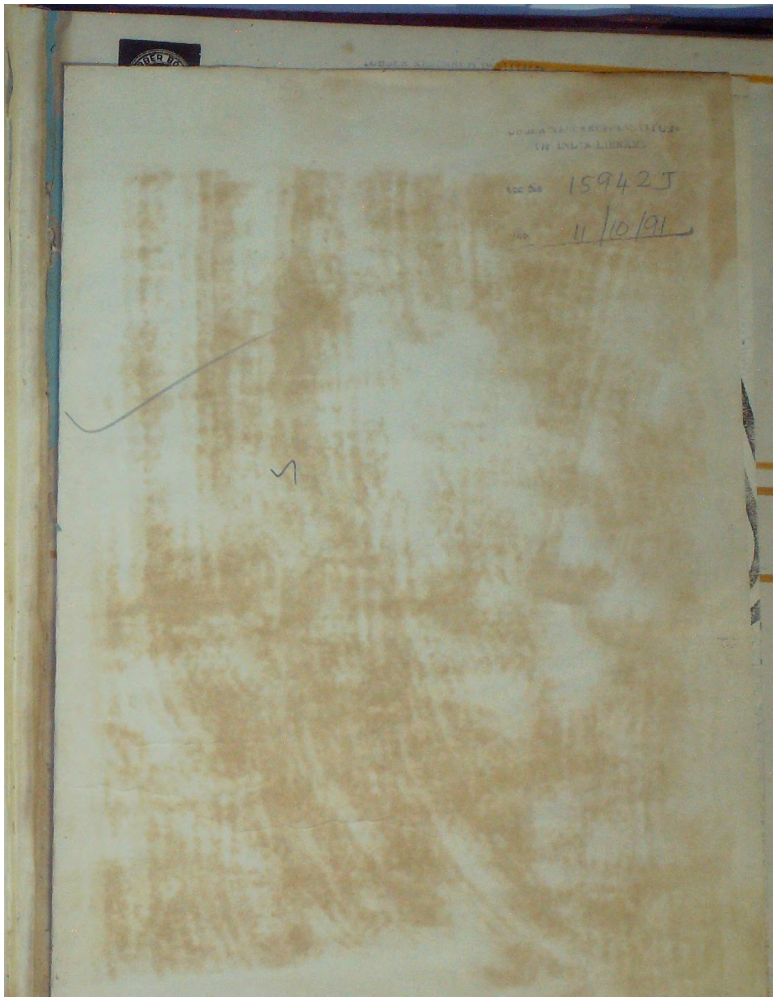

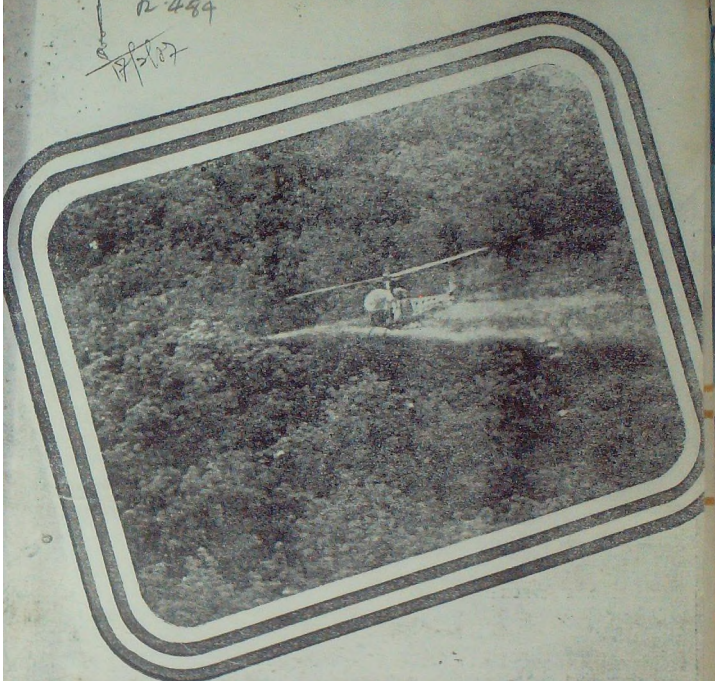

RUBBER BOARD BULLETIN

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Cover:

The Prime Minister visited the Rehabilitation Plantations at Punalur when he had been to Kerala last time. In the picture Shri Rajeev Gandhi curiously watching the tapping of rubber tree while others including Smt. Sonia Gandhi, his wife, Shri K Karunakaran, Chief Minister, Shri P Mukundan Menon, Rubber Production Commissioner look on.

THE RUBBER BOARD
KOTTAYAM 686 001 INDIA

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PC Cyriac IAS

Secretary
V Bhaskara Pillai

Rubber Production Commissioner
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Director of Research
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CM George

RUBBER BOARD BULLETIN

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THE QUARTER

At a time when all out efforts are being made to bring down prices of raw materials, the upward trend in prices of various grades of natural rubber, even during periods of peak production, has been causing concern for the Govt and the Rubber Board. The informal consensus arrived at the meeting of the secretaries of various economic ministries is that a price around Rs. 16.50 per Kg for Grade RMA-4 of natural rubber would be fair to both the producers and consumers. This has been endorsed by the producers as well. As against this, the price of RMA-4 has been ruling over Rs. 17 per Kg for the last few weeks. This would give the impression that the commodity is in short supply. The authorities will be left, as a result with no other option than improving the arrivals to the market by releasing rubber from the imported stocks and ordering for fresh imports. Therefore those producers and traders who have held stocks, speculating the prices would rise further during the lean season ahead, would do well if they bring their stocks to the market so that the scarcity for the commodity leading to rise in prices beyond a reasonable level could be put under check.

Shri P. C. Cyriac IAS addressing the 104th meeting of the Rubber Board. Shri George Joseph Mundackal M P, Shri M. D. Joseph, Vice Chairman, Rubber Board and Shri Bhandari, Director Ministry of Commerce are also seen.

104th Meeting of the Rubber Board

PLEA FOR ENHANCING PLAN ALLOCATION FOR RUBBER

Though the working group on Plantations constituted by the Planning commission had recommended an allocation of Rs. 150 crores during the 7th Five Year Plan for development of the Rubber Plantation Industry to be appropriated by the Rubber Board, the initial indication was that due to severe resource constraints this has been pruned down to Rs. 50 crores, as was done proportionately in other priority sectors. But the Rubber Board has very strongly made out its case to the Government of India repeatedly asking for higher allocation, as otherwise the entire programme for development of this commodity envisaged during the 7th Plan would go unfulfilled. If has also been made clear to the Government that at least an outlay of Rs. 120 crores should be made for rubber, which is the barest minimum.

This was revealed by Mr. P. C. Cyriac, Chairman, Rubber Board while addressing the 104th Meeting of the Board at Kottayam.

The Chairman hoped that the Government of India would favourably consider the request of the Board and sanction at least Rs. 120 crores for rubber, without which it would be extremely difficult to continue even the existing scheme for Rubber Plantation Development for which elaborate preparations have been made by the Board both in the traditional and non-traditional areas.

In order to achieve the projected targets for natural rubber production, ie., 300,000 tonnes by 1990 and 500, 000 tonnes by 2000 A. D., it is necessary to initiate steps for taking up large scale cultivation of rubber in non-traditional areas and boost productivity in traditional areas by phased replantation. The Chairman reported to the meet-

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THE QUARTER

Rubber Board has decided to do away with the practice of giving approval to rubber nurseries in the private sector during the current year. As a result of this, those who have raised high yielding planting materials of good variety in their nurseries are free to sell such materials to the rubber growers. The conditions heitherto imposed by the Board to the effect that only plantations raised with approved high yielding materials obtained from sources approved by the Board would qualify for planting, licence, registration and financial assistance would now stand relaxed so far as the insistance of source is concerned. But the Board still insists that the growers should use the approved high yielding materials. By this, they will be able to make their own contributions to the efforts made by the Board in enhancing the rubber production in India. The Board also desires to ensure that the use of high yielding planting materials should be a practice to be followed in the small holdings. On the other hand the nurseries while enjoying this freedom, are expected to sell only good quality materials to the needy growers.

Shri P. C. Cyriac IAS addressing the 104th meeting of the Rubber Board. Shri George Joseph Mundackal M P, Shri M. D. Joseph, Vice Chairman, Rubber Board and Shri Bhandari, Director Ministry of Commerce are also seen.

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STEM DISEASES OF *HEVEA*

Pink Disease

Pink disease affects the bark of the upper stem and branches of young trees particularly those between three to eight years old. The resulting loss of canopy retards growth, hence delaying the period of immaturity. The disease can be easily controlled by fungicides if the attack is detected at an early age.

Bordeaux mixture is widely used for controlling pink disease. It is effective only with frequent applications, as often as once a week, by spraying with a knapsack sprayer fitted with a lance and nozzle capable of giving a jet of liquid to a height of about 8 meters. Bordeaux mixture is usually prepared in the field in the proportions of 1 kg of copper sulphate, 2 kg of slaked lime and 100 litres of water. To avoid contamination of latex with copper, Calixin brush-on formulation was recommended since 1974 for use on trees under tapping as well as on immature trees. A single application gives good control for up to three months. Unfortunately, the need to climb the tree or the use of a ladder for applying the brush-on-formulation makes it impracticable when large number of trees are affected. Because of the high wastage during spraying (estimated at fifteen to twenty times more chemicals than painting), it is not economical to use Calixin in a sprayable formulation. Studies are being directed towards the development of a sprayable formulation that will be effective and economical to apply.

Black Stripe

Black stripe is a disease of the tapping panel. The disease prevents healthy regeneration of tapped bark. When conditions are favourable to the fungus, large areas of the renewing panel can be destroyed making future tapping difficult or impossible.

Black stripe can be controlled by regular applications of fungicides. During the past decade, 2% Difolatan 4F (0.8% captafol), 0.5% Antimucin WBR (phenyl mercuric acetate) and 0.5% Actidione (cycloheximide) were used for controlling the disease. Recent field trials have demonstrated 0.8% Ridomil (0.2% metalaxyl) to be slightly more effective than Difolatan. Due to their toxicity and non-availability, Antimucin and Actidione are no longer recomended.

Our present recommendation for block stripe control is 2% Difolatan 4F in water, applied at alternate daily interval, or Ridomil at four-daily intervals, usually for a period of about six weeks. However, Ridomil should not be used alone in view of reports of build-up of resistance by *Phytophthora* on other crops. Therefore, it is advisable to use Ridomil alternately with Difolatan. If these fungicides are formulated in an oilwater emulsion (PY formulation) the frequency of treatment is much reduced. Testing for newer chemicals is in progress.

