as the needed grades of smoked sheet NR are available from the rubber plantations all over the world, the rubber industry puts low priority in a North American source of natural rubber. I use the modifier North American' because both Hevea and guayule rubber are (or have been) produced in Mexico, which is the only country that can boast of a dual source.

If, however, that supply is artificially reduced (as in the British Stevenson cartel of the 1920s) or cut-off by 90% (during World War II) the cry of crisis arises like the guy who never paid any attention to water until the well ran dry.

Synthetic polyisopreue, of course, can fill the gap. But even our petroleum is subject to OPEC embargos and price squeezes. These are the simple but often ignored facts. Having no domestic rubber industry, the U. S. is vulnerable. Efforts to start the cultivated guayule industry which begun in California during the mid-1920s, mortally wounded by the depression of the 1930s and re-established for three years following Pearl Harbour, again surfaced when petroleum feedstocks for synthetics were threatened.

(Rubber World)

RUBBER EXPORT CONTROLS STUDY

Malaysia has asked the United Nations agency which sponsored the establishment of the International Rubber Agreement (INRA) to study the use of export controls to defend depressed rubber prices, said Mr, Paul Leong, Primary Industries Minister.

He asked Mr. Gamani Corea, visiting Secretary General of the United Nations Conference on Trade and Development (Unctad) to provide technical advice to help discussions aimed at improving the pact's effectiveness.

Leong said last month that Malaysia is working out details of export controls for discussion with producing and consuming countries. He said he told Mr. Corea that the pact's buffer stock operations have helped to stop the price slice but are not enough because of the continued economic recession. The Malaysian Government is expected to submit proposals for amendments to the INRA council at its next regular session in May.

(Financial Times)

TO REVIEW ATTITUDE TO RUBBER

The Malayasian Government is to reassess the future of its rubber industry, in the light of depressed prices and changes in consumption patterns. Datuk Paul Leong, Primary Industries Minister, who announced the setting up of a review committee of rubber experts, said the committee should report its recommendations within nine months. The committee, which will include several international rubber specialists, has been asked to look into the supply and demand in the elastomar market over the next 20 years, whether Malaysia should devote so much land and money to rubber cultivation, and whether present research, development and marketing should be less biased toward the needs of Western-based consumers. In retrospect, the Malaysian Government felt "misled" by the projections of rubber experts in the past, who forecast an increasing demand for the commodity throughout the 1980s.

Several international organisations, dealing with agricultural commodities were talking in the late 1970's, of a shortage of natural rubber in the region of half a million tonnes in 1985, and a projected price level of as high as 5 Ringgit (£l. 38) per kilo, partly in response to these optimistic views, Malaysian private estates slowed down their conversion from rubber to oil palm, while the Government started its "dynamic rubber production" policy under which public agricultural agencies such as Felda and Risda gave a greater bias to rubber cultivation in their land schemes. In the past three years, world natural rubber consumption had declined by an average of 4 per cent a year, while output rose by 2 per cent. The fall in car production, the change to longer lasting radial tyres and the trend towards smaller cars, led to sharp falls in rubber consumption.

FIRST SMALLHOLDER HONOURED WITH GOLD MEDAL

Malaysia's very first rubber smallholder, Enick Modh. Isa bin Pandak Mat Aris, now an incredible 124 years old, has been awarded the 1982 Ridley Centennial Medal. The award was made after an in-depth study of the recommendation by the National Rubber Smallholders Association that Encik Modh. Isa should be honoured as the first Malaysian villager to take up the planting of natural rubber on his own land.

Encik Modh. Isa was born in the remote village of Ulu Kenas, near Kuala Kangsar in Perak in the year 1858. At the age of 25, this young, energetic and adventerous man left his village to work in a rubber estate in Selangor. It was there that he acquired knowledge of planting and tapping, which after four years he took back to his village, along with rubber seeds and tapping equipment. A few years later he was able to earn over 500 Malaysian dollars each month from selling his rubber, giving him unheard-of wealth. Soon the whole village had planted rubber and Modh. Isa was hailed as a hero. The story of his success encouraged the establishment of other rubber smallholdings all over the country, and now over 60 per cent of all the rubber in Malaysia, the world's largest producer, comes from smallholdings.

FIRESTONE QUITS EMULSION SBR

Firestone Tire & Rubber Co. announced in mid-November that it will discontinue production of emulsion SBR in 1983, thereby becoming the only one of America's Big Five tyre makers not to have a captive source of the general-purpose polymer used extensively in tyre manufacturing. The withdrawal of the firm's 190,000 tonnes of capacity from the emulsion SBR market will reduce the operational capacity for that rubber in North America by about 15 percent.

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THE QUARTER

The concept of a national diacussion on rubber is well conceived in the sense that it provides an opportunity to have a dialogue between rubber producers and rubber goods manufactures. Since his assumption of the office as Chairman of the Rubber Board, Shri P. J. Thomas has been advocating this prospal as he believes that producing and consuming sectors could exchange their ideas for the healthy development and expansion of the Rubber Plantation Industry in the best intersets of the Nation at large. To assess the present situation and to review the broader aspects of the problem, a National Seminar on Rubber is to be convened in New Delhi on 10 th Sept., 1983 It is expected that the seminar which coincides with the 100 th meeting of the Rubber Board to be held in the Capital on 11 th Sept., 1983, would arrive at conclusions quite in conformity with the views already expressed by Shri P. J. Thomas.

NATIONAL SEMINAR ON RUBBER
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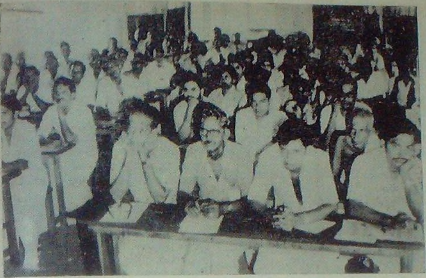
The various far reaching policy decisions taken by the Rubber Board, through the past 99 sittings and subsequent implementation of these decisions, have been largely instrumental in transforming the rubber plantation industry into one of the modernised and growth-oriented agricultural enterprises in the country. When the Board is due to have its 100th meeting, it could well be taken as to have attained a significant phase of progress in its strides ahead. Hence the decision to have the national seminar and Board meeting at the Capital which will facilitate a more intimate interaction with the planners, administrators and decision-makers at various levels in the Union Government.

The "National Seminar on Rubber" scheduled for 10 th September, 1983 has been conceived also as an exercise to foster cordiality and goodwill between the various interests involved in the rubber industry, particularly the rubber producers and rubber goods manufacturers. The Rubber Board had initiated a proposal for stabilising rubber prices at rates remunerative to the producer and affordable to the manufacturer, taking it for granted that these two interests are just two sides of the same coin. To a greater degree, there has been appreciation of the Board's efforts by these two sections. However, there cannot be any dispute about the fact that rubber producing industry and the goods manufacturing industry are complimentary to each other and mutually interdependant. Therefore, one sector cannot exist without the other and what we all should aim at is the "Integrated development of the rubber industry". In view of the national relevance and significance of this concept, it is being accepted as the theme of the Delhi Seminar.

The participants to the seminar are proposed to be drawn largely from the rubber producers and rubber goods manufacturers. Besides an inaugural and valedictory the seminar will have two specific sessions—one on "Rubber Production and related aspects", while the other will be on "Rubber Goods Manufacture and allied interests". Synthetic rubber, Reclaimed rubber, Rubber goods export, Rubber chemicals and Machinery will also be accommodated within these sessions, at the appropriate points.

A factual exhibition highlighting the salient features of rubber production and rubber goods manufacture is also proposed to be organised on the occasion at Vigyan Bhavan.

Those desirous of attending the seminar may please write to the Public Relations Officer of the Rubber Board before the end of July, 1983. Travelling, boarding and lodging expenses will have to be borne by the participants themselves.



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Seminar at Areekara

Shri MG Jagadish Das inaugurated the Seminar held at the St. Rocky's UP School in Areekara on 30th April, 1983, It was presided over by Rt. Rev. Simon Koonthamattom, Vicar General of the Catholic Diocese of Kottayam. He emphasised the need for more dedicated work and requested the local units of the Society to promote rubber cultivation to bring up the living conditions of the small and marginal farmers. Shri VI Varghese, President, Veliyanoor Panchayat also spoke.

About 100 rubber growers from the nearby places like Amanakara, Puthuvely, Monippally, Uzhavoor, Edakoly and Pious

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The Kottayam Social Service Society under the guidance of its Secretary Rev. Fr. Kurisummoottil and Project officer Shri K. Lukose is undertaking various activities focussing at the welfare of rubber growers. Their conscientization programme includes contact meetings with the growers which always help them to attain better knowledge of all aspects of rubber cultivation.

As part of the above programmes, two one day seminars were held at Karinkunnam in Idukki and Areekara.

The Seminar at Karinkunnam was inaugurated by Shri EJ Lukose MLA. Shri ET Varghese presided. Shri PS Kuriakose spoke on the occasion. The participants evinced keen interest in the discussions that followed. S/Shri KK Ramachandran Pillai, Premnath, Chandra Bose and Mohandas Panickar took classes on various topics. Shri PS Kuriakose acted as Director of the Seminar.

The valedictory session held in the afternoon was presided over by Shri VP Mathew, a prominent rubber grower of the locality. Shri K Lukose, Project officer, Kottayam Diocese explained the various activities of the Kottayam Social Service Society and its subsidiary units working in various parts of the District. He also outlined the future programmes proposed to be undertaken by

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Shri Jagadish Das delivering the inaugural address

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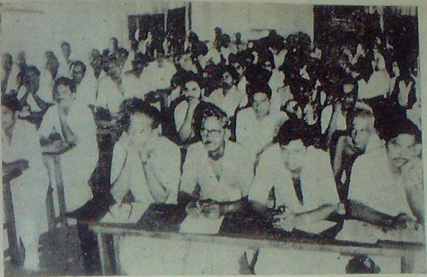

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COCONUT PALMS FROM TEST-TUBE

Coconunt palms can now be produced in a test-tube to produce millions of copies of a single palm by a method developed by British botanists which promises to increase the yield of coconuts.

The first clone of a coconut palm was 'born' in a British laboratory early this year under the tissue culture technique where ordinary cells are developed into plants.

If this is done the average yield of 1.2 tonnes of coconuts per hectare from traditional varieties could be increased to six tonnes in the same area, according to a report in the British journal 'New scientist.'

The report says that the low average yield in the Indian State of Kerala, a major producer of coconuts is partly due to diseases such as root-wilt. Some of the high yielding plants identified by researchers for cloning are resistant to the disease and are thus anideal species for clonal propagation.

In Kerala the average yield per palm per year is 35 nuts. Yet single elite palms have been identified which produce yields of over 400 nuts per year and it will be possible to clone such super palms.

Researchers at Wye College (University of London) have produced the first clonal plantlet after some eight months in culture.

Many thousands of plantlets can be produced each identical to the donor palm in yield or resistance to disease, thus providing growers with uniform and high quality material.

The demand for palm products has risen since the beginning of the 19th century because coconut and oil palm can be propagated naturally only from seed. A grower cannot take cutting since each palm has only one vegatative growing point.

The trouble with growing from seeds is that palms do not breed 'true to type' the off-spring differ greatly in vigour, productiveness and resistance to disease the researchers said.

Low soil fertility may still make high yields elusive but even a small increase in yield could be important in holdings of less than five hectares. Improved yields can not only increase the production of oil and copra but also harvests of husk and shell which are immense potential sources of energy.

The coconut harvest in Philippines in 1978 from millions of coconuts was equivalent in terms of energy to 3.8 billion litres of petrol. (PATRIOT, NEWDELHI)

RUBBER IN CHINA

"Since the liberation, rubber planting picked up expeditiously in China in 1952 resulting in enormous coverage of area. At present 4.53 lakh hectares have been brought under rubber cultivation in China, which yields over 1,40,000 tonnes, elevating China as the fourth largest grower of rubber area-wise and largest producer yield-wise.

Unlike other rubber producing countries China faces a variety of agro-climatic oddities. While the conventional rubber areas are confined to tropical regions lying between 10° South and 15° North of the Equator, China's rubber belt falls between 18° and 24° North-a region considered most inhospitable to rubber.

Very wide daily range in temperature varying from 0°C at night to 20°C during day time and high velocity typhoons are certain other inescapable features of Chinese climate. Similarly long drought seasons, poor soil and frequent cold waves impose severe constraints on the suitability of China to plant rubber.

Rubber trees tend to die of frost bite when temperature drops below zero. During the past three decades it is reported that China has been hit at least on seven occasions by extreme cold spells. The cold wave of 1955 killed almost all the rubber trees planted on thousands of hectares belonging to three State farms. Those trees which survived the hazard, were identified by researchers to be bred as parents of cold resistant strains. The seedlings were nurtured in a low-temperature nursery. A variety of hybrid cold resistant rubber tree was also cultivated."

Based on the report of the visit of Shri PJ Thomas, Chairman, Rubber Board and Dr. MR Sethuraj, Director, Rubber Research Institute of India.

The Association of Planters of Kerala organised a seminar on "New Developments in Rubber Production and Processing" at the Malabar Hotel, Willingdon Island on 29th December, 1982 with the active collaboration of the Rubber Board. The following papers were presented:-

Highlights on the diseases and pests of Rubber.
By
CR Nehru
Rubber Board

Advanced Planting Materials
By
MS Abraham
Shaliacary Estate

Highlights of Agronomical Investigations in Rubber
By
Dr SN Potti
Rubber Board

Chemical Weed control in Immature Rubber
By
R Balagopala Kurup
Pudukad Estate

Shri CR Nehru in his paper briefly analyses the control measures of diseases and pests. Shri MS Abraham writes on the experiments conducted in Shaliacary estate on the advanced planting materials. His revelations are mainly based on the personal experiences. Dr. Potti's brief note concentrates on agronomical investigations. Shri R. Balagopala Kurup writes on chemical weed control in immature rubber estates.

All the papers presented at the Seminar are included in this issue. Apart from highlighting the latest trends in different aspects, the papers would suggest guidelines in respective field and give an insight into the subject.

NEW DEVELOPMENTS IN RUBBER PRODUCTION AND PROCESSING

1. HIGHLIGHTS ON THE DISEASES AND PESTS OF RUBBER

Pathology Division is mainly concerned with the control of diseases and pests of rubber and the establishment of suitable cover crops. Studies on crown budding of high yielding clones susceptible to abnormal leaf fall disease caused by the fungus *phytophthora* with disease resistant/tolerant clones revealed that the tolerant clones F 4542, FX 516 and RRII 33 have definite influence on the trunk of RRIM 628, in increasing the yield. Whereas on the trunk of GT 1 these clones have depressing effect on yield. In the trunk of RRIM 600 there is no significant influence of the crown on yield. The yield data is furnished below.

Yield data during 1981.

Name of clone	Mean yield/Tree/Tap in grams: Kaliar Estate	Shaliacary Estate	Kinalur Estate
F 4542	62.44	41.00	29.51
FX 516	56.94	37.94	34.55
RRII 33	55.44	39.89	29.50
Control	40.78*	34.89**	47.19***

* RRIM 628 ** RRIM 690 *** GT 1

All these three clones have good tolerance against abnormal leaf fall disease. The percentage of leaf retention is given below.

Name of clone	% of leaf retention during 1982: Kaliar Estate	Shaliacary Estate.	Kinalur Estate
F 4542	69	56	85
FX 516	72	57	99
RRII 33	70	84	84
Control	14*	68**	51***

*RRIM 628 **RRIM 600 ***GT 1

Aerial spraying with Aliette, a systemic fungicide, against *Phytophthora* leaf disease was carried out in 16 estates, in four regions, during the 1982 spraying season at the rate of 5 kg of the fungicide in 40:1 of water per hectare. But the results were not encouraging as in the previous year. Good results have been obtained in the fogging trials conducted with TIGA fogging machine against *Phytophthora* leaf fall using 30 and 25:1 fungicide mixture hectare in the proportion of 1:4 Copper Oxychloride in spray oil. The precentage of leaf retention is given below.

Sl. No	Location	Percentage of leaf retention	
		Fogging trials COC in oil 1.4 proportion (30/25 1/ha)	Control COC full dose 1.6 portion oil/water
1.	Ayiranalloor	77 (30 1)	45 (Water based)
2.	Shaliacary	66 (30. 1)	53 (Oil based full dose)
3.	Kodumon	68 (25. 1)	35 (Water based) Micron dose 28 1/ha)
4.	Pullangode	84 (25. 1)	92 (Oil based full dose)

A total number of 130 regional isolates of pathogens of rubber diseases, especially *Phytophthora* is being maintained. Compatibility studies were carried out in the case of 6 *Phytophthora* isolates. Studies on clonal susceptibility of hand pollinated clones to Abnormal leaf fall disease continue. Attempts have been made to standardise the techniques of pressure injection by keeping 2½" depth of injection hole and 70 lbs pressure. Experiment on copper residue in sprayed area with different doses is being continued. The budwood plants of the tolerant and susceptible clones are being maintained for physiological specialisation studies.

Field trials to evaluate the effect of cover crops *pueraria phaseoloides*, *Mucuna bracteata* and *Calopogoninm caeruleum* on the growth of rubber have been conducted. *Mucuna* shows comparatively vigorous growth and quick spreading habit. Cattle won't feed this cover crop. Trials on the rate of establishment of these cover crops moisture-retaining capacity, and nitrogen fixing efficiency are in progress at three locations. Studies to assess the effect of *Azotobacter* on the girth, height and growth of rubber seedlings continued. *Beijerinckiana* sp. and other nitrogen fixing, less slime forming, bacteria were isolated from *Calopogoninm* raised area. The rooted cuttings of Mucuna are being distributed to planters.

Results of the field trial on the control of root grubs reveal that broadcasting of granular insecticides at the time of sowing seeds is more effective than application along with seeds. Plots treated with Sevidol 4:4G at 25 kg/ha recorded the lower plant mortality (1.5 to 2%) compared to control plots recording 42 to 45.5% plant mortality. Temik and Landrin baits proved to be more effective followed by Furadan, Thimet and Sevidol baits against rats. Broadcasting of granular insecticides at the entrance of burrows was ineffective. *Macaranga peltata* and *Michelia champaka* were identified as alternative hosts of gallery-making caterpillar. Landrin 15 G proved to be a more effective molluscicide than Temik 10 G in laboratory tests. Aldrin 0.2% is found to be most effective against termites even in the 4th year. Pot culture studies to assess the comparative efficacy of nematicides on the nematode population, growth, nodulation and nitrogen fixation of the cover crop, *Pueraria phaseoloides* revealed the efficacy of Furadan 3G, Temik 10G, Thimet 10G and Dasanit 5G in the descending order.

Three bee forage plants viz., *Antigonon, leptopus, Callistemon lanceolatus* and the fast growing *Manihot glaziovii* were well established at RRII as alternate sources of nectar and pollen for the bees during the dearth period. □

2. ADVANCED PLANTING MATERIALS

We are now on a mission to find out a wonder rubber tree which gives us the maximum yield with the minimum possible time. Of course, such a tree does not exist. However, research and development work in all the rubber growing countries are in progress to achieve this objective.

Many suggestions are being made by Research Institutes on various aspects of this problem. The planters have to put them into practice. A small holder cannot do the experiment in his small plot. The big planters should take up this as a challenge and be prepared to withstand the loss if any, from possible failure.

Polybag Planting

The accent now-a-days is on Polybag planting. Wide publicity is given and much is written about the advantages of this type of planting. How far this optimism is justified is yet to be evaluated.

We have been trying this method from the year 1979 onwards and fairly large areas have been brought under polybag planting.

The table gives the girth measurements of the various plantings. In the case of Polybags our experience has been that in the first year the girth increase has been the least; thereafter it has been progressing fast. To illustrate –

	1979 R. P.	1980 R. P.
1st Year	3.10 cm	4.68 cm
2nd Year	4.95 ,,	6.49 ,,
3rd Year	7.03 ,,	4.61 ,, (6 months)
4th Year	4.48 ,, (6 months)	

Green budded polybags follow a similar pattern.

Average girth at the end of 3½ years in 1979 Polybags is 25.26 cm and in 2½ year old 1980 R. P., it is 21.58 cm

Difference in girth in December, between Polybags plants and Budded stumps in the 1979 R.P., is 1.92 cm. and in the 1980 R. P. 4.81 cm.

The average girth of Budded Stump is 23.34 in 1979 & 16.77 in 1980 R. P. The question is whether the difference will still narrow down further and the BS catch up with the polybag plants

It will be noted that 1980 R.P. presents better growth of Polybags-There are several reasons for this. 1979 Polybag plants had only 2 whorls of leaves. It was transported by vehicles over a long distance. No. of wet days in 1979/80 was 134 against 164 in 80/81. So other factors also influence growth to a great extent. All comparisons therefore have their limitations.

As far as Shaliacary is concerned, we normally take up our new areas into tapping in 5 years and 8 months tappable trees 50% to 70%. We have done so in 1975 R. P. and 1976 R. P. We are putting the 1977 R. P. under knife in March 1983. Of course clonal difference will be there.

Hence, unless we can bring the polybag plants into tapping in at least 5 years, if not less, what is the great attraction? If a large estate with all the infrastructure facilities cannot achieve this, we cannot expect a small holder to do this, in the normal course.

There is, nevertheless, the other advantage of a fairly uniform stand, and a very low percentage of loss in the field, etc. which will compensate for the higher cost involved. Cost of our polybags Ex-Nursery had been Rs 4/26 in 1979, Rs. 4/50 in 1980, Rs. 4/73 in 1981 and Rs. 6/60 in 1982.

Stumped budding

I shall now go on to the next method of planting we are experimenting with-Stumped Budding.

In 1978, we planted about 182 Stumped Buddings which included some ministumps also. Planting could not-take place as it should have been, with the different stages like tailing of the tap root, clipping of the leaves, early pollarding of the Stump at 8/10 feet etc., we had to act in a hurry to beat the monsoon. 53 plants dried off in the ensuing summer. Of the balance 129, 47 plants now have an average girth of 46 cm-in just 4½ years after planting. Most of the others are in the range of 35 to 45 cm.

In 1978, itself, we decided to try out a larger area under stumped budding in the future. So we had the seedling Nursery in

1978 September	... Seedling Nursery
1979 May/Oct.	... Budding
1979 December	... Cut back
1981 June/July	... Planting (18 months)

From the details given separately it would be noted that girth increase for the first one whole year has been only 1 cm. This for GT 1; for PB 5/51 it has been even less at 0.7 cm. But for the next 6 months, it has been 5.66 and 4.25 cm. repsectively. The stumped Buddings of 1981 have now attained an average girth of 17.66 cm. – in 1½ years.

The cost of Stumped Buddings in 1981 was Rs. 3/75.

A stumped budding should come into bearing in 4 years from planting. Our 1981 area should be tapped in Sept./Oct., 1985 i. e. in 4 years, 2 months: in other words in another 2 yrs 9 months. The average girth increase should be 12 cm per year. It is just posssible. There is that possibility that in the 1985 conference if we have one, we might be able to report that this area had already been taken up for tapping.

There has been no growth in the first year, since there was almost nothing for the plants to grow on. The plants were just establishing themselves and continuing with their maintenance growth for the first year–at least till the first showers in the next monsoon. No root system to speak of – no shoot system big enough to supply material for both existence and growth.

With the showers in 1982, more flush was produced and there was a tremendous pick up. Foliage area greatly increased and the growth rate also picked up.

With proper attention now, it may be possible to register a real breakthrough in reducing the immaturity period.

But it is felt that stumped Budding may be suitable only for the Southern Districts where there is a more distributed rainfall. For the North, in the same way, there would be a strong case for using polybag plants rather than budded stumps. The former would be fairly well established during the wet months to meet the onslaught of summer, is much harder in the Northern districts than the South.

The following points may be remembered with advantages while using Stumped Budding:-

1) Weather conditions at the time of transplanting is a critical factor. If the weather is too dry and hot, failures will be very high too.

Aerial spraying with Aliette, a systemic fungicide, against *Phytophthora* leaf disease was carried out in 16 estates, in four regions, during the 1982 spraying season at the rate of 5 kg of the fungicide in 40:1 of water per hectare. But the results were not encouraging as in the previous year. Good results have been obtained in the fogging trials conducted with TIGA fogging machine against *Phytophthora* leaf fall using 30 and 25:1 fungicide mixture hectare in the proportion of 1:4 Copper Oxychloride in spray oil. The precentage of leaf retention is given below.

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The average girth of Budded Stump is 23.34 in 1979 & 16.77 in 1980 R. P. The question is whether the difference will still narrow down further and the BS catch up with the polybag plants.

It will be noted that 1980 R.P. presents better growth of Polybags-There are several reasons for this. 1979 Polybag plants had only 2 whorls of leaves. It was transported by vehicles over a long distance. No. of wet days in 1979/80 was 134 against 164 in 80/81. So other factors also influence growth to a great extent. All comparisons therefore have their limitations.

As far as Shaliacary is concerned we normally take up our new areas into tapping in 5 years and 8 months tappable trees 50% to 70%. We have done so in 1975 R. P. and 1976 R. P. We are putting the 1977 R. P. under knife in March 1983. Of course, clonal difference will be there.

Hence, unless we can bring the polybag plants into tapping in at least 5 years, if not less, what is the great attraction? If a large estate with all the infrastructure facilities cannot achieve this, we cannot expect a small holder to do this, in the normal course.

There is, nevertheless, the other advantage of a fairly uniform stand, and a very low percentage of loss in the field, etc. which will compensate for the higher cost involved. Cost of our polybags Ex-Nursery had been Rs 4/26 in 1979, Rs. 4/50 in 1980, Rs. 4/73 in 1981 and Rs. 6/60 in 1982.

Stumped budding

I shall now go on to the next method of planting we are experimenting with-Stumped Budding.

In 1978, we planted about 182 Stumped Buddings which included some ministumps also. Planting could not-take place as it should have been, with the different stages like tailing of the tap root, clipping of the leaves, early pollarding of the Stump at 8/10 feet etc., we had to act in a hurry to beat the monsoon. 53 plants dried off in the ensuing summer. Of the balance 129, 47 plants now have an average girth of 46 cm-in just 4½ years after planting. Most of the others are in the range of 35 to 45 cm.

In 1978, itself, we decided to try out a larger area under stumped budding in the future. So we had the seedling Nursery in

1978 September	... Seedling Nursery
1979 May/Oct.	... Budding
1979 December	... Cut back
1981 June/July	... Planting (18 months)

From the details given separately it would be noted that girth increase for the first one whole year has been only 1 cm. This for GT 1; for PB 5/51 it has been even less at 0.7 cm. But for the next 6 months, it has been 5.66 and 4.25 cm. rapsectively. The stumped Buddings of 1981 have now attained an average girth of 17.66 cm. – in 1⅓ years.

The cost of Stumped Buddings in 1981 was Rs. 3/75.

A stumped budding should come into bearing in 4 years from planting. Our 1981 area should be tapped in Sept./Oct., 1985 i. e. in 4 years, 2 months: in other words in another 2 yrs 9 months. The average girth increase should be 12 cm per year. It is just posssible. There is that possibility that in the 1985 conference if we have one, we might be able to report that this area had already been taken up for tapping.