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Cover: Aerial spraying on rubber

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THE QUARTER

Rubber bands have many uses in our day to-day life. In packing and binding, cotton thread and jute hessian have been replaced by rubber bands. It enjoys a very good international market. Malaysia exports about 5000 tonnes of rubber bands every year. But due to the peculiar atmosphere prevailing in India, the new entrepreneurs are being confronted with numerous problems even at the initial stages with regard to marketing. The workshop organised by the Technical Consultancy Division at the Rubber Research Institute of India has succeeded in identifying the problems. It is hoped that the deliberations of the workshop could draw new guidelines with a view to bring changes to the present set up.

IPREX 87 MALAYSIA

Malaysian International Plastics & Rubber Exhibition

Plastics and Rubber Industries to Focus on Malaysia

From 14th – 17 th July 1987, the Putra World Trade Centre in Kuala Lumpur will host the first Malaysian International Plastics and Rubber Exhibition - IPREX '87. This event is being sponsored jointly by the Plastics & Rubber Institute of Malaysia (PRIM) and the Rubber Research Institute of Malaysia (RRIM). These two authoritative bodies are at the forefront of Malaysia's polymer resources development programme which is designed to re-direct the market orientation of the industry.

IPREX '87 is intended to be an important stepping-stone on the way to full realisation of the Malaysian plastics and rubber industries' potential. The 5 th Malaysian Plan (1986–90) provides an accurate indicator of the government's intentions when it states that "the development of resource-based industries will open up more opportunities for investment, both for exports as well as for the domestic market." Equally, the government's attitude to foreign expertise is expressed clearly in the following sentence, "exports will also be promoted through the establishment of joint-ventures with foreign companies which have the marketing expertise and network, technology, and research and development facilities."

IPREX will be an ideal opportunity for companies who are considering joint-ventureship to test the market and establish further contacts within the country. With government encouragement assured, there will be great interest at the exhibition in new techniques, machinery, methods of training and ways of entering new markets. In partnership, international and Malaysian companies will be capable of providing the necessary developments that will allow the volume of finished rubber and plastics products for export to increase.

Interest has already been aroused over IPREX in the international business community, with several European countries preparing to fund national groups at the exhibition. With this level of involvement anticipated, IPREX will be a forum for the Malaysian rubber and plastics industry that will be recognised worldwide. A high level conference, in which many of the industry experts will be participating, is being planned to run concurrently with this exhibition. These two events guarantee that from 14th - 17 th July 1987, the international polymer industry will focus its attention on IPREX, Malaysia, and the potential that the country holds.

Fourteenth Rubber Conference

The Indian Rubber Manufacturers' Research Association will be holding its 14th Rubber Conference in Bangalore on 22nd and 23rd January 1988. The venue is Windsor Manor, Bangalore. The two-day conference will have four or five sessions and will deal with various aspects of the rubber and associated industries including Rubber Chemistry, Technology, Engineering, Compounding Ingredients, Machinery, Test Equipment etc.

Papers

Those planning to present papers at the conference are requested to note the following.
–Papers must be based on experimental work and original. Review papers of a general nature will not be accepted. The time alloted for presentation of papers is 20 minutes.
–The full text of the papers including diagrams, pictures etc should be sent to IRMRA on or before 31st October 1987.

Delegation fee

Each delegate will be required to pay in advance a fee of Rs. 650/- (Members) and Rs. 750/- (Non-members). Cheques may be drawn in favour of Indian Rubber Manufactures' Research Association.

Each delegate will be provided with a set of preprints of the papers to be presented at the Conference.

The delegates will be served light refreshments, and lunch.

Expenses incurred on boarding, lodging and travelling for attending the Conference will have to be met by the delegates.

ing the impressions he gathered during his recent visit to Assam and Meghalaya. He observed that the Governments in these states are fully siezed of the necessity to take up large scale planting of rubber there. The Board intends to launch intensive campaigns in the whole of North-East and other non-traditional areas to create awareness among the prospective growers.

Shri Cyriac also made reference to the interest being shown by the Prime Minister in taking up rubber cultivation in Orissa since that State has great potential for this crop. The Board, the Chairman said, will soon be taking steps to open up an office in Orissa and popularise rubber cultivation there.

Crown Budding

The Chairman then informed members of the action pursued dy the Board for gradually bringing up the present average yield of 800 kg per hectare to 1000kg in three years from now and to 1500 kg in five years. This would be possible, with the large scale adoption of the high yielding variety RRII 105 and the technique of "crown budding" proposed to be popularised among small holders to combat the leaf fall disease. Despite positive results, small holders still shy away from rainguarding. This technique is proposed to be popularised, so that loss of tapping days during rainy months could be avoided.

Shri Cyriac informed the Board of the favourable response shown by the Department of Agricultural Aviation for permitting liberal import of helicopters for spraying rubber estates. For spraying small holdings located scattered, the power sprayers now made available through cooperatives and farmers' associations could be made use of.

In the industrial sector, the Chairman pointed out that, due to the liberal policy enunciated by the Government, rubber-based industries are picking up fast which will increase consumption of rubber.

Shri Cyriac then explained the efforts made by the Board to clear off arrears in inspection and payment of subsidy to rubber growers who have planted under the Board's Scheme.

Rubber import

Out of the 29, 000 tonnes of natural rubber allowed for import during 1985-86 only 17,500 tonnes have been physically brought in. The Board resolved to recommend to the Government to import the remaining quantity of 11,500 tonnes with 3, 000 tonnes in December 1985, 4,000 tonnes in January 1986 and 4,500 tonnes in February 1986. It was decided that the release of above quantity, to be imported in a phased manner, would be done only in consultation with the Rubber Board. □

NR Producer making Rubber Toys

Malaysian natural rubber producer has taken government's urging to heart and now is producing NR latex toys.

Kumpulan Guthrie Sdn.Bhd., one of Malaysia's largest plantations, is involved in a joint venture with Newfeld Ltd. of the United Kingdom to make "Bendy" NR foam toys, according to the Malaysian Industrial Development Authority. That move is in line with the Malaysian government's avowed goal of turning the nation-the world's largest producer of NR-into a major force in rubber product manufacturing.

Guthrie Bendy Sdn.Bhd, has reached its first-year goal of making 1.5 million units in only nine months.

The joint venture is an outgrowth of the 40 year customer/supplier relationship of Newfeld and Guthrie.

Newfeld makes its own line of Bendy toys for the U. K. and imports the toys, too. In 1983 Newfeld and Guthrie discussed shifting part of Newfeld's manufacturing to Malaysia, where it could take advantage of the

Stuck on dad

Wacky Wall Walkers stick to lots of things, including fathers. Kenzo (left) and his brother, Justin, Hakuta bedeck their dad, Ken Hakuta, President of Tradex Corp and the importer of the rubber toys, with the products that have made him a millionaire.

Silicone sealant aids Pacific rowing feat

Kathleen and Curtis Saville have concluded a 7,000-mile Peru-to-Australia trip in a 25-foot boat, which was kept water tight by a silicone rubber sealant. Below, the couple use the General Electric Co. Silicone II sealant to caulk a bilge hole in the "Excalibur." The sealant is impervious to ultraviolet light and the corrosive effects of salt water. At right, the Savilles cast off from American Samoa. The Morgan, Vt. couple set a record for the first crossing of the Pacific Ocean by a rowing boat.

lower cost and better availability of NR latex.

The arrangement gives Guthrie a 51–49 percent majority equity position in the joint venture firm, which manufactures the toys in Malaysia. Meanwhile Newfeld holds a 51–49 majority in Bendy International, the U. K firm that handles international sales of the toys.

Guthrie Bendy produces the toys in the heart of a rubber plantation, the Port Dickson Lukut Estate. That location is unusual by Malaysian standards, where industrial estates are the norm.

"However, the infrastructural facilities are all here–electricity, piped water, telephone–even a railway line that runs right to our doorstep," Factory Manager Ng Poh Seng told MIDA. The toys even have a little "Cabbage Patch", in them, another Guthrie Bendy official hints.

"We are consistent in quality, of course, but no two toys are indentical, since the workers hand–draw every feature onto the toys, "said Ooi Beng Leong, Guthrie rubber products manager. "Perhaps we should market our toys on the strength of their individuality."

The operation had some training troubles initially, according to Ng–at first each worker could turn out just 40 toys per day, which Ng calls a disaster. "Our British technical adviser was shaking his head in despair."

But within a few weeks the workers got the hang of it, and today the average output per worker is 240 units, even above production levels achieved elsewhere so far, Ng said. The company turned out 1.5 million units in its first nine months of operation, the goal for the year.

The company employs 120 production workers and another 40 "home workers" who work at home at a piece rate assembling the wire frames used for the toys when seasonal demand picks up. □

Rubber Plas '86

Singapore–American suppliers to the rubber and plastics industry will have an opportunity to exhibit their products in an official U. S. Government pavilion at Rubberplas '86, the Fourth International Rubber & Plastics Exposition and Conference for Asia.

The event will be held at the World Trade Center in Singapore March 12–15, 1986.

The U. S. Department of Commerce has granted Trade Fair Certification to Cahners Exposition Group, organizer of Rubberplas, to also organize the American pavilion.

The U. S. government contact is Eugene shaw, Office of Special Industrial Machinery, Department of Commerce, Room 2100, Washington, D. C. 20230. Telephone (202) 377-3494.

For information about the Rubberplas Rubber Conference contact Rudy School, Technical Editor, Rubber & Plastics News 34 North Hawkins Ave. Akron. Ohio. □

PROSPECTS OF RUBBER PLANTING IN ASSAM

Rubber is a unique raw material which is vital and indispensable for the production of a wide array of strategic, industrial, agricultural and household goods. The world today uses as many as 50,000 different rubber products ranging from giant tractor and truck tyres to tiny button bushes, from hard ebonite products to soft foam goods and liquid adhesives and from life saving surgical aids to humble erasers, toy balloons and rubber bands. India occupies a prominent position in rubber goods manufacturing field and produces over 35,000 individual items, most of those for fast escalating internal use. Exports of rubber goods are also on the rise.

Natural and Synthetic rubbers

There are natural and synthetic rubbers. Natural rubber is derived from the milky juice or latex extracted from the bark of *Hevea brasiliensis*, a tropical tree having its centre of origin in the rain forests of the Amazon valley of South America. Successfully introduced to the east towards the close of the 19th century, the rubber tree today has grown in scientifically laid out plantations extending over 7.5 million hectares in Malaysia, Indonesia, Thailand, China, India, Sri Lanka, Nigeria, Liberia, Ivory Coast, Viet Nam, Cambodia, Philippines, Brazil, Burma, Bangladesh, Mexico etc. Synthetic rubbers, introduced commercially during the Second World War are produced mainly from petrochemical feedstocks by such industrialised countries as U. S. A U. S. S. R, Japan, France, Federal Republic of Germany, U. K., Italy, Brazil etc. China and India are also amongst the synthetic rubber producers. Although synthetic rubber accounts for about 68 percent of the total rubber used in the world today, the natural product is again gaining importance for the reasons that it is a renewable resource, non-polluting in its production and cheaper. Quality-wise also it is superior for general and heavy duty purposes. Further, it is being progressively modified through chemical means to yield different varieties which meet standards for special purposes.

Need for stepping up natural rubber production

India has all along given prominence for the use of natural rubber and at present as much as 80 percent of the total domestic use is contributed by it. As a result of the rapid industrialisation taking place in the country, rubber remains to be a commodity that is internally in short supply. From the time of independence, the area under rubber cultivation in India has increased from 65,000 hectares to over 300,000 hectares, the national average yield per hectare per year from 300 kg to 900 kg and the production from 15,000 tonnes to 200,000 tonnes. However, over the same period the consumption of natural rubber has risen from 19,000 tonnes to 230,000 tonnes. It is estimated that its domestic demand would reach 500,000 tonnes by the year 2000 AD. The country is now spending Rs. 30 crores in foreign exchange for import of natural rubber. This can increase several-fold even in the next 15 years. No doubt, the scope for stepping up the production is vast and its need urgent.

Non-traditional areas for rubber cultivation

Traditionally, rubber has been grown in India in the hinterlands of the south west coast, mainly in Kerala and adjoining districts of Tamilnadu and Karnataka. Owing to extreme pressure on land, the scope for further large scale expansion of the cultivation in these areas is limited. Realising this situation, intensive efforts have been made over the last two decades to identify suitable nontraditional areas for future development. These have gone to prove that large tracts of land in such States and Union Territories as Assam, Tripura, Meghalaya, Manipur, Mizoram, Nagaland, Arunachal Pradesh, West Bengal, Orissa, Andaman & Nicobar Islands, Goa, Maharashtra and Andhra Pradesh do provide agroclimatic conditions conducive for economic rubber cultivation.

Choice for location

The Rubber tree flourishes and yields best in warm, humid tropical conditions. The desired produce being the latex from the bark, it should be ensured that the tree attains quick vegetative growth, a clean and thick bole and soft and succulent bark. For these, the optimum conditions required are the following:

* An annual rainfall ranging from 2000 to 3000 mm evenly spread out over all the months of the year.
* Copious sunshine.

The general view of a rubber plantation planted with budded plants

* Equable temperature within a range of 21° to 35°C.
* High Relative Humidy in the atmosphere (75% to 95%).
* Deep (minimum 100 cm), well drained soil of acidic reaction (pH 4.0 to 6.5) and fair to good fertility.
* Freedom from factors that cause severe physical damages such as strong winds, cyclones, hail storms etc.

The above conditions are usually obtained in the plains and low hill tracts (Mean Sea Level to 300 metres above) of the equatorial tropics stretching to 10° North and South Latitudes.

The rubber tree is however a hardy one which can perform with fair to admissible degree of success in conditions more or less varying from the above. Hundreds of strains developed through careful breeding and selection in various rubber growing countries and cloned by the vegetative propagation of budgrafting provide choice of planting materials suited to differing environments. Agromanagement practices have also been evolved over the years with a view to making young plants and trees to grow and yield satisfactorily even under somewhat inhospitable conditions. All these have enabled successful development of extensive rubber plantations in not so ideal locations in North Kerala, Karnataka, Goa, North Eastern India, Thailand, Vietnam, China, Burma, Bangladesh etc.

Flat, mildly slopy and gently undulating lands are easy to work for planting, maintenance and tapping of rubber. Steep slopes are also being made use of for planting after providing such soil conservation measures as contour terracing, contour bunding etc. but it should be borne in mind that these would bring in higher costs. Lands prone to inundation or sub soil water-logging should be generally avoided unless artificial drainage can be provided easily and at reasonable cost.

Costs and benefits

Rubber planting and production have attained high levels of sophistication. All operations have to follow modern scientific methods and

management practices progressively evolved over decades if high levels of yields and profits are to be derived. Results prove good if all seasonal operations are promptly and meticulously done. The first three years are of critical importance in raising a successful rubber plantation. Prominent lapses and failures at this stage would adversely affect the plantation in the long run. Uniformity in the growth and yield of plants should be essentially achieved for which due care and attentation should be bestowed on individual plants. The immaturity period of rubber plantations in India is generally accepted as 7 years.

Consistent with the above, the direct agricultural cost of land preparation, planting and maintenance up to maturity 1985-86 rates can amount to an estimated Rs. 22,500 per hectare in the non traditional areas listed above. The cost of engineering infra-structure and management over heads will be extra. Well managed rubber plantations planted with high yielding cultivars in traditional areas in India yield an average of 1,500 kg of dry rubber per hectare per year. Economically productive period is 25 years starting from the 8th year of planting. A good yield in non-traditional areas can be assumed at an average 1,200 kg per hectare per year. At the prevailing steady price ofRs. 16/- per kg. the gross income will be Rs. 18,200 per hectare. The net income before tax can then be Rs.5,000 to Rs. 7,000 per hectare.

The resale value of old trees cut down after the 32 year cycle can be additional terminal income. Rubber timber, it may be noted, is easily degradable soft wood. By an easy chemical treatment, it can however be converted into light hard wood fit for furniture, light construction work, packing cases etc.

Rubber seeds are oil bearing. The oil is of the non edible type largely used for soap making etc. The oil cake is good for cattle or pig feed production. Another minor bye product of rubber plantations is honey obtained through bee-keeping. The extra floral nectaries occuring on flushes of tender leaves put out by the trees after annual wintering in December/January are a rich source of nectar for the bees.

The economic and social benefits can be summed up as follows.

1. Enables productive and economic utilisation of cultivable fallows and under utilised lands.
2. Generates rural employment opportunities. Mature rubber plantations provide regular employment at the rate of 0. 7 person per hectare.
3. Provides viable alternative to shifting cultivation (jhumming).
4. Affords soil conservation.
5. Brings about environmental improvement.
6. Opens up avenues for new rubber based industrial ventures.
7. Supplies timber, oil, oilcake and honey.
8. Adds revenue to the public exchequer.

A small holder crop

Large plantations of rubber can enjoy the benefits of organised scientific practices and other economies of scale. However, small holdings today predominate over large plantations in most rubber growing countries. In India too, small holdings of I or 2 hectare size are common and successful. Cultivators can easily learn the planting and production techniques and make themselves self employed in their holdings. Procurement of chemical inputs, crop processing and marketing can be on group or co-operative basis. The Rubber Board provides free advisory and extension services and training. The Board or other local agencies can take up production and supply of high yielding planting materials.

In Kerala, rubber is proving attractive even as a home-stead or backyard crop. It is however safe to ensure that no family is wholly dependant on rubber. Other supplementary sources of income should be available as an adequate stand by for such eventualities as unfavourable market fluctuations and need for replanting.

Rubber in Assam

Among the States in non-traditional regions, Assam is considered eminently suitable for extensive development of rubber plantations. This has been established after successive exploratory surveys and trials.

The Soil Conservation Department of undivided Assam had laid out trial plantaions of rubber from as early as 1957 in various localities such as Ougury, Baithalangus and Kohora. Planting was carried out with the then available improved seedling varieties. The plantations in the above named three localities proved very successful. The yields obtained have been satisfactory.

Although rainfall in Assam is somewhat in excess of the requirements during monsoon season, its distribution is more or less comparable to that obtained in Kerala. The dry season is how-ever partly covered by winter in Assam during which period the temperature drops to around 10°C for a short period. The growth and yield of rubber in situations of low temperature are reduced. It has however clearly emerged that the deleterious effects of low temperature during winter are not such as to seriously

hamper the overall growth and yield of rubber in Assam.

Encouraged by the results obtained in the trial plantings, commercial scale cultivation was first undertaken by the State's public sector Assam Plantation Crops Development Corporation from the year 1974-75. The Corporation has upto now planted rubber in over 800 hectares of land distributed in sizeable blocks mainly in the hill districts of Karbi Anglong and Cachar. The project is a part of Hill Area Development Scheme and specifically aim at resettling of Jhumiya tribesmen. The plantations are to be eventually parcelled out into small plots and handed over to the tribal families. The Corporation has also proposals to develop rubber plantations in selected plains districts and to maintain those under own management. Parts of the earlier plantations which have high yielding budgrafted varieties have come under tapping and are giving yields comparable to those in traditional areas.

A number of rubber small holdings have been developed in the State in private sector from 1979-80. The total area under rubber in Assam has thus gone up to about 1,400 ha.

It is estimated that over 50,000 ha in Assam could be gainfully put under rubber cultivation. The prospective areas are mainly distributed in the dry lands situated at low elevations (tillas) in Goalpara, Kamrup, Dhubri, Kokrajar, Nowgong, Karbi Anglong, Darrang, Cachar and Karimganj districts and in selected pockets of Lakhimpur, Sibsagar, Jorhat and Dibrugarh districts.

It is proposed to develop rubber plantations in at least 6,000 ha in Assam during the VII Five year Plan period.

Development of rubber plantations in Assam is taken care of at the State level by the soil Conservation Department which is organising necessary infra-structure and other promotional measures.

Rubber Plantation Development Scheme

With a view to promoting new planting and replanting of rubber and thereby maximising rubber production, the Rubber Board is implementing an integrated scheme from 1980-81. Under this Rubber Plantation Development Scheme, a Package of assistance and incentives is granted. These consist of the following:

1. A non-returnable grant paid in seven annual instalments for subsidising cost of cultivation and maintenance of plantation during prebearing period.

A well grown budded stump raised in polybag

2. Long term agricultural loans from Banks for supplementing the Board's subsidy in order to meet the entire cost of cultivation. The interest on the loans is 10.5 percent for growers owning upto 2 ha of land and 12.5 percent for others. There is a moratorium on payment of interest for the first 7 years. The accrued interest is payable during the 8th and 9th year. Repayment of loan principal together with the current interest is spread over 5 years thereafter.
3. Interest subsidy of 3 percent from the Board.
4. Free advisory and extension services.