There has been no growth in the first year, since there was almost nothing for the plants to grow on. The plants were just establishing themselves and continuing with their maintenance growth for the first year–at least till the first showers in the next monsoon. No root system to speak of – no shoot system big enough to supply material for both existence and growth.

With the showers in 1982, more flush was produced and there was a tremendous pick up. Foliage area greatly increased and the growth rate also picked up.

With proper attention now, it may be possible to register a real breakthrough in reducing the immaturity period.

But it is felt that stumped Budding may be suitable only for the Southern Districts where there is a more distributed rainfall. For the North, in the same way, there would be a strong case for using polybag plants rather than budded stumps. The former would be fairly well established during the wet months to meet the onslaught of summer, is much harder in the Northern districts than the South.

The following points may be remembered with advantages while using Stumped Budding:-

1) Weather conditions at the time of transplanting is a critical factor. If the weather is too dry and hot, failures will be very high too.

TABLE

Polybag plants & Budded stumps

(Girth in cm. at 125 cm.)

	1979 J/July	1979 Dec.	1980 J/July	1980 Dec.	1981 J/July	1981 Dec.	1982 J/July	1982 Dec.
'79 GT 1 PB		5.70	8.80	11.00	13.75	17.90	24.78	25.20
Increase			3.10	4.95			7.03	4.43
'79 GT 1 BS			6.30	8.47	11.85	16.36	18.87	23.34
Increase			6.30	5.55			7.02	4.47
'80 GT 1 PB			5.80	7.09	10.48	13.86	16.97	21.58
Increase				4.68			6.49	4.61
'80 GT 1 PB (Green Bud)			2.60	4.03	6.57	10.50	13.96	17.68
Increase				3.97			6.39	3.72
'80 GT 1 BS								16.77

Stumped Budding

(Girth in cm. at 125 cm.)

	1981 J/July	1981 Dec.	1982 J/July	1982 Dec.
'78 PB 28/59				46.00
'81 GT 1	11.00	11.40	12.00	17.66
Increase			1.00	5.66
'81 PB 5/51	11.00	11.30	11.70	16.95
Increase			0.70	4.25

2) You get caught if rains fail after you prune and the buds start swelling.

3) Extreme care is to be taken in transporting the stumps. No vehicle transport. Root not allowed to dry.

4) White washing of the stumps repeatedly if necessary.

5) Watering if warranted

6) Heavy mulching should be resorted to.

7) Split dose manure if possible.

8) Tailing about 40 days prior to planting & pruning about 10 days.

9) Selective removal of branches. To start with 10/15 or even more shoots present. All shoots below 9 feet may be promptly removed. The balance is allowed to grow. In an Year's time selective pruning that leaves 3/5 good branches.

While on this just as we have to remove branches for the 'Stumped' Budding, it is also worth while to remember, that branching must necessarily be induced in the case of polybags. If the polybag Plants do not branch between 8/10 feet the initial advantage is almost completely lost, the plant just going up straight and spindle like.

It is my personal view that further plantings using the two methods should be continued. I do not think that any polybag area has been brought into tapping yet, much less a stumped budding. But any programme aimed at reducing the immaturity period should be vigorously pursued. You not only start getting yield earlier, but you save the upkeep of an immature area for varying periods, depending on how much time you save.

I am grateful to the organisers of this conference for extending to me this opportunity, and to my Company–the A.V. Thomas Group Companies - for permitting me to make use of it.

3. AGRONOMICAL INVESTIGATIONS IN RUBBER

With a view to studying the response to irrigation of rubber plants at various stages of growth and to find out the economic feasibility of this practice exhaustive field trials are programmed in traditional and non-traditional rubber growing tracts. A small scale observational trials was taken up during 1981, in a small holding at Cannanore District. The percentage increase due to irrigation once in ten days over the pre treatment yield ranged from about 10 per cent in October to 25 per cent in February-March. For irrigation trials in mature area at Vettilappara estate drip irrigation unit has been installed.

The trial on planting practices started in 1976 with polybag green budded plants 75% attained tappable girth in conventional field-planted brown budded stumps and stumped buddings.

Mean girth of plants (6½ years)

Planting	Mean girth	% tappability
1. Polybag	53.46	73.36
2. Conventional	47.20	39.50
3. Stumped budding	43.13	40.18
4. Seed at stake	31.02	nil

Growth data recorded from intercropping trials started in 1976 revealed that the girth of plants in the Nendran banana intercropped plots is on par with legume cover area.

Mean girth and girth increment of plants under various intercropping

Treatment	Mean girth (cms) 1979	1982	Mean girth increment
Nendran banana	18.22	44.11	25.89
Non nendran banana	15.24	43.08	25.89
Tapioca	14.69	41.67	27.07
Cover crop	16.19	44.64	28.48

Eventhough Nendran banana had a favourable effect on growth during initial years, the girth increment is high in plots where leguminas ground covers were established in the year of planting itself. In the intercropped plots the cover crop was established from the third year.

In a glass house study, it was found that coating of fertilizers with neemcake and tar results in reduced rate of nitrification in rubber growing soils. Structural evaluation of rubber growing soils under natural and legume covers indicated that the mean diameter of the coarse water stable aggregates was high under leguminous cover in area. In soils under legume and natural cover area coarse water stable aggregate was higher (91.6) as compared to natural cover (83%). □

4. CHEMICAL WEED CONTROL IN IMMATURE RUBBER

Introduction

This paper deals with preliminary indications in the comparison of Chemical Weed Control against Manual Weeding. This is also intended to evoke interest in weed management at economic levels.

Plant growth is dependent on the biogenic potential of the plant, bio-eco system of the soil and the environment. Weeds constitute one of the major constraints, causing considerable expenditure. Rubber in its first two years does not occupy an area more than 10-15% of the land, leaving the balance portion exposed to weed population. As root competition is very high during this period, cost of weed control also tends to be high.

Material and methods

Trials are being conducted in Pudukad Estate of the Cochin Malabar Estates & Industries Ltd., since May 1982. The trial plots consisted of two five acre plots under Chemical Weedicides and a five acre plot under Control, i. e., Manual Weeding.

The first five acre plot, under Chemical Weed Control, received an initial blanket spray in the month of May 1982, using Gramoxone and Fernoxone, in combination with pre-emergent weedicides, Diuron. This was followed, six weeks later, by a cocktail of Gramoxone and Fernoxone and in due course a round of spot spraying of unaffected weeds.

The second five acre plot had almost the same treatment, as the first plot except that no pre-emergent weedicide was used in the initial blanket spray.

The third plot or the control plot had only normal hand weeding rounds. Details of treatments adopted are summarised below:-

Plot No.	Acres	Initial Blanket spray May 1982	Regular Weedicide Spray July 1982	Spot Spraying September 1982.	
1.	5	2 lit Gramaxone +500 grm Fernoxone + 500 grm. Diuron	5.5 lit. Gramaxone + 5 Kg. Fernoxone.	4.5 lit. Gramaxone + 1 kg. Fernoxone.	
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The first blanket spraying was done during May, before planting rubber. Since symptoms of 2,4-D toxicity were noticed on the tender shoots of budded stumps during the second round of spraying, use of Fernoxone was progressively reduced. This highlights the importance of adequate precaution against drift of spray.

One round of hand weeding was done for plant bases in the chemical weed control area to avoid the risk of chemicals damaging the tender shoots by spraying near the plants. No chemical weed control measures were found necessary since 15-9-1982.

Cost analysis:

(a) Chemical Weed Control - Total 10 acres

	Unit.	Rate	Total Rs.
Total Workers	63	13.80	869.40
Gramoxone	24 lit.	85 00	2040.00
Fernoxone	13.5 Kg	38 50	519.75
Hand Weeding around the plant bases	59	13.80	814.20
Grand Total			4243.35

Average Cost per acre Rs. 424/-

(b) Manual Weeding-5 Acres

Hand Weeding-141 workers @ Rs. 13.80 Rs. 1645.80

Average cost per acre Rs. 389/-

Expenses do not include cost of Diuron under (a).

Fringe benefits to workers are not taken into account.

Discussion:

The trials are to be continued for another two years. The chemicals were found to have controlled the growth of weeds in a reasonable measure. No appreciable difference in weed growth was noticed, where Diuron was used, indicating perhaps that use of this pre-emergent weedicide can be avoided in weed situations obtaining on this estate.

On a visual assesment, plants in the chemical weed control area appear to be healthier than those in the control area. This aspect can, probably, be better assessed during the next year. A fourth round of weeding is underway, in the manual weeded plot, while the weed population in the chemically treated area does not warrant any other spraying round. At the same time, it has to be observed, that in the weedicide plot, there is not adequate green matter for mulching the plants, a necessary operation at this time of the year. The tentative assumptions are:-

(1) Chemical weed control is almost as expensive as manual weed control in the first year, with every possibility of that becoming cheaper than manual weeding in the subsequent years, because of reduced rounds of treatments required.

(2) Chemical weeding aims at reduced employment of large gangs of casual workers with attendant commitments, like E. P. F. Membership.

(3) Manual weeding costs are bound to go up with escalating wages and D. A. in the coming years.

Acknowledgment:

My thanks are due to Mr. K. R. Menon, Executive Director, the Cochin Malabar Estates & Industries Limited, for encouraging me to present this paper. □

MORE LAND FOR RUBBER PLANTATION IN TRIPURA

Mr Dasarath Ceb, Deputy Chief Minister, Tripura said that the state government had taken up scheme to bring 9,750 hectares of land under rubber plantation in the course of next 10 years

He said the state Government had set up Tripura rehabilitation Plantation corporation for rehabilitation of Jhumias, (tribals engaged in shifting cultivation) in a planned way through rubber plantation The board of directors would be constituted shortly with a managing director, he added.

According to the deputy chief minister 450 hectares of land would be brought under rubber plantatian during the current year.

A STABLE PRICE-PRE-REQUISITE FOR TOTAL WELFARE: PJ THOMAS

In his impressive performance at the 99th meeting of the Rubber Board held on 4th May, 1983, Shri. P. J. Thomas, Chairman, Rubber Board, reiterated his desire to work for the total welfare of the Rubber Plantation Industry in India. He said that the components that go into this system viz., the rubber producer, the rubber goods manufacturer, the rubber trader and the labour are interdependent. To that extent, they are indivisible and inseparable. He was delivering the inaugural address for the first time since he assumed office as Chairman, Rubber Board.

While discussing the total welfare of the rubber industry, he said that 'the most essential pre-requisite is a stable price for rubber – a price remunerative both to the producer and manufacturer. The process of development could be accelerated only by maintaining harmonious relations among various segments based on appreciation and trust. He was hopeful that something positive would emerge in the near future. Analysing the rubber situation, Shri. P. J. Thomas went into the details of all the problems being confronted by the plantation industry. The full text of his speech is reproduced below:–

Natural Rubber production has touched an all time high of 166,000 tonnes during 1982-83 registering an impressive growth rate of 8.6% over the previous year, while the consumption increased only by 3.5% i.e. 195,000 tonnes. 33,000 tonnes of NR was imported last year to fill up the deficit. The stock on hand at the close of the year 1982-83 is provisionally put at 44,000 tonnes. The projected production of NR for 1983-84 estimated by the Statistics and Import/Export Committee which met at Madras on 28th February last is 175,000 tonnes, while the consumption is estimated within the range of 198,000-203,000tonnes, depending on a variety of factors. Taking into account the carry over from the previous year and the stock reserve to be maintained within the country, the likely deficit has been put in the range of 27,000-34,090 tonnes. Of course, this needs periodical revision based on the performance of both the producing and the consuming sectors.

> **9,90,99**
>
> In his first inaugural address to the 99th meeting of the Rubber Board held on 4th May, 1983, Shri. PJ Thomas Chairman Rubber Board has said that he is the 9th Chairman of the Board having the privelige to preside over the 99th meeting after 90 days of his assuming office.

The rubber growing zones were badly hit as you are all well aware, by an unprecedented drought and as a result the production in April is likely to be a little lower than expected. This has caused a temporary rise in prices. Since pre-monsoon showers have commenced now, I hope that perfect normalcy would be restored soon.

Achievements

The Rubber Plantation Development Scheme of the Board has made satisfactory progress since the last meeting despite the shortage of adequate staff. We have been able to clear about 27,000 pending cases in about 8 months time. This is no mean achievement. Still there are about 36,000 cases requiring clearance, besides 1983 applications and efforts have to be intensified in a bid to liquidate them. We have touched new heights of efficiency when we disbursed Rs 5 crores 2 lakhs as planting subsidy in 1982-83, by exceeding the target by Rs. 2 lakhs. This is an all time record. Similarly we collected Rs. 6.4 crores as cess this year against the targetted figure of Rs. 6.3 crores-the largest revenue ever realised by the Board. For the first time the Board incurred a total expenditure of Rs. 10 crores, substantially exceeding the cess collection for the same year.

> **TRIBUTES**
>
> Shri. PJ Thomas, Chairman paid tributes to the galaxy of his distinguished predecessors who had very ably steered the affairs of the rubber industry. He also said that the immediate past Chairman of the Board Shri. K. Mohanachandran from whom he took over also has done marvellously well during his tenure despite the additional burdens he had shouldered.

Had it not been for the dedicated efforts of our officers and staff these significant achievements would not have been possible.

The total subsidy disbursed by the Board under the replanting scheme since its inception is around Rs. 19 crores, out of which more than Rs. 13 crores have gone to the small holders. The total area replanted with the Board's aid is over 53,000 hectares. About 35,000 hectares of the replanted area have come under tapping which yields at least more than 3 times of what they were yielding earlier. The

Shri PJ Thomas addressing the 99th Meeting of the Board

resultant gains to the exchequer have been substantial.

Recently I had visited most of the non-traditional zones for an on the spot study and to assess the scope for development. Tripura has made real headway. Other States in the N. E. Sector do follow suit. Goa and Maharashtra, especially the Konkan area, are also falling in line. Development of these tracts are being vigorously pursued, and need-based infra-structural support are also being organised in a phased manner.