Though the scheme for implementation for the VII Five Year Plan period is yet to be finalised, the Board proposes the following rates of subsidy and loan per hectare. It is expected that the proposals will be approved by the Government of India shortly.

Category of growers	Subsidy (Per ha)	Loan (Per ha)
Owning upto 6 ha of rubber including area proposed for newplanting.	Rs. 7,000	Rs. 15,500
Owning above 6 ha of rubber including area proposed for newplanting.	Rs. 3,000	Rs. 19,500

The basic approach followed in the proposed scheme is that a farmer who owns or legally possesses land suitable for planting rubber should be provided with the entire financial and technical assistance required for raising a plantation to the productive level and that he should find it easily possible to refund the loan assistance with minimum interest utilising part of the earnings from the plantation.

PLANTATION PRACTICES IN BRIEF

Clearing the area

Slash down all the existing vegetation, leave it to get partially dry in the sun, collect the debris in convenient heaps and give a light burning (to be completed in March).

Spacing and terracing

In flat or gently slopy or undulating lands, planting distance commonly adopted for rubber are 4.6mx4.6m (15'x15') and 4.9mx4. 9m (16'x16'). For steeper slopes requiring contour terracing or contour bunding for control of soil erosion. the spacings accepted are 6.4mx3m (20'x10') and 6.7m x3.4m(22'x11'). The contour lines should be correctly aligned using an appropriate equipment. The terraces should be 1.52m(5') wide slightly sloping inwards and provided with stops of uncut earth at intervals designed to check lateral flow of water. It is desirable to have individual plat forms (honeycomb type) of size 1.52mx1.52m (5'x5') size with slight inward slope in undulating areas.

Pits

Pits of 75cmx75cmx75cm ($2\frac{1}{2}$'x$2\frac{1}{2}$'x$2\frac{1}{2}$') are to be dug at the pegmarked points in April-May after receipt of a few showers. The pits so dug are allowed to weather for about two 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 refilled soil, using 175gm of Rock Phosphate (Mussoriephos) and 12 kg (one kerosene tin full) of well rotted cattle manure or compost.

While filling that pit, the top surface of the pit should be about 5cm (2") above the ground level so that when the soil sets it finds 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 1 are the three important high yielding rubber planting materials recommended. Other high yielding varieties including polyclonal seedlings also could be chosen depending on the needs of regions with varying agro-climatic features and terrains.

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 in the shape of a pocket fit for accommodating the whorl of pruned lateral roots at the collar of the stump. A planting hole is then made with a crowbar to a depth equal to the actual length of pruned tap root. After thrusting the crowbar to the required depth, its top end is moved around and the hol

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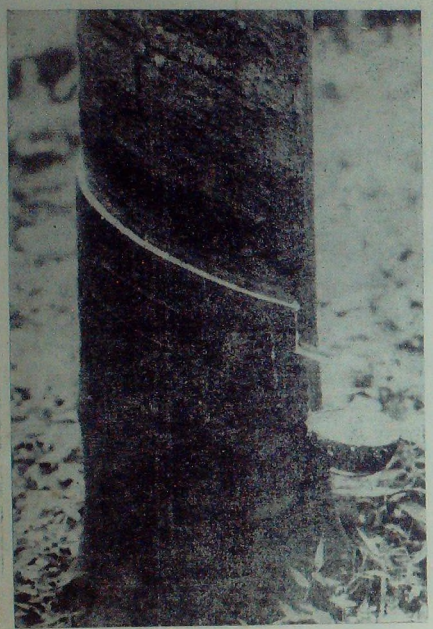

The high yielding variety R R I I 105 under tapping

widened sufficiently to allow easy insertion of the stump. The root portion is then inserted into the hole taking care to ensure that its lower end firmly touches the bottom of the hole and the lateral roots are properly seated in the pocket at the top. Special attention should also be given to ensure that the tip of the hole. tap root does not hang loose at the bottom of the hole. An air gap should not be allowed in the planting hole as it may lead to the failure of root development.

Loose soil is put in the hole around the root 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.

Planting poly–bagged plant

In order to reduce immaturity period of rubber plants in the field, to ensure uniformity and to avoid vacancies, it is highly desirable to plant the budded rubber stumps at first in polythene bags in September/October and to later transfer the plants intact to the field in June/July when those have attained a height of 180-210 cm with 4-5 whorls of leaves. As the plants have to grow in the bags for 7 to 8 months, the bags should have 65cm x 35cm lay flat size and 500 guage thickness. The polybagged plants should be kept in a nursery of appropirate lay out, lightly shaded during summer and afforded necessary irrigation, manuring, disease control and other care. Only plants of good uniform growth are transferred to the field. Transfer should be effected only when top whorl of leaves is fully mature and hardened. The bag should be carefully sliced through and removed at the time of planting.

Cover crop

Pueraria could be gainfully raised as cover crop in rubber plantations. Puereria seeds need soaking in warm water for 4 to 6 hours before sowing is done on beds of size 120cm x 90cm (4' x 3') made between the rubber plant rows at the rate of one each in the centre of 4 rubber plants. The cover crop seeds should be mixed with equal quantity of Rock Phosphate (Mussorie Phos) at the time of sowing. The seed rate of Pueraria per hectare is 4–4½kg.

The cover crop could be planted along with rubber or even earlier. A well grown leguminous covercrop helps to smother weeds, prevent soil erosion, fix atmospheric nitrogen in the soil, add organic matter to the soil, improve soil tilth and aeration and moderate soil temperature. Rubber accordingly derives immense

advantage in growth as well as yield.

After care

Where budded stumps are planted direct in the field, the grafted bud starts sprouting 2–3 weeks after planting. Sprouts appearing from anywhere other than the bud patch should be nipped off. The tender bud shoot should be afforded protection from hot sun, wild animals etc. with tree guards made of woven bamboo/reed splints. These should be of 75cm (2½') length and 45cm (1½') diameter.

Pruning should be carried out from time to time to remove any low branches developing upto a height of 2½ mts (8') from the ground level on the trunk shoot.

The young plants require manuring twice an year as shown below using fertiliser mixture containing NPK Mg in the proportion of 10:10:4:1.5.

Areas planted and maintained with leguminous cover crops and plant bases mulched during the initial years.

NPK 12:12:12

Year	Time of application	Qty. per hectare
5th	April – May	125 kg.
-do-	Sept – Oct	125 kg.
6th	April – May	125 kg.
-do-	Sept – Oct	125 kg.
7th	April – May	125 kg.
-do-	Sept – Oct	125 kg.

Instead of NPK 12:12:12, any of the complex fertilizer grades 15:15:15, 17:17:17 or 19:19:19 NPK may be used, dosages of these being 100 kg, 87.5 kg and 80 kg. respectively per application. 10:26:26 NPK complex (115 kg) mixed with Urea (40 kg) or Ammonium Phosphate Sulphate 20:20 (150 kg) mixed with Muriate of Potash (50 kg) are also suitable alternatives in which case the dosage per application should be reduced to 50 kg.

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

For mature rubber under tapping NPK 10:10:10 grade mixture at the rate of 900 grams per tree (approximately 300 kg per hectare) every year during March–April in single application is recommended.

Instead of this 12:12:12 NPK mixture at the rate of 250 kg/hectare or any of the complex fertilizers of the grades 15:15:15, 17:17:17 or 19:19:19 NPK can also be used, quantities of these being 200 kg, 175 kg and 160 kg respectively 10:26:26 NPK complex(115 kg) mixed with Urea (40 kg) or Ammonium Phosphate Sulphate 20:20 (150 kg) mixed with Muriate of Potash (50 kg) are also good substitutes. The dosage in these cases is limited to 100 kg.

The following are the other upkeep operations:

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

During the first 4 years the fertilizer mixture is applied around the plant in progressivily widened annular bands and mixed up with the top soil with a fork.

From fifth year onwards manuning should be done based on soil and leaf analyses. If this is not feasible, the general recommendation to us NPK 12:12:12 or 15:80:6 mixture maybe followed as shown here:

For areas not planted with leguminous covers and plant bases not mulched during the initial years.

NPK 15:10:6

Year	Time of application	Qty per hectare
5th	April–May	200 kg
-do-	Sept–Oct	200 kg
6th	April–May	200 kg
-do-	Sept Oct	200 kg
7th	April May	200 kg
-do-	Sept-Oct	200 kg

1] Weeding should be done regularly in rubber plantations in earlier years till the cover crop spreads fully.

2] The plant bases are to 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. This also helps to control weed growth around the plant bases.

3] Vacancies in the planted area require filling up preferably with polybagged plants, two-year old budded stumps or stumped buddings.

4] Brown portion of the stem of young plants needs while washing during summer from the second year onwards using qucklime to protect them against such scorch. This is to be continued every year till the canopy closes.

5] Suitable plant protection measures may be adopted against diseases and pests at the appropriate time as recommended by the Rubber Board.

6] The site proposed to be planted with rubber should be properly fenced with available local materials to prevent cattle menace and other tresspasses.

7] If branches do not develop above a height of 2.5 meters (8') from the ground, it should be induced by artificial methods like notching or by temporarily suppressing the growth of apical bud by closing it with the tender leaves around.

8] The cover crop should not be allowed to climb over rubber plants as it will suppress growth or cause bending etc.

The Rubber Board members visited the Rubber Plantations of Burembasar managed by the Plantation Crops Development Corporation of the Govt. of Assam. S/Shri P. J.Thomas, P. Mukundan Menon, B.K. Nair Ex. M. P., P. K. Padmanabhan, K. M. Philip, George Joseph Mundackal M. P., P. C. Datha, Kunheeran, Varkey George, A. P. Kurien, James Makkil, M. K. Vidyadharan and M. O. Joseph are seen in the picture

Diseases of rubber

The major fungus diseases that artact the tubber trees in India are Shoot Rot, Powdery Mildew, Pink disease, Abnormal leaf-fall etc. Shoot Rot and Abnormal Leaf-fall can be controlled by prophylactic spraying of copper fungicides like 1 per cent Bordeaux Mixture. Pink disease which occurs on the fork regions of young rubber trees could be controlled by timely detection and application of Bordeaux Paste. Powdery Mildew affects tender leaves of young plants or grown up trees. The disease is effectively remedied by dusting sulphur or sulphur talcum mixture or spraying wettable sulphur mixed with water. Whenever symptoms of disease appears, the Rubber Board experts may be approached with disease affected specimens so that appropriate remedial measures could be recommended. Fortunately, rubber has no serious pest problems.

Rubber tapping

Tapping is controlled wounding of the bark made with a specially designed knife in order to extract the latex. The tapping cut extends over one half of the trunk in a half spiral shape.

A budded rubber tree is ready for tapping when it attains a girth of 50 cm (20") at a height of 125 cm (50") from the bud union. A seedling tree (tree raised from seed) can be tapped when it reaches a girth of 55 cm (22") at a height of 50 (20"). The tapping cut in budded trees should be given a slope of 30° from the horizontal, while it is 25° in the case of seedling trees because budded trees have thinner bark compared to seedlings and chances of the latex over flowing sideways are greater.

Budded trees are to be tapped alternate daily, while seedling trees are suggested to be tapped only once in three

days at least for the first few years. More intensive tapping can cause physiological and other disorders.

Latex is collected in suitable cups. Coconut shells are used in Kerala while in Malaysia etc. either glazed earthern-ware cups or glass cups are the choice. The cups are attached to the trees using a wire cup-holder. Latex is directed to the cup by means of a spout made of galvanized iron sheet and driven gently into the outer bark. The position of the spout and the cup can be changed from year to year.

Attached to each Regional office of the Rubber Board competent Rubber Tapping Demonstrators have been posted whose free services can be availed of by growers for advice and demonstration of the correct systems of tapping.

Crop collection and processing

Rubber trees are tapped early in the morning. Exudation of latex takes place for 2 to 3 hours. On stoppage of the flow, the latex from tapping cups is collected and sent for processing. The latex contains about 35 per cent dry rubber by weight.

The latex collected is bulked and strained using 40 mesh and 60 mesh Stainless steel sieves. Then it is diluted with clean water, twice in quantity and transferred to aluminium coagulating dishes at the rate of 4 litres per dish. Diluted formic acid (3 cc in 300 cc of water) is then added to the latex in the pan, mixed well and resulting froth if any is skimmed and removed.

The latex in the pan fully coagulates by the next morning. The coagulum is first pressed with hands to remove as much of the acid-serum mixture as possible, then fed into sheeting rollers and made into thin ribbed sheets. These sheets are thoroughly washed in water, allowed to drip dry in shade for a couple of hours transferred to smoke houses where they are subjected to controlled smoking and drying for 4-5 days. The sheets so dried and smoked are amber coloured and standard weight of each sheet is $\frac{1}{3}$ kg.

The process of tapping which is defined as an operation of controlled wounding. It is a skilled job.

The sheets are graded by visual appearance and other physical attributes. The graded sheets are baled before marketing.

Latex forms only about 80 per cent of the crop. Latex dried up on tapping cut, spout, cup etc. are also collected. The scrap rubber or field coagulum forms 20% of the crop. This is dried, cleaned and marketed as such or converted into crepe forms before sale. Ribbed smoked sheets (RSS) are the most common form of raw rubber. Other forms are latex grade crepes, preserved centrifuged latex containing 60% dry rubber, and solid block rubber or crumb rubber. The last two are subjected to standard technical sampling and specifications. □

THE RUBBER INDUSTRY IN INDIA

P. C. CYRIAC I. A. S.
Chairman, Rubber Board

The Rubber Industry in India represents one of the fastest growing sectors of economic activity in the country. The spectrum of the rubber industry is so wide and diverse in nature that it engulfs a variety of interests such as natural rubber, Synthetic rubber, Reclaimed rubber, Rubber goods manufacture, Rubber machinery, Rubber chemicals, Rubber goods export and Rubber trade.

As the major source of raw material of the rubber industry, natural rubber enjoys a pride of place in the national economy. In view of its unique strategic value, natural rubber is rightly defined as 'nature's most versatile vegetable product', which serves as the base for the manufacture of over 35000 varieties of individual rubber goods in the country ranging from giant truck tyres to tiny button bushes, needed alike during war and peace.

Natural rubber, the unique, renewable resource of nature, is a new comer among plantation crops in India which found commercial introduction to this country only in 1902. Rubber Plantations registered phenomenal growth in the country since independence and it has spread to over an area of 3,00,000 hectares by 1984-85, yielding about 2,00,000 tonnes of rubber valued at Rs. 3,000 million.

Over a million people depend on this industry for their livelihood. An analysis of the rate of growth of this industry would reveal that the production was stepped up ten-fold within a span of 3 decades, while the area picked up a four-fold increase. The average yield per hectare also shot up to 890 kg. thereby registering 3-fold increase in 3 decades. This has pushed up India as the fourth largest Producer of natural rubber in the world and second only to Malaysia in productivity.

Rate of growth

The Union Ministry of Agriculture has testified the rate of growth in production of natural rubber as unmatched by any other agricultural commodity in the country. The average growth for rubber during 1949-50 to 1981-82 was 8.89% as against 5.95 percent for wheat, 5.17 percent for coffee, 2.53 % for tea and 2.59% for all crops. The rubber goods industry had attained an average annual growth rate of 6-7% in the last one decade, while the corresponding figure for natural rubber production was only 4.1%. This wide gap between demand and supply has necessitated an all out effort to maximise natural rubber production within the country, which is envisaged to be achieved through phased rehabilitation of old uneconomic units and introduction of rubber to new areas suitable for the same. The Rubber Board has fielded an ambitious scheme for the Development of Rubber Plantations, effective 1980, as a means to this end which has met with widespread acceptance from the planting community throughout the country. Over 90% of the area under rubber in India, is in Kerala. The rest is in Tamil Nadu, Karnataka, Tripura, Goa, Andamans etc. Recently, in a bid to produce more rubber, suitable areas outside the traditional tracts have also been identified. The State of Tripura has taken the lead, followed by Assam, Meghalaya, Mizoram, Arunachal Pradesh and Nagaland in the North Eastern Sector and other non-traditional regions in Goa, Maharashtra and Orissa.

Small Holdings

Earlier plantations were fairly large in size while, of late, rubber has become a small holder's crop. Almost 75% of the area and 70% of the total production under rubber are shared by small holdings numbering around 2,50,000 having an average area of around 1 hectare. Large estates, above 20 hectares in extent, are as few as about 460. Being a highly labour intensive enterprise rubber plantation in the country is providing direct employment to over 2,00,000 people and indirect occupation to about a million.

Effective 1985, every year an additional output of over 15,000

tonnes of natural rubber could reasonably be estimated to come, as the material used for new planting and replanting since 1979 under the new scheme for promotion of rubber plantations is very high yielding capable of producing 1½–2 tonnes per hectare. As a result of the bumper production so anticipated, it is likely that by 1990 the natural rubber output in the country would touch an all time high scale of 3,00,000 tonnes.

The natural rubber produced by the plantations in India is consumed by over 3200 rubber goods manufacturing units situated all over the country. Among them, the number of units which consume more than 100 tonnes per year of rubber is as few as 175, which include 12 Tyre Companies whose consumption exceeds 50% of the total natural rubber produced. Others are small scale industries. The turnover of rubber production during 1984–85 was worth over Rs. 25,000 million. A part of the rubber goods made in India is being exported which earned Rs. 87 crores in 1984-85.

The foregoing description reveals that the rubber producing and rubber goods making industries are proliferated by vulnerable sections. Integrated and orderly development of these sections could be ensured only by the judicious evolution and adoption of an appropriate strategy, based on mutual appreciation of their inherent interdependance and indivisible nature. This aspect eminently points to the truth that the interests of the rubber producer and rubber consumer are just one and the same.

Requirements of the rubber goods industry against the domestic output of 1,86,000 tonnes of natural rubber in 1984-85, was 2,16,000 tonnes leaving a deficit of 30,000 tonnes. The gap between supply and demand is being bridged now by imports. India, along with China and Brazil, is a rubber producing country which has an industrial capacity to consume more than the domestic output of natural rubber. This is attributed to the existence of a strong and steadily growing rubber goods manufacturing industry within the country.

Synthetic Rubber

Synthetic rubber produced by the Indian Petrochemicals Ltd in Gujarat and Synthetics and Chemicals in Bareilly are effectively of setting the shortage of natural rubber. Though the synthetic rubber industry in the country has a capacity to produce 62,000 tonnes, both the existing plants put together manufactured only 37500 tonnes of Synthetic rubber during 1984-85. Demand for Synthetic rubber was lying low primarily due to the fact that the prices of natural rubber were ruling at rates lower than that of Indigenous synthetic rubber most of the time. Special purpose Synthetic rubbers, intended for exclusive uses are also imported in limited quantities.

While the ratio of consumption of natural rubber to synthetic rubber is 32:68 in developed countries, in India, natural rubber has been able to maintain and ensure steady and uninterrupted supply to the goods industry. Synthetic rubber, in India, ever since its inception has always been playing a complementary role and not a competitor to natural rubber, maintaining the consumption pattern between natural and synthetic rubber at 80:20 for many years. This is the most ideal and appropriate setting for a developing economy where natural resources are abundant.

Reclaimed Rubber

Emergence of reclaimed rubber as a source of raw material for certain specific uses is also assuming significance. It can be viewed only as an attempt to recover 'wealth from waste' and not as an alternative to replace natural rubber. Reclaimed rubber has the advantage that it is least expensive compared to natural rubber and synthetic rubber. During 1984-85 reclaimed rubber production touched an all time high of 30,000 tonnes. While discussing integrated development of the rubber industry, it is essential that proper co-ordination of eforts between the various sectors of the producing industry such as natural, synthetic and reclaimed rubbers should be ensured so that uninterrupted supply of the basic raw material is ensured, with synthetic and reclaimed rubbers identifying their roles as only supplementary to natural rubber.

India, with its vast stretches of arable land suitable for rubber cultivation, can easily take up the job of producing natural rubber adequate to meet the growing needs of the rubber goods industry. As rubber plantations can generate massive rural employment, utilisation of all the available land for planting rubber would help to remove the social malady of unemployment.