The Katchal Rubber Plantation Project which was under the Board's possession for over a decade has been formally handed over by me to the Andaman-Nicobar Forest and Plantation Development Corporation on 4th April, 1983.

The Research projects of the RRII are progressing satisfactorily. A remarkable stride made recently is the success achieved in developing tissue culture of rubber plants by the National Chemical Laboratory Pune with the active co-operation of the RRII. This achievement points to the fact that genetic engineering holds out great promise for developing homogenous clones of rubber, blended with desirable characters like high yield, disease resistance, drought tolerance, proliferous root system etc. The RRII has to undertake a sponsored research programme with the NCL to facilitate routine mass production of the progenies, for which a proposal has been placed before you.

In addition, the RRII has already submitted an International Research Programme on production physiology to the International Rubber Research and Development Bord (IRRDB). The IRRDB is seeking international funding for a lot of projects on natural rubber and it is likely that our programme may be able to secure their approval and financial aid.

The Department of Rubber Processing vigorously continued its efforts for the organised processing and marketing of small holders rubber, through the co-operative sector. The crump rubber factory at Palai has been re-commissioned with expanded capacity. The other two factories at Kozhikode and Kanjirapally will go on stream shortly resulting in tangible conversion of small holders crop into technically specified rubber. Three more crumb rubber factories at Muvattupuzha, Thodupuzha, and Palghat are also under different stages of establishment. All these factories are in the process of opening and operating Smallholders' Development Centres on the AMUL pattern for collection of the produces, transfer of techniel knowhow and distribution of inputs required for optimum production. A scheme to provide financial aid to promote such centres is with the Government of India. Also we are planning to assist establishment of small scale modern processing units under each Co-operative Society to promote the concept of group processing and organised marketing.

To ensure successful implementation of the existing schemes and to imbibe these new ideas, the rubber marketing co-operatives and their apex Federation need revitalization and strengthening. Realising this, the Board has taken steps to bring all the concerned agencies around one table. Since my taking charge as Chairman we had four such meetings in which the Registrar of Co-operative Societies also took very keen interest. I am sure that the strategies evolved in these meetings supported by the additional finances the Board can now give to the societies and Federation, will go a long way in improving the marketing of small holders' rubber.

Plans for the future

As soon as I took over I had conveyed to you all my earnest desire to work for the total welfare of the industry. All the components that go into this system, viz. the rubber producer, the rubber goods manufacturer, the rubber trader, and the labour are interdependant. To that extent they are indivisible and inseparable. I reiterate that it will be my special endeavour to ensure the fairest deal to all these segments.

Both the rubber plantation industry and the rubber goods producing industry which are in fact two sides of the same coin are predominantly an affair of the small scale sector. Out of 2.30 lakhs plantation units only 553 are above 20 hectares level. Similarly out of 3300 manufacturing units only 12 are major auto tyre companies. It is in the interest of the Board to see that both these sectors develop in an orderly manner. Evidently, to ensure this, priority has to be given to the small scale sector which is weaker and vulnerable.

Stable price

While discussing the total welfare of the rubber industry, the most essential pre-requisite, I feel, is a stable price for rubber–a price remunerative to the producer and affordable to the manufacturer.

To evolve an agreeable price pattern I had suggested at the Madras meeting of the Board's Import/Export Committee that the Producer and Manufacturer should sit across and discuss. On behalf of the Rubber Board I had offered to mediate such a dialogue. The faster we do this the better. It is the harmonious relations between various segments based on mutual appreciation and trust that would accelerate the process of development.

It is gratifying to note that there has been encouraging response from all the sectors to my offer and I hope that something concrete would emerge soon.

Another relevant point, which I would like to share with you in respect of price stabilisation is the constraints experienced by the Board in playing a constructive role in enforcing stability. Though Section 8A of the Rubber Act clearly stipulates that it shall be lawful for the Board with the previous approval of the Central Government to import rubber for sale or to purchase rubber in the internal market at such prices as the Central Government may fix, the Board has not been able to do this for want of authorisation. The Rubber Board is anxious to keep under control the wide fluctuations in prices. The Board would like to stabilise the price with leverage to swing only within a limited range mutually agreeable to the producer and the manufacturer. If this can be done, the Board should be able to take prompt action by importing rubber, purchasing it in the internal market, or buffer stocking at times when prices tend to go below the desirable levels and release such stocks when prices tend to rise above reasonable levels.

Also the Act points out in Section 9B that all sums realised by sale of imported or purchased rubber under Section 8A shall be credited to a Pool Fund which is to be utilised for the rehabilitation of small growers. Since Import of rubber is entrusted to STC the small grower is naturally deprived of his rightful share accruing from the sale of such rubber.

The Board would be the ideal agency to do the job because it feels better the pulse of the grower as well as the consumer than any one else. Much of the discrepancies in timing quantity allocation etc. could be best resolved if the Board is entrusted with the task. I would like to have the learned views of the members on this point.

Technology transfer

Another proposal which I would like to moot, is the immediate need for enlarging the techno-economic base of rubber industries in the country, especially the small scale sector. Recenly I had deputed two of my officers to Delhi and Haryana for an on the spot study of the rubber based industries in that area, and identify the problems experienced in respect of technology, availability of quality raw materials at competitive prices, marketing arrangements, etc. They have reported that the entire state of affairs leaves much to be desired.

To obviate these constraints I feel that the Board should lay emphasis on provision of technical assistance and advisory services to small scale rubber goods manufacturers besides arranging the supply of quality rubber through existing trade channels and ensuring price stabilisation. Also the Board should provide training services to meet the requirement of the entreprenuers. If the Board succeeds in achieving this, even small growers of rubber can take up manufacture of rubber products within their own courtyards utilising the raw rubber they produce in their holding and employing family labour. Such a course of action would enable the rubber producers to market their produce as value added rubber products and enhance economic viability of their holdings. This would also help to generate training and employment opportunities not only to the family members of the producers, but also to the dependents and family members of their workers.

In order to put this idea into operation the Board envisages to create a special set up in the immediate future and cater to the needs of the small scale industries sector in an effective manner.

Extension

It is now wellknown that, as a result of our research activities on Natural Rubber production we have the knowhow to produce at least an average of 2000 kg. rubber per hectare/year though our national average production is only about 830kg/hectare/year. The only reason that can be attributed for this wide gap is that our plantations particularly small holdings are maintained, exploited and managed at a very low technology level. Therefore, I feel that there is a lot for us to do for the transfer of technology to the grass root level with a view to bridging the gap. Hitherto, we were trying to transfer the technology through our field staff whose main occupation was to implement the development schemes of the Board. But as you are aware, with this arrangement we are not in a position to ensure that all the available knowhow is being put into practice even in the new plantings/replantings subsidised by the Board. A team of properly trained extension officers are to be given the responsibility of undertaking the extension activities of the Board geared to production, if we want to bridge the gap expeditiously. Realising this, a proposal was drawn up and the same after thorough scrutiny of the Planting Development and Extension Committee and the Executive Committee of the Board is now before you for consideration.

Labour Welfare

Unfortunately over 70% of the workers employed in rubber plantations are outside the purview of the Plantation Labour Act simply because they happen to be employed in smallholdings. The number of workers so left outside the protection of the Plantation Labour Act is over 130,000. They do not enjoy any social security benefits. The Labour Welfare Committee considered this need and has placed before you for consideration a plan to cover at least 100,000 workers under the protection of a Welfare Fund operated by a Trust. The fund will be generated by annual contribution of Rs. 2/-from each worker, Rs. 4/-from the employer and Rs. 6/- from the Rubber Board. Out of this fund accident insurance benefit will be extended to each worker under the "Swaraksha" scheme of the United India Insurance Company. The remaining fund will be utilised to give other emergency help and retirement benefits to the workers participating in the scheme.

Building at Kottayam

The long felt need of having its own building to house all the offices of the Rubber Board now functioning in rented buildings at Kottayam is materialising soon. Acquisition proceedings of the land is almost complete and the land would be handed over to us shortly.

Steps are also afoot to acquire own accommodation for the Board at Delhi, Bombay and Trivandrum.

New Regional Offices

Another significant proposal which I have placed before you for consideration is opening of 3 new Regional Offices of the Rubber Board at Trichur, Nilambur and Kanhangad. This facility is expected to improve the services of the Board in these areas.

Conclusion

I have been trying to present to you a very brief account of what has been done and what is proposed. With the active co-operation and involvement of veterans like you, I anticipate no difficulties in implementing these proposals.

The employer-employee relations within the Rubber Board had been extremely good in the past. The employees of the Board have been behaving as a highly responsible set of people. The Staff Affairs Committee constituted for taking care of the various issues concerning the employees recently met and had prolonged discussions on various demands. But the deliberations were inconclusive. Therefore the Committee has decided to meet soon again and hold comprehensive dialogue with representatives of staff associations.

Coming from a family of farmers and with a bit of experience in the socio-political life of the State of Kerala, fortunately I have had sufficient exposure to the agro-economic problems of the vulnerable section of the population. Therefore as I told, I do not find myself to be a stranger to this field. With active support from all quarters, I hope I will be able to live upto the tasks expected of me.

In this connection I may point out unless the administrative and financial powers of the Board are enhanced, it will be hard for the Board to perform the various functions expeditiously and effectively. I have decided to take up the matter separately with the Union Commerce Ministry.

I would like the honourable members to write to me freely and frequently conveying their suggestions for improving the working of the Board. Let us work together for the common cause of the overall promotion of the rubber industry of India. □

Man, Nature and Technology

Human beings have established themselves as masters of the earth, asserting that the world revolves around them. I am reminded of some French lines, which caught my attention when I was a teenager. One person says to another, "Time is going, time is going". The reply is, "No, not time, it is we who are going"

But before going we are recklessly using up the earth's limited non-renewable resources. We are wounding the very vitals of the earth, reducing its hither to remarkable capacity for regeneration. Are we concerned? Only a few are (though growing in number), and they are regarded as cranks. It is said that some way out will be found, if not here then on other planets!

—Shrimati Indira Gandhi.

KERALA STATE PRODUCTIVITY COUNCIL ANNOUNCES PRODUCTIVITY AWARD

KeralaState Productivity Council announces setting up of awards of productivity as forming part of the celebrations of its Silver Jubilee year 1983. The awards will be a continuing feature in the ensuing years also.

This award would be given before 30th June, 1984.

It is the objective of the Kerala State Productivity Council to enthuse large medium and small scale industries to continue to involve themselves in the increase in productivity and production. During the Silver Jubilee year 1983-84 it is its aim to propagate adoption of productivity techniques in the various areas of industrial practice in conserving the resources and utilising them effectively.

The eligibility and criteria for productivity awards are broadly indicated as under:

A. Eligibility: All industries in the state of Kerala are eligible to compete for the productivity awards.

How and when to apply?

Those industries/organizations desirous of competing for the productivity award should register with Kerala State Productivity Council before 15th July 1983. On receipt of their desire to participate in the award, the Kerala State Productivity Council will despatch proforma for this purpose, so that the industries/organizations can compile the details as required for the award. The special award committee will call for details and also will make visits if necessary before 31st March 1984 so as to decide the award. Any assistance required for providing the data for the award will be provided by the Council on request.

Criteria:

The following norms are provided for classifying industries:-

1. Large Industry: It should have an authorised capital of Rs. 1 crore or more.
2. Medium Scale Industry: It should have an authorised capital of more than Rs. 20 lakhs but less than Rs. 1 crore
3. Small Scale Industry: It should have an authorised capital of 20 lakhs or less.

Object of awards:

1. To evolve large, medium and small scale industries in participating in the award contest thereby sharing their achievements of productivity during the period April, 1983 to March, 1984.
2. To provide opportunity to all industries to have closer interaction with the Kerala State Productivity Council and to encourage the concept of productivity at all levels in their plants.
3. To provide the Venue for Specialists and Top Executives from industries and entrepreneurs to meet in a common forum and to involve in the continued propagation and implementation of productivity concepts in industrial practice.
4. To provide knowledge and to propagate the concepts of productivity to the public at large who would be the beneficiaries of the results of productivity as consumers of industrial products.

Award

Large industry: 3 Awards

a. Engineering Industry: (including light engineering) automobile anciliary manufacturing, Electrical, Foundry, Mechanical handling equipment manufacture etc. — 1 AWARD

b. Process Industry: (including Textiles, Chemicals Food, Rubber Plastic etc.) — 1 AWARD

c. Service Industry: (Including Transport, Electricity Board, Water and Drainage Board, Air-conditioning, Railways etc.) — 1 AWARD

Medium Industry: 3 Awards

a. Engineering Industry: (including light engineering) General Machine Shop, Automobiles ancillary, Electrical Foundry, Mechanical handling equipment manufacture etc. — 1 AWARD

b. Process Industry (including Textiles, Chemicals Food, Rubber, Plastic etc. — 1 AWARD

c. Service Industry (including Transport, Air-condioning, General services etc.) 1 — AWARD

Small Scale Industry: 3 Awards

a. Engineering Industry (including light engineering, General machine shop Automobile ancillary, Electrical, Structural etc.) and Mechanical Industry. — 1 AWARD

b. Process Industry (including Textiles, Chemicals, Food, Rubber, Plastic etc.) — 1 AWARD

c. Service Industry (including Transport, tool room Air-conditioning, general services etc.) — 1 AWARD

Basis for Award:

—Implementation of productivity techniques at plant level.

—Effective utilisation of raw-materials.

—Productivity of man, machine and money.

—Level of modernisation and absorbtion of new technology contributing to productivity.

—Extent of involvement in social responsibility and creating awareness in productivity and production thereby passing the benefit to reach customers.