Prospects

Rapid sophistication and urbanisation in the life style of human beings in a developing economy cannot materialise without increased output of rubber, while an American consumes 15kg of rubber per year, a Canadian consumes 12.5 kg, a German consumes 10 kg and a British consumes 8 kg per year. Three Indians put together are consuming only 1 kg of rubber per year. This would reveal the immense scope and vast vista of opportunities that await the Indian rubber industry. But the prospect of this industry, particularly the rubber plantation

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VILLAGE ADOPTION PROGRAMME - AN EFFECTIVE EXTENSION AND PROMOTION METHODOLOGY TO IMPROVE CROP RESPONSE

VIRENDRA KUMAR & R. V. MISRA*

Abstract

Coordinated efforts of the Government, research institutions and the fertiliser industry have helped in increasing the fertiliser consumption and its optimum use. Fertiliser industry on its part has taken up village adoption programme aimed at upliftment of the rural population, increasing agricultural production, scientific fertiliser use and social welfare. The Programme has created substantial impact on the rural life and has resulted in increased agricultural production and better response to agricultural inputs especially the fertilisers. The paper summarises objectives of the programme, its methodology, achievements and lessons drawn.

Village development forms the foundation for the upliftment and prosperity of a nation like ours which has a rural and agricultural base. It is needless, therefore, to emphasise that our planning should be largely village based. It may, however, not be feasible to initiate an intensive development programme for each of the 6 lakh villages in the country in the near future, because of the limited means and resources. Fertiliser industry in India has taken an initiative of adopting villages for their overall integrated development with major emphasis on agriculture.

In the village adoption programme of the fertiliser industry, speedy technology transfer is an essential component. The main component of agricultural development must have adequate material and infrastructure support for inputs. In their adoption programme, industry has attempted to minimise the problems relating to technology transfer. Some of the major problems identified in this regard relate to inadequate extension and development infrastructure, excessive large areas of operation, lack of training of extension workers and the farmers, and the lack of appropriate ties with research and development agencies. Most of the programmes are time bound programmes combined with clear specific schedules of work with regular and close supervision.

Objectives of Village Adoption Programme

The foremost objective of the village adoption programme is to ensure an overall intergrated development of the villages and promote adoption of latest agricultural technology by the farmers at a quicker pace. It also aims at:- bringing a general increase in agricultural production and raising the living standards of the village community; demonstration of modern agricultural technology like latest cropping systems, efficient use of inputs and helping the farmers to adopt the same; arranging for adequate and timely supply of good quality agricultural inputs; development of integrated village health, which includes crop and animal health besides the human health; assisting the farmers in the development of agriculture allied activities like piggery, dairying, poultry, etc. which have a direct bearing on the village socio-economy and soil productivity; developing the village in such a manner that it serves as a model and uncleus for dissemination of technology to the neighbouring villages; and inducing farmers to develop and join cooperative ventures/institutions.

Selection of Villages for Adoption

For attaining the objectives laid down, correct choice of the village is important. Some of the important points to be kept into consideration, while selecting a village are as follows: - that the village in an underdeveloped village and possesses potential for further development in agriculture; that the village has a population neither too small nor too large. Generally, villages with 88-100 families are considered as ideal; that the village is easily accessible; that the village is free from local factionalism; that the farming community in the village are enthusiastic and ready to cooperate; and that the village has not been adopted earlier by any agency.

Planning and Execution of Programme

A systematic survey of the village and collection of basic information is the first step in the planning and execution process. Information on the following points are collected: details of location of village; number of families, agricultural families,

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population, etc.; total geographical area, agricultural area, irrigated area, area under different crops, high yielding varieties, average yield of crops, etc; number of wells, tubewells, and canal and river, irrigation facilities; soil type, soil fertility, problematic soils if any; level of fertiliser use season and crop-wise, method of application; cooperative membership, credit facilities; and details on village institutions like Panchayat, school, post-office, hospital etc.

Chalking out a Programme action

A programme of activities is chalked out in consultation with the farmers and local officers. Feasible targets for each of the activities to be undertaken are set yearwise, well in avdance of the commencement of the activities. Yearwise targets are further broken monthwise. While fixing the activities and their timings, it is ensured that they coincide with the farming operations and the crop calendar Field representatives plan their visits at regular intervals. Each of the activites are planned in a manner so as to ensure maximum participation of the farmers. The progress of the activities are reviewed every month. The villages are adopted for a period of three to five years. After the villages reach the take off stage, their adoption is discontinued. In order to coordinate implementation, a village coordinator is appointed for each of the villages adopted and is provided with suitable honorarium.

Activities

The activities in adopted villages are oriented towards technology transfer, supply of agricultural inputs, provision of farm equipments, creation of motivation and awareness through promotional, educational and social welfare programmes.

(a) *Technology transfer and educational activities*

Some of the important activities organised in adopted villages are:— field demonstrations, field days, farmers meetings, crop seminars, farmers fairs, campaigns on, soil testing, seed treatment, plant protection, weed control veterinary care, human health care, rodent control.

(b) *Input support activities*

For improving the agricultural production, use of quality inputs by the farmers is a must. Input support activities are organised in the following manner: arranging adequate and timely supply of agricultural inputs viz. fertilisers, seeds and pesticides through the village cooperatives and input suppliers; assisting the farmers in getting timely credit; and making provision for agricultural equipments like dusters, sprayers, seed treatment drums, seed-cum-fertiliser drills,) etc.

(c) *Monetary and organisational support for other activities*

adult education; improving the educational facilities in the village school; drinking water supply; medical facilities; strengthening the village cooperative society; road building; biogas development; and social forestry programme;.

Measuring Impact of Programme

The progress of the programme is constantly reviewed. Some of the major parameters adopted for measuring the progress are:— increase in total agricultural production and productivity per unit area; increase in fertiliser consumption; increase in area under high-yielding varieties; increase in number of input users: number and quality of promotional programmes organised; provision and addition of basic amenities and facilities in the villages including health, education, transport, supply of drinking water, etc.; improvement in the socio economic conditions of the villagers; and impact on the nearby areas.

Annexure-I summarises the impact of the village adoption programme on crop productivity and fertiliser use. The data compiled at the final year of the adoption reveal considerable improvement in the productivity of crops, fertiliser consumption and crop response to fertiliser application. □

(Cont: from Page 15)

industry depends on how best it emerges competitive in respect of presentation, price and quality.

It is in this context that the role of the Rubber Board, a statutory body, functioning under the Union Ministry of Commerce, assumes relevance and significance. The Board has acquitted itself creditably well and lived up to its social and economic obligations.

Rubber industry in India can rest assured of bright prospects in the years to come, provided the various sectors within this industry are able to appreciate the mutuality of interests and achieve the laid out objectives through proper mobilisation and allocation of resources to the best advantage. □

ANNEXURE 1

Impact of village adoption programme on crop productivity and fertiliser use

State, Village & District	Year of adoption/final year of adoption	Fertiliser Consumption (Kg/ha)	Average crop yield (Kg/ha)		Crop response to fertiliser after adoption (kg/kg nutrient)	
1	2	3	4		5	
Uttar Pradesh			*Paddy*	*Wheat*	*Paddy*	*Wheat*
Jevai, Bareilly	1978–79	56.5	3100	3000	43.1	40.0
	1981–82	71.5	3750	3600		
Jamapur, Moradabad	1978–79	47.4	2050	2450	28.4	31.2
	1981–82	65.0	2500	3000		
Birauli, Faizabad	1978–79	62.2	1800	1550	32.1	38.8
	1981–82	99.5	3000	3000		
Haryana						
Landhi, Kurukshetra	1976–77	87.7	1600	2600	23.4	45.4
	1979–80	102.9	1950	3300		
Kheri Ramnagar Kurukshetra	1976–77	83.3	3200	1800	63.4	27.3
	1979–80	118.2	5400	2750		
Punjab						
Karyal, Ferozpur	1977–78	84.9	4800	2850	35.5	24.7
	1980–81	131.3	6450	3950		
Sursinghwala Ferozpur	1977–78	70.4	4000	1500	47.3	29.0
	1980–81	101.7	5500	2400		
Bandala New, Ferozpur	1977–78	123.4	6200	2500	32.3	52.1
	1980–81	146.0	6945	3700		
Tamkoli, Ludhiana	1977–78	124.4	6000	2500	27.1	40.6
	1980–81	161.3	7000	4000		
Gujarat			*Cotton*		*Cotton*	
Areni, Kaira	1977–78	57.5	1200	2300	26.7	40.1
	1980–81	79.9	1800	3200		
Theba, Jamnagar	1977–78	38.7	1250	2000	22.0	40.4
	1980–81	65.9	1850	3100		
Madanpara, Junagarh	1977–78	30.9	1250	2500	46.5	26.3
	1980–81	54.6	2200	3125		
Karnataka			*Paddy*	*Wheat*	*Paddy*	*Wheat*
Gundenhally, Dharwar	1976–77	65.8	—	1200	—	38.0
	1979–80	86.7	—	2000	—	
Madhya Pradesh						
Utawad, Dhar	1978–79	3.9	450	650	27.6	42.5
	1980–81	8.6	580	850		
Hasampallia, Ratlam	1978–79	77.0	—	2500	—	48.8
	1980–81	107.7	—	4000		
Orissa						
Chandigaon, Balasore	1978–79	22.4	3700	—	27.0	—
	1980–81	33.4	4000	—		
West Bengal						
Madhusudankati 24-Paraganas	1978–79					
	1980–81	70.1	2900	2300	33.3	39.1
		86.6	3450	2950		
Maharashtra						
Udatare	1978–79	32.5	2000	3250	36.2	36.2
	1980–81	46.3	2500	3750		

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A Preliminary Report on Investigations to Improve Establishment Success of Stumped Buddings in *Hevea*

GAN L. T. CHEW O. K., HO C. Y. AND WOOD B. J.*

In view of the importance of early maturity in the pay-back period and eventual profits in *Hevea*, a lot of efforts in the past were directed to shortening the immature period of rubber. One of the approaches by which this could be achieved was through the use of advanced planting materials. Stumped budding for example had been reported to have been used pre-war (Los 1938) and in this country since 1956 (Strivens 1962). This method of planting involved delaying the buddings or clonal seedlings in the nursery for eighteen months or longer. The budded plants or clonal seedlings were tailed and topped at about five and two weeks respectively prior to field planting. Strivens showed that with this method of planting, stumped buddings were 15 – 18 months further ahead in growth than field buddings. Other forms of advanced materials tried in the sixties were four whorl polybag buddings (Mainstone 1962) and the soil core method (Sergeant 1967). The various methods of establishing advanced materials were compared in one way or another by several workers (Shepherd, 1967; Templeton, 1967; de Jonge 1967). Shepherd showed that 15½ month old stumped buddings prepared in accordance with Strivens's recommendation was superior in growth in comparison with green and brown buddings in field, green buddings in bags, budded stumps in bags and buddings in soil cores. Better advantage of stumped buddings in girth over the two-whorl polybag materials was also reported by Sivanadyan *et al.* (1973) and Zeid *et al.* (1976). (Sivanadyan *et al* also showed that the immaturity period in rubber could be reduced when polybag materials were raised to six to seven whorl of leaves, but the advantages were less in comparison with stumped buddings. Experiences from Harrisons Malaysian Plantations Bhd and Kumpulan Guthrie Sdn Bhd (Teoh 1984) confirmed that stumped buddings could be brought into tapping one year earlier than the two whorl polybag material.

Various methods to establish stumped buddings more successfully have been reported. Dijkman (1951) recommended white washing after planting to prevent die-back of stumps. Yoon (1972) confirmed that such a practice after pollarding improved transplanting success by about 25-30 per cent. Zeid *et al.* (1976) introduced the 'Sarong' method of planting which involved a technique by planting stumps in a 60 x 60 x 50 cm hole with the lower half filled with lightly compacted soil to provide proper taproot anchorage while the upper 25 cm of the tap-root held in a polythene sarong filled with good quality top soil. The planting hole is mulched. Watering is done when no rain fell during the initial phase of establishment. The Sarong is removed about two months after planting. Establishment successes of over 99 per cent for clonal seedlings and 95 per cent for stumped buddings were reported when using this technique. Yoon *et al.* (1976) indicated that deep planting of stumps (Dijkman 1951) improved transplanting success by 12–22 per cent Pakianathan *et al.* (1978) showed that use of rooting hormone (Indolebutyric acid) enhanced earlier root initiation and increased the rate of root production. Yoon *et al.* (1976), from the marcotting experiment on stumped buddings, suggested that the presence of actively growing roots in the stump may assist in early establishment but the results were not conclusive due to the good weather prevailing after transplanting. Work on factors influencing growth of stumps were also reported. Sivanadyan *et al.* (1973) showed that mulching improved girth increment of stumps by about 43 per cent. RRIM (1974) reported that stumps planted on Munchong, Prang and alluvial soil had better growth than on Malacca series soil, smaller stumps (10.0–11.4 cm) had better girth increment than bigger stumps (14.5 – 15.9 cm) and moisture stress during drier months affected growth of stumps planted in soils with lower water table.

However, notwithstanding the various developments made, use of stumped buddings was and still is not widely accepted commercially. The main 'drawback is the variable establishment success of stumped buddings in the field. Establishment successes ranging from 60 to 98 per cent on commercial plantings have been experienced. The variable performance of stumped buddings was also observed by Ariffin *et al* (1981). They reported planting success and growth of stumped buddings to be poorer

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Table 1. Trials on Establishment of Stumped Buddings

Trials	*Location (Estate)*	*Date planted*	*Clones*	*Soil type*
Tailing x Girth classes	Karak, Pahang	Sept '80	RRIM 600 and PR 261 (18 mth old stumps)	Tebok series
Trial on effects of weather				
Topping position and pruning trial	Karak, Pahang	Nov '80	RRIM 600 (20 mth old stumps)	Tebok series
Year round planting trial	Siliau, N.S.	Nov '82	GT 1 (18 mth and older)	Bungor series
Topping and tailing trial on 25 mth old stumps	Siliau, N.S.	to Oct'83 May '83	GT 1 (25 mth old stumps)	Established in polybag
Polybag nursery trial	Siliau, N.S.	Nursery– Aug '82 Field–	GT 1 (18 mth old stumps retained in polybag for	(51 cm x 61 cm) Established in polybag (51 cm x 61 cm) field–
Topping and tailing on 18 mth old stumps trial		Nov '82	3 mths)	Bungor series
Trial on planting during wet month				
Trial on field planting during dry month	Sillau, N.S.	Nursery– Aug '82 Field–	GT 1 (18 mth old stumps retained in polybag for	Established in polybag (51 cm x 61 cm) field–
Trial on retention of stumps in polybags	Siliau, N.S.	Feb '83 Nursery– Aug '82 Field– Nov '82 Jan '83 Mar '83	6 mths) GT 1 (18 mth old stumps retained in polybogs for 3.5 and 7 mths)	Bungor series Established in polybag (51 cm x 61 cm) field– Bungor series

than that of soil core buddings in a commercial exercise comparing the technique of planting. Experience in the past often indicates that the inconsistent results in establishment of stumped buddings on commercial scale has been associated with dry weather that prevailed after planting, and to a certain extent the quality of labour and management inputs, labour availability, terrain and soil types.

Method

In our investigations, we looked attailing (*i. e.* severing the tap root) and topping (i. e. pollara at about 2.4 cm above the ground) moreclosely and evaluated the effects of root treatment a and budbreaker (sodium dikegular — a systemic plant growth regulator which reduces apical dominance and increases lateral branching) on transplanting success. We also examined the effects of weather conditions on the normal and 'Sarong' methods of establishing stumped buddings; the 'Sarong' method followed Zeid's recommendations (1976). The possibility of having a two stage nursery for stumped buddings was also evaluated. To do these, seven trials were laid out as summarised in *Table I*. The trial details, according to their objectives, are discussed below:

Tailing x girth classes trial

The oldest trial tested 18-month old stumped buddings of clones RRIM 600 and PR 261. It investigates the effects of tailing intervales at 6, 8, 10 and 12 weeks before transplanting factorialised with three girth classes. Topping was done at 10–14 days before transplanting, followed by white-washing. These were planted using the 'Sarong' technique and compared with the normal method of planting as control.

The girth classes compared were 9, 11 and 13+ cm at planting. Stumps with girth of 7 cm and smaller were excluded because the stems at 2.4 m above the ground at the time of topping were still green. The trial was laid in a randomized complete block design with 49 trees per

plot, replicated twice for each clone.

Topping trials. Topping and tailing trial on 25 month old stumps. An observational trial was laid down to compare topping immediately before transplanting with tailing done eight weeks before and immediately before transplanting on25 month old GT 1 stumps established in 51 cm x 61 cm polybags. Six trees, with all buds counted, were used in each treatment in this trial. Sodium dikegular (a budbreaker), and watering treatments were superimposed in the trial. Sodium dikegular was sprayed at 2500 ppm on all buds.

Topping and tailing on 18 month old stumps. Observations on tailing and topping simultaneously immediately before; and tailing at eight weeks and topping at two weeks before transplanting on 18 month old GT 1 stumps were made in the polybag nursery trial (refer Stumped Buddings in polybag Trial).

Topping position and pruning. This trial compared the performance of stumps progressively pruned to one branch with those pruned to two or three branches on clone RRIM 600 on 20month old stumps after field planting. Tailing and topping were done at eight week and 10-14 days respectively before transplanting. The stumps were white washed after topping. The pruning treatments were compared in each plot with boundary trees pruned to two-three branches whilst trees in the core plot were progressively pruned to one branch A t otal of 18 plots with 49 trees perpplot were used. In this trial, top ing above, at the middle andbelow the bud whorl was superimposed.

Effects of Weather Conditions on Establishment Success and their amelioration

Effect of weather on establishment of different sized stumps x tailing internals

This observation was made in the Tailing x Girth Classes Trial described earlier.

Year round planting

This observational trial involved planting stumped buddings of GT 1 throughout the year (November 1982-October 1983)with treatments comparing normal planting, rooting treatment with IBA (Indolebutyric acid) at 1 kg compound to 2.5 litre water mixed with Agricol at 9 gm compound in 1 litre water and the 'Sarong' technique. Ten trees per treatment per planting were used. Blocking of plants in the nursery for different months of planting was done prior to trial commencement.

A different approach was tested in a series of observational trials in 1982 involving a two stage nursery for stumped buddings af GT 1. The method involved transplanting the stumped buddings into large polybags for periods of three to seven months before field planting. The stumps at the time of field planting would therefore have already developed canopies and root systems.

Polybag nursery trial

This observational trial compared the performance of stumps topped, tailed and transplanted into polybags simultaneously (Polybag I method) with that of stumps tailed and topped eight and two weeks respectively before transplanting into polybags (Polybag II method). The stumps were treated with IBA, Agricol and a mixture of IBA+ Agricol before transplanting (same concentrations as in Year Round Planting Trial). Sample size was 40 stumps per treatment.

Transplanting polybag stumped buddings in the field during wet weather

Successful plants from the poly bag nursery were field planted as three month old polybag materials. These were compared with tho omal and "Sarong' methods of planting with reot treatments with IBA, Agricol and IBA + Agricol in a split plot design with establis hment methods in the main plots and root treatments in the sub-plots. Plot size was five trees, replicated four times.

Transplanting polybag stumped buddings in the field during dry weather

In this observational trial, the balance of stumped buddings in polybags from the nursery trial were planted as six-month old polybag materials during the dry month of February 1983 superimposing with and without watering treatments. Normal and 'Sarong' methods were also compared.

Effects of retention period old stumped buddings in polybag

This is an observational trial with five trees per treatment per planting to compare performance of stumps left in the polybag for three, five and seven months before transplanting. Preparation of stumps was in accordance with the Polybag Method II described earlier.

Results

Tailing x girth classes trial

At two months after planting, there were no differences in establishment success between tailing intervals of 6, 8, 10 and 12 weeks before transplanting within girth classes of 8, 9, 11.6 and 14.4 cm at planting *(Table 2)*. There were also no significant differences in the vigour of the stumps between these treatments at 36 months after planting regardless of tailing intervals and initial girth of the stumped buddings. No differences were observed between clones PR 261 and RRIM 600 *(Table 3)*.

Little to no girthing was observed until about eight months after planting. Girth increment was consistently better with smaller atumps in both clones PR 261 snd RRIM 600. Vigour of different girth classes of stumped buddings narrowed at 18 months and thereafter, all treatments had comparable girth *(Table 4)*.