—Extent of developmental work and research support provided with a view to conserve scarce resources and increase productivity thereby reducing cost per unit.

—General support to productivity movement provided at plant level.

—Safety record of the Company.

—Record of Industrial Relations of the Company.

—Steps taken for reducing breakdown.

—Steps taken for improving quality.

—Steps taken for reducing pollution.

Evaluation

Evaluation Committee will comprise of a team of experts in productivity and this committee will recommend the Award.

The Applications received from the industries will form the base for evaluation. The Evaluation Committee will call from industries for such details as are necessary for deciding the award. It may also visit the industries. The decision of the Awards Committee will be final.

The award will be a rolling shield and certificate of merit each to be distributed to the concerned industries at a special function organised for this purpose.

—Kerala State Productivity Council, Kalamassery-683 104

NO FORESTS BY 2000 AD

If denudation of forests continues at the present rate, and massive reafforestation is not started soon, India will have no forests by the end of the century' according to a new study "Forests Farming — Prosperity for India."

In a special chapter on agroforestry, Mr Ranganathan, one of the co-authors says that if denudation continues as at present, good agricultural land will be ruined, as happened in the case of what are today the deserts of the Sahara, Mesopotamia and the Indus valley, and millions of people will die of starvation.

Although published statistics indicate that 22 per cent of India's total land area is forested, the actual area under forest cover is much less.

In the last 50 years, the area of land that has been stripped of forest cover, cultivated for a few years and then abandoned, amounts to nearly 90 million hectares, Mr Ranganathan says.

Because of loss of forestcover, erosion is rampant. Dr. M. S. Swaminathan, former director general of the Indian Council of Agricultural Research had estimated that 6,000 million tonnes of topsoil were washed or blown away every year. Considering that the most valuable layer of cultivable soil is the top seven inches, this represents a loss of six million acres of cultivable land every year. Related to food crops, it represents a loss of Rs. 3,000 million.

Besides, floods are too frequent as a result of deforestation. The loss of property due to floods in the last 25 years has amounted to over Rs. 22,000 million. Further, siltation of large reservoirs reduce their effective life to a fraction of what was estimated at the time they were built.

When the Bhakra dam was built, it had an estimated life of 88 years, now it is reduced to 47. Nearly Rs. 50,000 million has been spent on large dams over the last 25 years. At least half of this expenditure must be regarded as lost, according to Mr. Raganathan.

TRENDS IN PRODUCTION AND PRODUCTIVITY IN RUBBER PLANTATION INDUSTRY

PN KRISHNANKUTTY

Introduction

Natural rubber is a strategic raw material needed for the production of a wide range of industrial and consumer goods. Among cash crops rubber plantation has got the highest economic and employment potential. The rubber plantation Industry plays an important role in the economy of Kerala which accounts for nearly 91% of the area under rubber and 91% of the production of natural rubber in India. It provides direct employment to over 2 lakh workers, both hired and self-employed.

Inspite of the fact that the industry began to take roots in the country only at the beginning of the present century it has achieved phenomenal growth over the years in respect of area, production and productivity. In this paper an attempt is made to examine the progress of the industry during the post-independent period with special reference to trends in productivity. This topic, it is felt, gains much relevance in the context of Hon. Prime Minister's call to the nation last year to observe 1982 as the productivity year.

Background in brief

The modernisation of the industry has begun only in the post-independent period. During the pre-independent period, in the absence of any long term planning and mandatory assignment the industry had to pass through odd phases of ups and downs. In the initial years of its establishment during the pre-independent period on account of attractive prices for rubber the area under rubber expanded substantially. This favourable condition more or less continued until the beginning of the Great Depression of 1930s. During that period, as in the case of other agricultural products the prices of rubber also slumped to very low levels and there was an overall set back in the growth of the rubber plantation industry. However, as a blessing in disguise the outbreak of the Second World War set the conditions conducive for the growth of the industry as the Allied Nations had to entirely depend on India and Ceylon (at present Sri Lanka) for the supply of rubber. The upswing in the growth phase of the industry came to a halt as a result of unattractive prices that prevailed after the cessation of hostilities. This stagnancy continued for some more time until the industry picked up tempo of growth after the Independence of the country owing to the concerted efforts of the National Government.

Area under rubber

In 1948-49 the total area under rubber in the country was 65376 hectares. By 1981-82 this has increased to 2,80,000 hectares, an increase on 328.9%. The annual compound rate of increase comes to 4 67%. In order to examine the variations in growth trends of the industry in respect of area, a further break up of the period is made (Table 1). It shows that the highest level of growth has been achieved during the period 1953-54 to 1958-59. The annual compound rate of increase in area during that period was 10.66%. The corresponding percentage for the period 1958-59 to 1963-64 is 6.56. The growth rate was rather at a low level during the period 1973-74 to 1978-79. However, the momentum has picked up in the following years, as can be seen from the table.

The linear trends in growth rates in area during the above period have been worked out using the formula $Y = a + bx$. The constants a and b are determined by the method of Least Squares. The trend value obtained is $R^2 = 0.9908$

Table 1

Trends in area under rubber

Year	Area in hectare	Annual compound rate of increase over the interval (percentage)
		—
1948-49	65376	1.46
1953-54	70271	10.66
1958-59	115970	6.56
1963-64	152946	3.89
1968-69	187514	3.02
1973-74	217540	1.63
1978-79	235910	6.00
1981-82 (P)	280000	

Trends in production

Since 1948-49 there has been a steady increase in production of natural rubber in the country. In that year annual production was 15394 tonnes only. By 1981-82 it has increased to 152870 tonnes, an increase of 893.04%. The annual compound rate of increase comes to 7.38%. The break up figures of this rate of increase show that the trends in growth in production between the intervals vary considerably. The highest rate of growth was achieved during the period 1963-64 to 1968-69. This is followed by the period 1968-69 to 1973-74 with an annual compound rate of increase of 12%. The progress of the industry in terms of production was rather slow during the year 1973-74 to 1978-79. The annual compound rate of increase in production during that period was only 1.75%. The poor performance of the industry in production can be attributed to the adverse climatic conditions during the period coupled with wide spread labour strike in many large estates during the peak production periods in 1977-78. Since then, the industry has shown signs of further growth in production by registering an annual compound rate of increase of 4.24% during the period 1978-79 to 1981-82. The break up figures of growth in production are given below:-

The linear trends of growth in production are worked out using the formula Y = a + bx, Value of constants a and b are determined by the method of Least Squares. The trend value obtained is $R^2 = 0.9720$

The trends in area and production are graphically presented as annexure I (A & B). It can be observed from the graph that production and area show varying levels of growth during the period under reference. The growth trends in production were at a higher pace than the growth trends in area.

Productivity

Although productivity is an important economic concept, the views of productivity for purposes of definition and understanding have not been consistant and uniform. According to Prof. Paul Mali, Professor of Management, University of Hartford, it is a "a measure of how well resources are brought together in organisation and utilised for accomplishing a set of results. Productivity is reaching the highest level of performance with the least expenditure of resources". In his view higher productivity could be achieved with effective resource allocation and efficient resource utilization. A measure of productivity can be obtained by comparing the magnitude of results with the magnitude and volume of resources i. e, the functional relationship between inputs and outputs. A simpler measure of productivity is the partial Factor Productivity or Partial Productivity ratio. It is a ratio or output to any particular input, say - land.

In this paper productivity is measured in terms of a unit of land, i. e. the yield per hectare. During the year 1948-49 the average yield per hectare was 320 kgs. In 1981-82 this has increased to 78[illegible] kgs, an increase of 143.75%. The break up details are shown in Table III.

It can be seen from the above table that the yield per hectare has achieved the highest level of growth during the period 1963-64 to 1968-69. The annual compound rate of increase in yield per hectare during that period was 7.98%. The corresponding percentage for the period 1968-69 to 1973-74 is 5.59. The yield per hectare has shown an absolute increase for the two decades since 1948-49. However since 1968-69 the rate of increase has shown a declining trend. During the period 1973-74 to 1978-79 the annual compound rate of increase was negative. The drop in productivity during this period can be traced to the adverse climatic conditions as well as the wide-spread labour strike during the peak production period, as has been stated earlier. However, the period from 1979-80 to 1981-82, the situation has changed and the productivity has recorded an annual compound increase of 3.26%. The increase in productivity estimated for 1982-83 is above 6%. There are definite indications that the productivity would consistantly increase in the years to come.

Table II

Trends in production

Year	Production (in tonnes)	Annual compound rate over the internal (percentage):
1948-49	15394	—
1953-54	21588	7.15
1958-59	24169	2.37
1963-64	37487	9.37
1968-69	71054	13.75
1973-74	125153	12.00
1978-79	135297	1.75
1981-92	152870	4.24

Area, production and productivity

Changes in production can come through the following ways:-

(a) Changes in area under mature rubber

(b) Changes in yield per hectare.

(c) Interaction between changes in area and yield.

In other words, it would be possible to attribute changes in production to the following three factors:-

Table III

Trends yield per hectare

Year	Yield per hectare	Annual compound rate of increase over the internal (percentages)
1948-49	320	—
1953-54	326	0.56
1958-59	344	1.48
1963-64	393	2.71
1968-69	576	7.98
1973-74	756	5 59
1978-79	710	(—) 1.15
1981-82	780	3.26

Changes in production
= (a) Initial area x change in yield
+ (b) Initial yield x change in area
+ (c) Change in area x change in yield

(The derivation of this relation is given in annexure II)

Changes in production on account of changes in area can be termed as area effect. Changes in production as a result of changes in yield per hectare can be termed as yield effect. Changes in production on account of interaction between changes in area and yield can be termed as Interaction effect.

It has already been seen that the annual production of 15394 tonnes in 1948-49 has increased to 152870 tonnes by the year 1981-82. If this phenomenal increase is attributed to the three effects mentioned in the above paragraph it could be seen that 34% of this increase was on account of Area Effect and 16% on account of Yield Effect. 50% of this increase can be attributed to the Interaction Effect of area and yield. However, the percentages are found vary when the interim periods are considered. Details of the different intervals are given in table IV.

From the above table it can be seen that the growth of the industry in terms of total production until the year 1963-64 was mainly on account of in-rcease in area under rubber. As against this trend, the growth in production during the next proceeding five year period was mainly due to the increase in yield per hectare. During the year five period from 1973-74 to 1978-79 the yield effect was negative. It was area effect which substained production and even partially neutralised the negative yield effect. However, during the succeeding 3 year period the yield effect was the important factor for increasing production, as can be seen from the table.

Factors that promoted the growth of the industry

As mentioned earlier, the industry's growth as well as modernization started mainly during the post-independent period. Those associated with the industry can be proud of its achievements in respect of higher growth rates in area, production and productivity. There were many favourable factors which made it possible for the industry to achieve such a rapid progress with in a short period. The attractive prices of rubber, and the all time patronage enjoyed by this crop from Government and co-operative agencies have contributed to the rapid increase in area and production. The land reforms introduced in Kerala some time back which gave exemption for rubber and other plantation crops from the purview of the ceiling on land holding and the change over from coconut cultivation to rubber in view of the devastating disease malady that struck the former have substantially contributed for the expansion of rubber cultivation in Kerala. The high employment potential of the crop might have also favourably stood for the development of the public sector rubber plantations. Apart from the growth oriented schemes initiated by Governmental agencies, prices of rubber have been statutorily controlled by the Government with a view to increasing the area and production of rubber, even prior to Independence. The availability of high yielding cultivators and scientific methods of cultivation at the thresholds of the planting community have encouraged the planters to bring more area planted with high yielding varieties. As a result of this the area planted with high yielding varieties increased gradually during the years. The area planted with high yielding varie-

Table IV

Contribution of increase in area and yield towards increase in production

Period	Yield Effect (percentage)	Area Effect (percentage)	Interaction effect (%)
1948-49 to 1953-54	5%	93%	2%
1953-54 to 1958-59	45%	52%	3%
1958-59 to 1963-64	26%	65%	9%
1963-64 to 1968-69	52%	33%	15%
1968-69 to 1973-74	41%	45%	14%
1973-74 to 1978-79	(—) 50%	158%	(—) 8%
1978-79 to 1981-82	74%	24%	2%

ties formed only 19.78% of the total planted area in 1948-49. The corresponding percentage for the years 1968-69 and 1978-79 are 60.33% and 78.55% respectively.

It is an accepted fact that, but for the active role of the Rubber Board, the industry would not have made such rapid strides in progress. Constituted for the promotion of natural rubber plantation industry, the Board took up active participation in the development of the industry since 1956. Among the various schemes initiated by it, the replanting subsidy scheme-a package scheme in which financial aid, inputs, subsidies and technological know-how are combined, takes the pride of place. The success of the scheme could be established from the fact that so far an area of over 53 thousand hec tares have been replanted under this scheme after its Inception 1957. It has been very successful in modernising and rehabilitating the old and uneconomic units in the industry inspite of the fact that there are still a large number of inefficient units in it. In order to encrease the tempo of planting this scheme has been recently modified by extending the financial and input subsidies to new planting also. Much has been done by the Rubber Research Institute of India in the field of plant breeding, maintenance and exploitation. The high yielding clones evolved by the Rubber Research Institute of India are enviously popular among the planting community. Through its participation in the international forums and associations of rubber producing countries, the Board could channel the latest technological know-how on rubber cultivation to the planting community. The chain of extension officers operating in the length and breadth of the country's main rubber growing regions, have been very effective in disseminating the fruits of research among the planting community.

Conclusion

The rubber plantation industry has achieved tremendous progress in respect of area, production and productivity. During the period 1948-49 to 1981-82 the area has registered an increase of 328.9%. Production of rubber which stood at 15394 tonnes in 1948-49 has shot up to 152870 tonnes by 1981-82, regsitering an increase of 893%. Productivity measured in terms of yield per hectare has also shown a substantial increase of 143.75%.

At a time when the availability of arable land is becoming increasingly limited day by day the competition among the crops for this factor of production would be inevitable. Therefore, in future as in the case of other agricultural crops, growth in production of rubber should primarily come through higher levels of productivity. In the rubber plantation industry, with about 1.8 lakh producing units, the scope for achieving higher production by better microlevel planning and resource utilization is enormous. There are still a large number of uneconomic units planted with very low yielding plants. If these units are made economically viable by systematic replantation with high yielding cultivators the productivity of the industry could be raised to a much higher level.

As a result of the ongoing scientific research in the field of rubber cultivation and exploitation in this country and elsewhere the horizon of productive potential is expected to widen in the future. If the producing units in the country could keep pace with such advancements in the production techniques the productivity of the industry could be increased further.

Acknowledgement

The author is grateful to the Rubber Production Commissioner for going through the paper and suggesting improvements. He also wishes to express his thanks to the Economist and Deputy Director (Statistics) for the help rendered by them in the preparation of this paper.

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ANNEXURE – II

Let $A1$ and $A2$ denote the area in the initial and final years

$P1$ and $P2$ the production in the initial and final years &

$Y1$ and $Y2$ the yield in the initial and final years.

$A2$ can be written as $A1 + \triangle A$ where $\triangle A = A2 - A1$

Similarly $P2 = P1 + \triangle P$ and $Y2 = Y1 + \triangle Y$

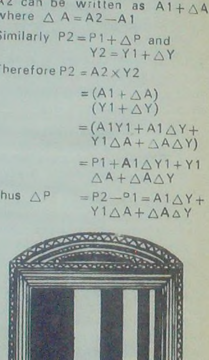
Therefore $P2 = A2 \times Y2$

$$= (A1 + \triangle A)(Y1 + \triangle Y)$$

$$= (A1Y1 + A1\triangle Y + Y1\triangle A + \triangle A\triangle Y)$$

$$= P1 + A1\triangle Y1 + Y1\triangle A + \triangle A\triangle Y$$

Thus $\triangle P = P2 - P1 = A1\triangle Y + Y1\triangle A + \triangle A\triangle Y$



ECONOMICS OF RUBBER PLANTATION AND SCOPE FOR COST REDUCTION

Shri K. S. Varma, Financial Advisor of the Rubber Board examines the scope for cost reduction in rubber plantations. The author is of the view that a methodology could be developed from the studies conducted so far for identifying the costs involved in developing and maintaining a rubber plantation.

The rubber prices were constantly erratic in the last several years and so the computation of the benefits in monetary terms has to be necessarily a matter of opinion. His attempt is to develop a handy tool to the farmer to understand, appreciate and tackle the whole problem in a better way. The paper was Presented at a seminar on 'Productivity in rubber plantations' held in Cochin on 4th June, 1983.

KS VARMA

History of Rubber Plantation in India appears to be 110 years old, starting with the six plants brought to Calcutta by Britishers in 1873. First large scale delivery of Hevea seeds to India was made by Mr. Henry Wickham in June 1876. Considering the seeds germinated, the cost per seedlings was around £ 0.75 at that time. (Report of Dr. Trimen of the new Production Commissioner, Ceylon, 1881 - Expenditure of over £ 1758 on 70000 seeds out of which only 3% germinated). The first commercial plantations came up in 1902 near Alwaye. By 1930s the planters felt their first pinch of an uneconomic price and the first International Rubber Regulations Agreement had to be signed in 1934 prohibiting new planting and regulating exports. Thus for about the last fifty years, rubber industry in India was controlled by one regulation or other. From 1947, price notifications came into force. It is of interest to note that in 1947, RMA 4 sheets were priced between Rs. 68 and Rs. 67 per 100 lbs. (Variation of Rs. 1/- between maximum and minimum notified prices) and this is equivalent to about Rs. 1-50 per kg. The earliest cost of production figures available is for 1951-52 which gave the basic cost at Rs- 1-55 per kg. and the total cost (including rehabilitation allowance, return on capital etc) at Rs. 2-83 per kg. Since then, there had been a series of cost studies and price notifications for rubber, the last notification being announced on 17-4-1979. Though a further cost study was conducted in 1981, no notifications emerged probably because, there is no relevance to a notified minimum price in the present days market price for rubber. I have traced this history only to emphasise that cost consciousness existed in Rubber Plantation Industry for a pretty long time.

Need for the Exercise

Where land is scarce and more than one crop is cultivable in his land at particular time, the farmer is faced with the basic economic problem, the problem of putting his limited land to the most economically viable agricultural operations. The problem is really complex when one considers the diverse nature of investments and returns and the time-lag involved in completing the crop cycle. Tha present paper is an attempt to develop a handy tool to the farmer to understand, appreciate and tackle this problem in a better way. It is also pertinent that once a decision to plant land with rubber is taken, it is a long term investment decision spreading over 30 years. In an economy where prices are not always dependent only on cost plus considerations, it is imperative that the cultivator should continuously do his cost control and cost reduction exercises in order to ensure a most fair return for his investments.

At present rubber has a steady market in the country. The present demand in the manufacturing industry is in excess of supply and so natural rubber was being imported to the country during the last 5 years.

Being a perennial tree crop Rubber can serve as a good soil regenerating crop particularly in areas susceptible for soil erosion and wash out. The rubber growing tracts are generally hilly and or undulating and are highly susceptible for erosion and wash out. Under the circumstances rubber growing in such areas will not only stabilize the ecological balance but also will help to compensate for the dwindling forest resources position in the area.

Another pertinent aspect of rubber plantation industry is its highly labour intensive character and its habitat in the underdeveloped rural areas. The capacity of this industry in generating rural employment also justified the socio-economic need of this study.

Data available for the study

Excepting a few large estates in the organised sector, the majority of growers do not keep reliable and correct data on the costs and benefits of their rubber plantations. However several studies have been conducted by the Tariff Commission and the cost Accounts. Branch of the Ministry of Finance of the Government of India on the cost of production of this commodity. These studies can supply adequate data to develop a methodology for identifying the costs involved in developing and maintaining a rubber plantatian.

As regards benefits the data available is meagre. There are statistics available with the Rubber Board on yields but the rubber prices were consistently erratic in the last several years and so the computation of the benefits in monetary terms that too for the prolonged life of 25 years, has to be necessarily a matter of opinion.

Methodology

Considering the prolonged nature of the cost outflows and benefit inflows it was felt that the picture projected by the figures of absolute income and expenditure may not give a realistic analysis. A discounted cash flow analysis was therefore thought more relevant in this case. In order to keep the calculations simple, the effect of inflation and seasonal fluctuation in prices are ignored and the unit rates of costs and benefits are taken to remain unchanged throughout. For development costs (Table I) and for maintenance yield extraction and processing costs (Table II) current wage rates and current prices of various inputs are adopted. For the benefits also, evaluation is done on an average current price in the indigenous market. These costs and benefits are discounted at 15% for the purpose of cost benefit analysis (Table III). No attempt has been made to evaluate social costs and benefits. An attempt has been made to work out the Internal Rate of Return. A sensitivity analysis is also attempted with reference to variations in yield rates, sales prices and discounting rates.

Areas of cost control & cost reduction

By cost control what is meant is bringing the costs to the standards set and targets fixed. Cost reduction is a more dynamic concept of reviewing the targets and standards and improving upon them to achieve real and permanent reductions in costs. The areas where these concepts can apply to rubber cultivation will differ based on circumstances available in each case but generally, the potential areas are the following.

Planting high yielding varieties

Planting decision is taken only once in 30 years which would mean normally not more than twice in the life time of a planter. Since the largest single factor in cost reduction is the yield optimum yielding planting material suited to each locality and agroclimatic conditions plays a vital role in reducing costs per kilogram of yield.

Reducing immaturity period

Even at a little higher cost if the immaturity period can be reduced by following a package of practices suited for each area

TABLE II

Gross Expenditure for Production of Natural Rubber at peak Yielding Period

	Labour mandays	Cost of Labour Rs.	Cost of materials Rs	Total Rs
A. Maintenance & Upkeep of trees				
Manuring	5	85	425	510
Spraying	4	68	514	582
Weeding	30	510	—	510
Misc. works	4	68	10	78
Total A	43	731	949	1680
B. Tapping Cost	140	2520	—	2520
C. Processing of latex (Cost for rendering the product marketable)	67	1200	600	1800
Total	250	3451	1459	6000

TABLE I

Cost of Development of one Hectare

Particulars	1st year	2nd year	3rd year	4th year	5th year	6th year	Total
, Clearing, Terracing. Pitting etc.	3020	...	...	...	...	...	3020
2. Cost of polybag plants 400 Nos. @ Rs 6/-	1400	...	...	...	...	...	2400
3. Weeding & Mulching	1690	1940	1690	1350	1020	760	8450
4. Fertilizer & application charges	420	780	840	780	540	540	3900
5. Spraying costs	270	360	470	470	640	700	2910
6. Cover crop and other miscellaneous items	800	120	...	...	...	...	920
7. Indirect expenses	400	400	400	400	400	400	2400
TOTAL	9000	3600	3400	3000	2600	2400	24000

TABLE-III

Cost Benefit Analysis of Rubber Plantation of one Hectare

Year	Capital Cost	Operating Cost	Income	Discounting factor (at 15%)	Discounted cost	Discounted benefit
1	9000			0 870	7830	
2	3600			0.756	2722	
3	3400			0.658	2237	
4	3000			0.572	1716	
5	2600			0.497	1292	
6	2400			0.432	1037	
7		3000	9520	0.376	1128	3580
8		4000	12240	0 327	1308	4002
9		5000	14960	0.284	1420	4249
10		5500	17680	0.247	13 9	4367
11 to 28 year		108000	367200	1.514 / 18	9084	30886
29		5000	17680	0.017	85	301
30		4000	14960	0.015	60	224
31		3000	12240	0.013	39	159
Income from residual value of trees			45000			585
TOTAL	24000	137500	511480	—	31317	48353

$$\text{Cost benefit ratio} = \frac{48353}{31317} = 1:1.54$$

$$\text{The IRR} = 15 + \frac{48353-31317}{48353-27501} \times 5 = 15 + \frac{17036}{20852} \times 5$$

$$= 15 + 3.08 = 19.08$$

* Rs. 27501 is the total discounted cash inflows at 20%

which would include (a) advanced planting material (b) doing correct cultivation practices during immaturity period (c) ensuring girth increase by inducing branching at optimum height etc, it will go to increase the present worth of the investment and can contribute to ultimate cost reduction.

Stand per hectare

The present stand per hectare advised by the Rubber Board is the optimum for ensuring highest yield per rapper for a fixed task. Where limitations in land is more critical and where family labour is used for tapping increasing stand per hectare to ensure highest yield per unit area would be worth experimenting from the point of view of cost reduction per unit area.

Productivity of inputs

Cost reduction is achieved by ensuring better output for each unit of input whether the input is in tha nature of materials, men or money. The following are a few critical inputs.

(a) Fertiliser

The response of rubber tree to fertilizer application is significant in the earlier years. Proper covercrops and correct dose of fertilizer in the first 3 to 4 years may bring about substantial reduction in overall fertiliser costs. Even then, proper soil and leaf analysis and adopting discrcimінatory fertilizer application is a must for every plantations

(b) Spraying

The dosage and frequency of spraying may depend on several factors like the nature of trees, age of trees etc- Here also proper study of each plantations can result in effective cost reduction.

(c) Rain guarding

Rain guarding and tapping of trees throughout the year can optimise returns by evening out the supply and making available the rubber when prices are high.

Exploitation schedule

When each plantation attains maturity, it is advisable to prepare an explitation schedule most suited to the particular type of trees. Application of stimulants and revising tapping frequencies may result in savings of labour cost without appreciable variation in the yield.

Group processing and marketing

As against individual processing and marketing their produce group processing and marketing will have significant savings in costs. These will not only bring about economy in scale of operations, but also bring about better prices for the producer through collective bargaining. Malaysia has already got group processing centres and in Kerala also the Rubber Board has already experimented successfully the operation of small holder development centres through the co-operative movement.

Early replanting

Research is bringing about notable improvements in planting materials, planting techniques etc. Where the present plantations are low yielding, even if the trees have not spent their economic life, replanting can result in substantial cost reduction. A hypothetical case is worked out in Annexure IB. This shows that if a low yielding (600 kg/ha) Plantation is replanted in its 15th year of life even after a six year immaturity period, the increased yield would more than justify the incremental investments.

Findings of the exercises attempted

During the peak period of production the annual income and expenditure (undiscounted) would be Rs. 20,400 and Rs. 6000 per hectare respectively.

The cost benefit ratio works out to 1:1.54 at a discounting rate of 15%

With a discounting rate of 12% the cost benefit ratio improves to 1:1.82

With a reduction in the yield by 20% (from 1500 kg/ ha/year to 1200 kg/ha/year) the cost benefit ratio comes down to 1:1.36. At this yield level, a lower discounting rate of 12% would improve the ratio to 1:2.60

A reduction of selling price to Rs. 12 from Rs. 13.60 per kg. originally assumed would also reduce the cost benefit ratio to 1:1.36

In all the above cases the IRR fluctuates only marginally ie, between 17% to 19%

Where yield differences are considerable. cost considerations justify early replantings and within the life period of the original plantation itself, the return from high yielding replantings would justify the investment.

Conclusion

The study of economics of each plantation and review of its cost benefit analysis is a useful and necessary exercise. There is ample scope for attempting cost reduction in the plantation both mature and immature. So long as the prices are not directly related to costs, all possible ways and means of cost reduction will have to be attempted to ensure an optimum return for the grower and a sustained growth of the Industry. □

MALAYSIA SETS UP PANEL ON RUBBER

The Malaysian Government is to reassess the future of its rubber industry, in the light of depressed prices and changes in consumption patterns.

Datuk Paul Leong, Primary Industries Minister, who announced the setting up of a review committee of rubber experts said that the committee should report its recommendations within nine months.

The committee, which will include several international rubber specialists has been asked to look into the supply and demand in the elastomer market over the next 20 years, whether Malaysia should devote so much land and money to rubber cultivation, and whether present research developmnnt and marketing should be less biased towards the needs of Western based consumers.

In retrospect, the Malaysian Government felt "misled" by the projections of rubbber experts in the past, who forecast an increasing demand for the commodity throughout the 1980's.

Several international organisations, dealing with agricultural commodities were talking in the late 1970's of a shortage of natural rubber in the region of half a million tonnes in 1985, and a projected price level of as high as 5 Ringgit (£1.38) per kilo.

Partly in response to these optimistic views Malaysian private estates slowed down their conversion from rubber to oil palm, while the Government started its "dynamic rubber production" policy.

PLANT RUBBER FOR PROSPERITY

The inaugural address delivered by Shri PJ Thomas, Chairman, Rubber Board at the "Seminar on productivity in rubber plantations" in Cochin on 4th June, 1983 is significant as it reveals the efforts of the Rubber Board in evolving a new strategy for the expansion of rubber cultivation in India. He also narrates his experiences he had in China while on a visit to that country as leader of the Indian Delegation to attend the meeting of the International Rubber Research and Development Board at Beijing. He had also the opportunity of visiting most of the rubber growing areas there accompanied by Dr. MR Sethuraj, Director, Rubber Research Institute of India.

He also describes rubber as "Kalpa Vriksha." Every part of the tree is utilizable. Citing an example of the Chinese people, he says that the ingenuity, dedication and concerted efforts have made rubber cultivation in China possible. Even against heavy odds, China would emerge as a powerful force in the field of rubber cultivation and outstrip traditional counterparts in respect of production and productivity. In India also, the aim should be to maximise the output per unit area at minimum costs. He concludes that planting rubber is a way to prosperity.

Promotion of productivity should be looked upon as a continuous and ongoing process in every sphere of economic activity–more so in the third World where built-in constraints impose limitations for planned change. The year 1982 was celebrated the World over as the year of productivity. It does not mean that effective 1st January, 1983 we can afford to forget this inevitable concept of development. Viewed in this context I hasten to offer my compliments of felicitations to the Kerala State Productivity Council for vigorously pursuing the dissemination of the spirit of productivity among the individuals and institutions engaged in the task of social and economic upgradation of human life. I learn that this non-profit, tripartite body which has been in existence for over 2 decades has done commendable service in instilling awareness on productivity in the community. There is hardly any area of social change which they have not touched upon. The latest in the series is the 'Seminar on Productivity in Rubber Plantations' which we are commencing right now.

Productivity or the state of being productive is an attempt to extract the maximum at minimum efforts, inputs and cost. The motivation for organising productivity is largely governed by the cost-benefit ratio of any enterprise.

Underdeveloped economies are afflicted by inherent drawbacks like poor literacy, low per capita income, adherance to tradition-bound practices, low crop yields high population, poor sanitation, and above all very low productivity of men and material. Prevalence of these disfavours retards the process of change and resist acceptance of innovations. In such a setting "Change Agents" with a spirit of service and skills in persuasion cou'd attempt at gradual transformation of the traditional behaviour of people. For the full realisation of productivity in any enterprise those at the helm of affairs of respective sectors should have a clear vision of the problems, prospects and relevance of the concerned enterprise in the national economy. Otherwise any attempt at indiscriminate promotion of production and productivity could result in imbalances, disparities and glut.

While discussing the topic of 'Productivity in Rubber Plantations' one has to take note of the versatility and 'all purpose' nature of natural rubber which has made it a unique and strategic material for the manufacture of a variety of products essential for social life.

Though a new comer among plantation crops in the country rubber occupies a pride of place in the national economy. Rubber plantations have gradually spread far and wide in the South, particularly in Kerala, obviously due to the lucrative and labour intensive nature of this crop besides the agro-climatic suitability. Unlike in other rubber producing countries in the World, the largest single factor that has accelerated the promotion of this crop in India, is the emergence of a strong rubber goods manufacturing industry capable of absorbing more than the entire domestic production.

From a humble beginning in 1902 the area under rubber in India as on date has spread up to 2.9 lakh hectares producing 1.66 lakh Metric Tonnes of natural rubber, while the annual requirement of the manufacturing industry is around 1.95 lakh Metric Tonnes. The annual rate of growth of production in the plantation sector registered during the last one decade is only 6.7%

while the annual increase in the consuming sector was over 10%. This ever widening gap between demand and supply has necessitated an all out effort to maximise production within the country. This could be achieved by phased rehabilitation of old uneconomic units and introduction of rubber to new areas suitable for the same.

Distribution

The State of Kerala has a virtual monopoly over the area and production of natural rubber. Given below is an account of the distribution of both the extent and output of this commodity (1981-82).

India, the production index for rubber had steadily increased and in 1976-77 it touched 206.5. In the case of all the plantation crops put together, the index for the same year was 139.3 while the figure for all the agricultural crops as a whole was 116.4. For 1980-81 the index numbers were 211.3, 157.3 and 135.2 respectively. The index of productivity for rubber steadily moved to 138.7 while the comparative figures for plantation crops as a whole stood at 123.6 and for all crops 109.2. The index numbers of productivity for 1980-81 were 136.9, 134.2 and 123.5 respectively. Upto 1976-77 rubber was ahead of all crops in respect of growth rate of production and productivity.

State	Estimated Area(Ha.)	Percentage to total	Production (Tonnes)	Percentage to total
Kerala	248,000	88.6	139,455	91.2
Tamil Nadu	15,700	5.6	10,510	6.9
Karnataka	8,700	3.1	2,606	1.7
Tripura, Goa, Andamans and Others.	7,600	2.7	299	0.2
Total	28,000	100.0	152,870	100.0

Growth of the Industry

In respect of area, average production and productivity of rubber plantations there has been impressive growth over the years as could be seen from the figures furnished below:-

Year	Area (Hectares)	Production (M. Tonnes)	Average production (Kg. per Hectare)
1960-61	129,905	25,697	365
1965-66	164,713	50,530	448
1970-71	203,098	92,171	653
1975-76	224,428	137,750	772
1980-81	241,503	153,100	790.
*1982-83	290,000	166,000	830

*ESTIMATED

Productivity index

As per the Index number of Agricultural Production (with base triennium ending 1969-70 = 100) published by the Ministry of Agriculture, Government of

Institutional Promotion

The Rubber Plantation Industry attained its present status largely due to the planned institutional promotion launched by the Rubber Board (a statutory body functioning under the Union Ministry of Commerce to take care of the development of the rubber industry in India by "such measures as it thinks fit") since 1954. Adequate financial assistance linked with development and transfer of appropriate technology through a well laid out communication and extension outlet to those who needed it, is perhaps the major factor that has transformed the rubber plantations in India into a relatively modernised agricultural enterprise in the country. Alongside a well laid out rural market network and an *assured remunerative price* for the produce was also facilitated by the Board.

The earlier Plantations were fairly large in size while, of late, this has become a small holders crop. Almost 75% of the area and 70% of the total production under rubber are shared by small holdings. Those holdings above 20 hectares in extent are defined as 'estates' and those up to 20 hectares are 'small holdings'. A classification of the size of rubber holdings obtaining in the country based on the statistics for 1980-81 reveals that there are as many as 1,10,000 small holdings while the large holdings are as few as 550.

Prospects

By 2000 AD the need for rubber in the country is estimated to be of the order of 6 lakh MT. The plantation Industry would not have measured upto this level by then, leaving a wide gap between demand and supply. Therefore any amount of rubber produced in the country is sure to be absorbed by the consuming sector, thereby assuring a bright future for this commodity.

The efforts of the Rubber Board is therefore directed to promote intensive and extensive cultivation of rubber in the country employing the latest technology. Since 1957 the Board has been implementing a scheme for subsidising the replanting of uneconomic holdings. Over 55,000 hectares have been replanted under this programme till 1980. From 1980 onwards both replanting and newplanting are being subsidised on a par under an integrated programme called 'Rubber plantation Development Scheme', the scale of assistance extended being as given below for different slabs, based on the size of holdings.

Size of rubber holding	Subsidy (per Ha.)	Loan (per Ha.)
0.20 to 6 Hectares	Rs. 6980	Rs 8020
6 to 20 Hectares	Rs. 5000	Rs. 10000
Above 20 Hectares	Rs. 3000	Rs 12000

It could be seen that the total finance made available to all the three slabs is at the rate of Rs. 15,000/-per hectare with variable rates of subsidy and loan. Besides, 3% of the interest chargeable on the loan component for small holders owning upto 20 hectares of rubber will be subsidised by the Board. The accumulated interest at the reduced rate is to be paid in annual instalments from the 8th year of planting, while the principal is to be paid back in 5 annual instalments from the 10th year onwards. A rubber plantation starts yielding from the 7th year and attains commercial production from the 10th year onwards. Hence such a repayment schedule.

This new programme of the Rubber Board is claimed to be the most attractive and unparalleled agricultural development scheme ever attempted for any crop anywhere in the country. The response for this programme, on account of the liberal provisions it contains to meet almost the entire cost of cultivation till maturity in the form of subsidy and soft loan, has been very good.

Transfer of technology

There is a well built machinery within the Rubber Board to communicate with the rubber producers and disseminate new technology at regular intervals employing the various channels of information. Rubber producers in India are remarkably innovative and receptive. The small holders are found to be relatively more advanced in their "information seeking behaviour" than the organised sector. This feature of the small holder sector in India has made it superior to its counterparts in other rubber producing countries.

Crossing the frontiers

In a bid to produce more rubber, the Rubber Board has crossed the frontiers of the traditional boundaries and stepped into the states in the North Eastern sector. Tripura has taken the lead in introducing rubber, followed by Assam, Meghalaya, Mizoram, Nagaland and Arunachal Pradesh.

Cost and presentation

Natural rubber in India has to emerge competitive in cost of production, processing and presentation of the produce. Costs could be brought down only by increasing output per unit area. This is possible, for, the technology is there, the resources are there, extension support is there and above all the protected market and remunerative returns are also assured. As a renewable resource, natural rubber has no immediate threat even from synthetic polymers which are made of feed stocks that are exhaustible. On account of this, the reliance on natural rubber has been increasing.

Of late the supply of oil has improved resulting in reduction of prices. Those associated with natural rubber should certainly be siezed of this development, because if Petroleum becomes cheaper and abundant the prospects for synthetic polymers would improve. Therefore efforts at increasing production and productivity of natural rubber should aim at built-in safeguards for the future, such as installation of adequate infrastructure for development of rubber based industries, so that if at any point of time the supply tends to exceed demand there should not be any glut or slump.

It is eminently true that "after oil, rubber is the power". Rapid sophistication and urbanisation in the life style of human beings in underdeveloped economies cannot materialise without increased output of rubber. The fact that while an American consumes 15 kg. of rubber per year, a Canadian consumes 12.5 kg. per year, a German consumes 10 kg. per year and a British consumes 8 Kg. per year, three Indians put together is consuming only 1 Kg. of rubber per year, would reveal the immense scope and vast vista of opportunities that await the rubber plantation industry in this country.

A classic case of high productivity in rubber plantations is the Chinese experience, which I had the good fortune to learn recently. I had been to China along with the Director of Research of the Rubber Board a few days back to participate in the meeting of the International Rubber Research and Development Board at Beijing. At that time the organisers of the meeting had taken us round the various rubber growing areas in China.

Unlike other rubber producing countries China cultivates rubber facing a variety of agro-climatic oddities. The rubber growing belt in China is located far away from the conventional tropical region. It falls between 18°-24° North-a zone considered most inhospitable for rubber.

Very wide daily range in temperature varying from 0°C at night to 20°C during day time and high velocity typhoons are certain other inescapable features of Chiness climate. Similarly long drought seasons, poor soil and frequent cold waves impose severe constraints on the suitability of China to plant rubber.

Despite these disfavours the Chinese people have managed to plant rubber and attain a national production average, almost comparable to that of ours. They have evolved cold resistant varieties and checked typhoon damage by establishing green walls of wind-breaking trees.

Chinese perfected their rubber planting techniques learning from the past experiences they had with the failures in earlier plantations which were devastated by natural hazards like extreme cold and high velocity typhoons. As a result rubber trees have found a home in China. It is the ingenuity, dedication and concerted efforts of the Chinese people that have made rubber cultivation in China possible. The pace at which China has emerged as a successful rubber producer points to the fact that even against heavy odds she will outstrip other traditional counterparts in production and productivity.

To many of those who have planted rubber it is a KALPAVRIKSHA, because every part of this tree is utilisable. The rubber wood has a variety of uses. If properly treated it would yield excellent material for fabricating attractive furniture. Branches of this tree when cut down provide quality fire wood. Rubber seed oil is extensively used for making soaps. Rubber oil cake is a good cattle feed. The honey exuding from the rubber trees is very delicious. Of late, the dried petiole twigs have been found well-formed splinters for making safety matches. Ecologically rubber trees offer a forest environment.

In short "rubber planting is prosperity."

Maximising rubber output per unit area at minimum costs should receive top priority. I hope this Seminar will drive home this message ably and effectively.

I am immensely grateful to the organisers of this Seminar for having given me an opportunity to share my thoughts with you on the vital aspect of productivity.

I declare this Seminar 'inaugurated' and wish that Productivity lead us to prosperity.

□

FIFTY PERCENT SUBSIDY FOR LOW VOLUME SPRAYER

The aerial spraying which is the most widely practised means for carrying out prophylactic operations against abnormal leaf fall disease of rubber is getting severely handicapped owing to shortage of the required type of helicopter in the country, difficulty in importing spare parts and dearth of trained and experienced pilots. During the last year extensive areas earmarked for aerial spraying could not be actually sprayed. The difficulty is likely to be experienced during the current year as well as in the years to come until the above position in respect of helicopters eases. To overcome this situation, the Board has decided to popularise use of low volume power sprayers which can be operated from the ground. The small rubber growers could utilize the services of sprayers available from the rubber marketing co-operative societies.

The scheme now approved by the Rubber Board provides for grant of 50 per cent subsidy in the cost of "Shaw Duster cum Sprayers" purchased by rubber marketing co-operative societies during 1983 for lending to small rubber growers for use in their rubber holdings subject to the rules under the scheme. "Shaw Duster cum Sprayer" is the only low volume power operated sprayer at present approved by the Rubber Research Institute of India. This is manufactured by M/s. Shaw wallace & Co., Ltd, Madras and marketed through their Regional Office at Kottayam as well as through their agents M/s. Ooppoottil Agencies. The price charged is Rs. 8,500/- per unit plus S T. at 8.8% or a total of Rs. 9,248/- ex their premises. The machine has an attachment with which it can also be made use of for dusting operations. As per the scheme now introduced, the Rubber Board would subsidies 50 per cent of the actural cost of the machine or Rs. 4,624/-, whichever is less against applications submitted in the prescribed manner by rubber marketing co-operative societies after effecting purchase of the machines.

It should be particularly noted in this regard that machines purchased under the scheme should be utilised for the benefit of small rubber growers only. The machine is somewhat light and sophisticated and hence, it should be handled only by trained hands at all times. The candidates selected and nominated by the Society will be given free training by the Rubber Board at the Rubber Research Institute of India with the assistance of M/s. Ooppoottil Agencies Kottayam.

NEWS IN PICTURES

RUBBER SEMINAR

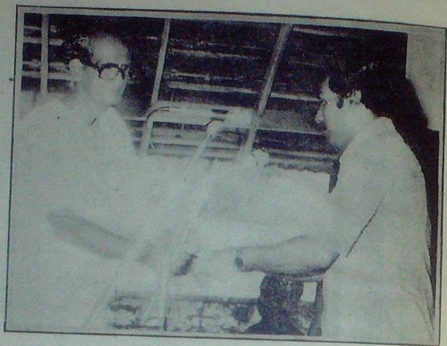
Malanadu Development Society, which is a registered Society under the Charitable Societies Registration Act, is the official organisation of the Diocese of Kanjirappally for social service. Head-quarters at Kanjirappally, the Society has a vast area of operation in the three districts of Kottayam, Idukki and Pathanamthitta. Though engaged in a plethora of activities like community development and organisation, small scale employment units, khadi & village industries, dairy projects, poultry breeding schemes, bee keeping, biogas development programme etc., the Society seems to move more towards the farming community particularly the poorest among the farmers.

As a result of its concern for the welfare of the smallest holders, the Society has recently launched the "RUBBER TO THE POOR" project, with the technical and material support of the Rubber Board. In 1982 the Society organised 1250 poor farmers in this programme and provided them assistance to plant some 125000 rubber trees. The Society proposes to organise 5000 marginal farmers owning less than a hectare of land under this programme and assist them to increase their annual income. It has already established 22 rural service centres with all the inbuilt facilities for distribution of planting materials, fertilizers, and fungicides and for conducting bordo spraying. 22 full-time paid social workers engage themselves in these centres, enrolling new members checking up with those already active in the project, and teaching them scientific rubber cultivation techniques.

The degree of enthusiasm that has been generated among the farmers through this novel programme of Malanadu Development Society was recently manifested at a Rubber Growers' Seminar conducted at Anakara in Udumpumchola taluk by the Rubber Board and Malanadu Development Society jointly. 600 farmers from as far as Kalthotty, Vallakadavu, Wallaride, Kochera and Vandenmedu sat through the long sessions that lasted till 5 PM with rapt attention and keen interest.

Shri P Mukundan Menon, Rubber Production Commissioner inaugurated the seminar. The inaugural meeting was presided over by Nandakumara Menon, Additional District Magistrate, Idukki. Experts from the Rubber Board and the Rubber Research Institute of India explained in detail such various subjects as preparation of polybag plants, new and high yielding clones, disease care and manuring, and the Rubber Plantation Development Scheme of the Rubber Board. The Seminar has successfully imparted a scientific know-how to the farmers on the cultivation of rubber.

REPLANTING DRIVE IN MODI VILLAGE



As part of the activities of the Modi Development Project, they have now embarked upon a new venture by which the applications for new and replanting subsidy would be collected from prospective smallholders and handed over to the concerned Regional Office of the Rubber Board. The applications from the smallholders who reside only within the jurisdiction of the Project would be collected in bulk. The survey plan of each area is to be prepared by the surveyors of the Project itself.

Shri K. Mohandas, District Collector of Kottayam inaugurated the new scheme at Poovathilappu on 6th May, 1983. Shri ET Varghese, Member, Rubber Board presided over the function. Thirty seven applications were collected at the inaugural function. About 100 more applications are also expected in the coming months. The District Collector complimented the Modi Rubber Development Project for the various measures being adopted by them towards improving the living standards of small rubber growers. Besides, Mr. Abdul Salam, District Planning Officer, the officers of the Rubber Board viz., S/s. V. Parasuraman, P. K. Narayanan and K. K. Ramachandran Pillai spoke on the occasion About 250 small rubber growers attended the function.

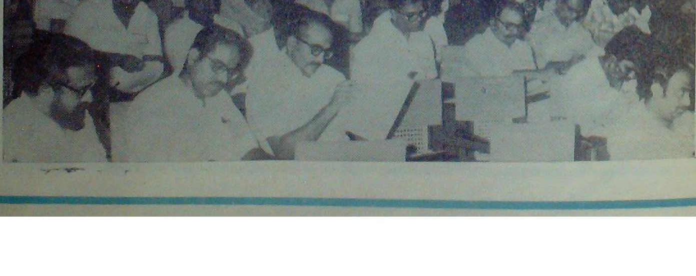
INAUGURATION OF THE NEW OFFICE

An office of the Junior Field Officer has started functioning at Bandadka in Kasargod Taluk with effect from 20th June, 1983. Shri P Murali Mohan, Dy. Development Officer, Taliparamba inaugurated the office. The meeting organised in connection with the inauguration was presided over by Shri Aravindan, Manager, Gramin Bank Branch there. Shri M Dinesh is the Junior Field Officer of the new office.

Shri KT Radhakrishnan, Field Officer addressing the participants of the rubber seminar held at Koorachundu on 26th March, 1983.

SEMINAR ON PRODUCTIVITY IN RUBBER PLANTATIONS

A seminar on productivity in rubber plantations was organised by Kerala State Productivity Council (KSPC) on 4th June, 1983 at International Hotel, Ernakulam in collaboration with Rubber Board, the Plantation Corporation of Kerala Ltd, State Farming Corporation of Kerala Ltd, Rehabilitation Plantations Ltd and Association of Planters of Kerala. The council is entering its Silver Jubilee Year and is therefore organising a number of special seminars, one of which is on productivity in rubber plantations. Shri PJ Thomas, Chairman, Rubber Board inaugurated the seminar. Shri PK Narayanan, Public Relations Officer introduced the theme. Dr. M. V. Pylee addressed. The technical sessions that followed were presided over by Shri P Mukundan Menon Rubber Production Commissioner and Shri TSG Nair, Managing Director, Plantation Corporation of Kerala Ltd, Dr. MR Sethuraj, Director, RRII, Shri NK Gopalakrishnan, General Manager (Plannning and Production) Plantation Corporation of Kerala Ltd, Shri KS Varma, Financial Adviser, Rubber Board, Dr. V. Haridasan, Economist, Rubber Board, Shri PN Krishnankutty, Research Assistant, Rubber Board and Shri T. Upendran, Chief Executive, AV Thomas and Company, Alleppey presented papers on various topics. Shri PN Surendran, Managing Director, State Farming Corporation of Kerala presided over the valedictory session. Dr. S.N. Potti, Dy. Director, Rubber Research Institute of India delivered the summing up speech. The intention of the seminar was to introduce the principles of productivity in plantation management thereby improving the efficiency of plantations. (The inaugural speech of Shri PJ Thomas and the papers presented by S/Shri PN Krishnankutty and KS Varma are included elsewhere)



news and notes

SUBSIDY FOR RAINGUARDING OF RUBBER TREES IN SMALL HOLDINGS

Encouraged by the response of the scheme already introduced for rainguarding of rubber trees in small holdings the Rubber Board has decided to continue the implementation of the scheme for the remaining two years of the current plan period on a large scale.

According to the programme to be implemented with immediate effect, tapping shade, polythene sheets and adhesives required for rainguarding in 5000 hectares of mature, high yielding areas in small holdings will be made available with 50% subsidy at source. The distribution of the materials will be undertaken through the Kerala State Rubber Marketing Federation Ltd, their constituent rubber marketing co-operative societies and associate co-operative institutions.

The smallholders desirous of availing the benefits under the scheme shall apply for the same in the form prescribed, which can be had from all the Regional offices of the Rubber Board.

CHINA'S RUBBER OUTPUT WILL EXCEED INDIA'S

(The despatch of the Press Trust of India from Beijing after and interview with the leader of the Indian delegation to China Shri PJ Thomas got wide coverage in the Indian Press. The report is reproduced below:)

BEIJING, May 30 (PTI)

China may overtake India in natural rubber production in the next five to ten years, although per hectare yield is 830 kg here compared with India's about 700 kg in this country.

The Chairman of the Indian Rubber Board, Mr. PJ Thomas, who was here for the first-ever nine-day symposium of international rubber research and development told PTI that "China is going to double its rubber production in the next five years because of increase in acreage and not because of higher productivity."

"Now the Chinese claim that they have a special clone for high altitude and cold conditions." Mr. Thomas said adding that "because of China's increase in acreage under rubber plantation, there is likelihood of China overtaking India in rubber production in about 5 to 10 years.

Currently, India is producing 1.67 lakh tonnes of natural rubber, while China's yield is about 1.40 lakh tonnes annually.

While there are 4.50 lakh hectares of land under rubber plantation in China, India has only three lakh hectares, but the latter's total production is 0.27 lakh tonnes higher. The gestation period of a rubber plant is about seven years before it is ready for tapping.

India is presently importing between 30,000 and 40,000 tonnes of natural rubber to meet increasing demand but from 1978 onward "we have increased our plantation by 60,000 hectares. It is new plantation of high-yielding variety." Mr. Thomas said.

In the Andaman Islands, "we have already 2000 acres of tapping rubber. In nearby Katchal Islands, there are 600 hectares of rubber plantation.

"We have in Tripura more than 2000 hectares of land under rubber cultivation. Some of the areas are already yielding rubber but some not", Mr. Thomas said.

"We have stretched our rubber cultivation to Goa, Karnataka, Maharashtra, Assam and Meghalaya. Rubber pr duction in India is promising and its imports will be on par with consumption in another five years."

The Rubber Board has plans for rubber plantation in hot conditions, while China is experimenting in cold areas at high altitudes.

Mr. Thomas said, "We are also going to have high altitude rubber cultivation in Meghalaya and Mizoram with like almost in the same latitude as that of China."

Until a few years ago, rubber cultivation was done in Kerala alone where climatic conditions are ideal for the development of this valuable agricultural commodity.

The Beijing symposium was also attended by Dr.M.R.Sethuraj, Director of Research, Rubber Research Institute of India.

RESEARCH GRANT FOR RUBBER TECHNOLOGY DEPARTMENT

The Department of Science and Technology of the Union Government has sanctioned a research grant of Rs. 10 lakhs to a proposal submitted by the Department of Polymer Science and Rubber Technology of the University of Cochin.

The research proposal entitled "thermoplastic elastomers based on natural rubber" will be carried out under the guidance of Prof. D. Joseph Francis, Department Head.

The object of the investigation is to explore the possibility of introducing reprocessability to rubber products, Prof. Francis said.

By introducing thermoplasticity, rubber compounds could be processed on injection moulding machines which may revolutionise the rubber processing industry in the country, he said.

The Alexanfer Von Humboldt Foundation of West Germany has also donated a brandender platograph costing about Rs. 2 lakhs to the department for exclusive use in this project, Prof. Francis added.

SPEEDIER GENETIC INTRODUCTION

Scientists working with the Monsnto Company in America have found a way of getting new genes into plants so that the plants then obey the new genetic instructions. This technique will enable plant breeders to overcome the present laborious plant breeding methods. At the moment if a new characteristic is to be introduced into a plant the cultivated plant has to be crossed with another plant having the desired characteristic. Several years of growing and selection then follow to eliminate the unwanted plants until the desired variety is selected. The new method will reduce this to just one step.

Until now it has been difficult to get new genes into plants because of the way plants are structured. Each plant cell has a hard outside skin with a soft jelly-like centre. To work on the cells, it is necessary to take out the soft centre and get the new gene in. So far all methods have failed to make a successful transfer. So scientists have been trying a new angle.

The bacteria, *Agrobacterium*, causes a form of cancer on plants by infecting the plant cells. To do this the bacteria inserts its own genetic material into that of the infected cells. So the scientists have used this bacteria to transfer other genetic material into the plant by placing that genetic material in the bacteria. The Monsanto scientists have proved that extra genes which were implanted into agrobacteria were transferred into plants infected by the bacteria and that those extra genes were then expressed by the plant cells. That is, the plant obeyed the new genetic instructions. The technique is still in its early stages and it has yet to be shown if the new genes will remain in the crop plants generation after generation. But the technique does look as if it will enable plant breeders to transfer in disease resistance and other characteristics not only from related species but from unrelated as well.(Agricultural Development)

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