Topping trial

Topping and tailing trial on 25 month old stumps. Higher transplanting and sprouting succesSses were obtained when the

Table 2. Effects of Tailing Intervals and Girth Classes on Establishment Success of Stumped Buddings, Evaluated two months after planting

Girth class at	*Percentage sprouting+*				
planting (cm)++	*6*	*8*	*10*	*12*	*Mean*
8.9	91	84	86	88	87
11.6	85	83	88	85	85
14.4	92	92	81	82	87
Mean	89	86	85	85	
S.E. OF					
DIFFERENCE		7.61			
LSD (5%)		15.53			

\+ *Mean values of clones PR 261 and RRIM 600, tailed at intervals of indicated number of weeks before field planting.*

++ *Stumps were categorised before tailing treatments were effected but classes refer to mean girth at planting.*

Table 3. Effects of Tailing and Initial Girth on Growth of PR 261 and Rrim 600 Stumped Buddings Evaluated Thirty six months after planting

	Girth [cm] at 152 above ground level							
	PR 261				*RRIM 600*			
Tailing interval	*8.9 cm*	*11.7 cm*	*14.4 cm*	*Mean*	*8.8 cm*	*11.5 cm*	*14.3 cm*	*Mean*
6 weeks	31.1	33.7	33.4	32.7	32.2	32.0	33.6	32.6
8 weeks	32.5	29.7	33.0	31.7	34.7	32.1	35.0	33.9
10 weeks	31.1	31.0	32.6	31.6	30.6	32.1	33.9	32.3
12 weeks	30.0	32.9	33.1	32.0	30.0	32.4	31.6	31.3
Mean	31.2	31.8	33.0		31.9	32.1	33.5	
S.E. OF								
DIFFERENCE		1.25				2.00		
LSD (5%)		2.75				4.40		

stumps were prepared with tailing and topping rests before transplanting, particularly with daily watering. All the plants died when topping of the stumps was carried out immediately before transplanting regardless of whether they had any tailing rest. Use of a budbreaker appeared to help the breaking of bud dormancy to a certain extent but the results are still not better than stumps which received a topping rest of two weeks. Results also showed that. with no topping rest, daily watering did not help improve sprouting success *(Table 5.)*

Topping and tailing trial on 18 month old stumps. When 18-month old stumps of GT I were as also shown that higher transplanting success was obtained for stumped buddings which received topping and tailing rests *(Table 10)*.

Topping position and pruning.

Topping when carried out above or at the middle of a leaf whorl produced clusters of branches Topping below the leaf whorl, however, produced a few well spaced out branches.

Girthing of stumps with two to three branches left unpruned was better than pruning to leave one branch. The girth at 24 months for these two treatments was 35.5 and 33.1 cm respectively (*Table 6*). There was no incidence of wind damage so far in both treatments.

Effects of Weather Conditions on Establishment success and their amelioration

Effects of weather on establishment of different sized stumps x tailing intervals

Planting of the first two replicates coincided with a very dry spell.

Some rain fell during the planting of the remaining two replicates. When there was no rain during planting, smaller stumps appeared to have better success than bigger stumps. In wet weather, the reverse trend was observed. The 'Sarong' technique was observed to be effective when planting was done during the

Table 4. Comparative Growth Trends of Different Girth Classes of PR 261 and RRIM 600 Stumped Buddings

Clones	Girth at planting (cm)	Girth (cm) at 152 cm above ground level			
		8 MAP	18 MAP	30 MAP	36 MAP
PR 261	8.9	9·5 (0.4)	14 1 (5·2)	25.9 (17.0)	31.2(22.3)
	11·7	12.4 (0.4)	15.1 (3.6)	26·6 (15.1)	31 8(20·3)
	14.2	14.8 (0.5)	17.4 (3.2)	27.5 (13.3)	33.0(18.8)
S.E. OF Difference		0.12	0·30	0.59	0.34
LSD (5%)		1.18	1.29	2.53	1.47
RRIM 600	8·8	10.0 (1.2)	14·9 (6.1)	26.0 (17·2)	31.9(23.1)
	11.5	12.4 (0.9)	16.7 (5.2)	27.5 (16.0)	32.1(20.6)
	14.3	15.1 (0.8)	17.7 (3.4)	28.5 (14.2)	33.5(19.2)
S.E.of Difference		0.48	0.41	0.76	1.46
LSD (5%)		2.08	1.74	3.27	6.29

Figures in parenthesis are cummulative girth increments in cm.
MAP-Months After Planting
S.E. and LSD for absolute girth comparison.

Table 5. Effects of Immediately Topping Before Transplanting on Establishment Success of 25 MTH old GT 1 Stumps Evaluated at Five Months after Planting

Interval before transplanting				Daily watering			Water at 5 days interval	
				Original no of			Original no. of	
Tailing	Topping	Use of bud-breaker	Plants survived	Buds	%bud sprouted	Plants survived	buds	%bud sprouted
8 weeks	2 weeks	Nil	6	80	33	4	100	27
8 weeks	Immediate	Nil	0	98	0	0	105	0
Immediate	Immediate	Nil	0	94	0	0	89	0
8 weeks	Immediate	Yes	1	110	14	1	97	9
Immediate	Immediate	Yes	2	92	20	3	116	34

Plot size per treatment: 6 stumps

Table 6. Comparative Growth of RRIM 600 Stumps Pruned to one and Two-Three Branches after Field Planting.

Pruning treatments	Girth (cm) at 152 cm above ground level		Increment (8-24 (MAP)
	8MAP	24 MAP	
Pruned to 1 branch	12.2cm	33.1cm	20.9cm
Pruned to 2-3 branches	12.1cm	35.5cm	23.4cm

MAP—Months After Planting

dry spell. The success rate with the 'Sarong' was 77—86 present compared with 32 percent for conventional method. There was no significant advantage with the 'Sarong' method in wet weather (*Table 7*).

There was no difference in establishment success between tailing intervals of 6, 8, 10 and 12 weeks before transplanting in the various girth classes during both dry and wet plantings (*Table 8*).

Year round planting

Results confirm field experience that with the normal method of planting, stumped buddings planted during the wetter months (September to November) gave better results than those planted during the drier months (December to August). Compared with the normal method of planting stumps, the 'Sarong' technique was effective during the drier months (except February 1983 which was evidently too dry even to be aided by the Sarong) but which made less difference during wetter months (*Table 9*). These results are similar to those recorded in the earlier trial (*Table7*).

In the drier months, IBA+Agricol treatment was advantageous. However, it was not better than the 'Sarong' technique of planting (*Table 9*).

Polybag nursery trial

Results in *Table 10* show that stumped buddings not subjected to any root treatment when tailed, topped and transplanted into polybags simultaneously, gave lower transplanting success (63 percent) than those tailed and topped eight and two weeks respectively before transplanting.

The latter recorded 90 percen transplanting success in the polybag nursery. The former

Table 7. Effects of Weather Conditions and Girth Classes on Establishment Success of Stumped Buddings with the Normal and 'Sarong' Methods of Establishment

Girth classes at planting(cm) +	*Mathod of planting*	*Percentage sprouting* *Weather conditions at planting*++ *Dry*	*Wet*
8.9	Sarong	86	87
11.6	Sarong	78	93
14.4	Sarong	77	97
11-5	Normal	32	96
S.E. of Difference		8.02	1.06
LSE (5%)		25.20	3.37

Note:

\+ *Mean girth of clones PR 261 and RRIM 600 at planting for all tailing treatments.*

++*Dry–No rain for 9 days during planting*

Wet —4 days rain (41 mm) during planting;

Subsequent month, 11 days rain (237 mm).

Table 8. Effects of Weather Conditions on Establishment Succes of Stumped Budding of Different Girth Classes with Different Tailing Intervals*

Girth class categorisation (cm)	*Percentage sprouting* *Dry* 6	8	10	12	*Wet* 6	8	10	12
9	90	86	84	82	92	82	88	84
11	78	72	88	74	82	94	88	96
13+	86	84	66	70	98	100	96	94
S.E of Different	15.51				5.13			
LSD (5%)	34.12				11.30			

**Tailed at intervals at indicated numbers of weeks before field planting*

Table 9. Effects of Planting GT 1 Stumped Budding Throughout the year

Planting months	*Rainfall mm*	*Raindays*	*% Plants surviving* Normal untreated*	*Normal (with IBA + Agricol)*	*Normal (Sarong)*
Nov 1982	416.1	19	95	100	100
Dec 1982	149.9	14	70	90	90
Jan 1983	56.0	4	70	90	100
Feb 1983	8.9	3	0	10	10
Mar 1983	22.9	2	0	0	80
Apr 1983	37.1	4	10	40	90
May 1983	138.4	9	60	80	80
Aug 1983	152.3	8	70	50	90
Sept 1983	187.3	11	100	100	80
Oct 1983	142.6	6	100	100	70

Note: There was no planting in June and July 1983
* As at Jan '84

Table 10. Effeccts of Tailing and Topping Rests and Root Treatment on Establishment success of GT 1 Stumped in Polybags Evaluated Three months after Transplanting into the Polybags

Methods	*Methods of establishment*	*Root tretaments*	*Number of plants surviving*	*Percentage*
Polybag I	Top, tail, transplant into polybag simultaneously	Untreated	25	63
		IBA	32	80
		Agricol	34	85
		Agricol + IBA	34	85
		Total/Mean	125	78
Polybag II	Tailed 8 weeks and topped 2 weeks before transplanting into polybags	Untreated	36	90
		IBA	39	98
		Agricol	39	98
		Agricol + IBA	38	95
		Total/Mean	152	95

material generally had a higher incidence of dormant buds

Better transplanting success were obtainde with root treatments with IBA + Agricol than non-treated plants in the polybag nursery (*Table 10*). This occurred irrespective of whether tailing and topping operations were carried out earlier or at the time of transplanting into polybags. There was little difference between IBA, Agricol and mixture of IBA + Agricol as root treatments.

The canopy status at three months after transplanting into the polybags was more advanced and better in the Polybag II method than the Polybag I method. Sprouting was earlier in the former which therefore had more time for canopy development (*Table 11*)

Transplanting polybag stumped buddings in the field during wet weather

At three months after field planting, the Polybag I, Polybag II, normal and 'Sarong' methods showed a success of 88, 95, 98 and 99 per cent respectively. Precipitation at the time of planting was relatively high (*Table 12*). This was however followed by a dry period between three and six months after planting. At the sixth month from planting, the Polybag II method of planting maintained the original success rate. The Polybag I and normal methods of planing recorded a slight decline while the 'Sarong' method showed a relatively marked decline in the success rate. This was because the sarongs were removed just before the onset of the drought. The sudden creation of dry environment around the root zone could have affected the 'Sarong' materials adversely. Plants in the other treatments could have adjusted gradually to the drier conditions. The trend stabilised after the twelfth month. It is worthwhile noting that the normal method of establishment recorded good success during wet weather which confirms the earlier findings.

The girth performance in *Table 13* shows that the best vigour was obtained with the Polybag II method at the twelfth and eighteenth months after planting, followed by the Polybag I method and the normal method. The 'Sarong' method showed

Table II. Canopy Status of gt I Polybag Stumped Buddings at Three months after Transplanting Into the Polybags

Treatments	*No. of plants with young and unhardened leaves*	*No. of plants with leaves all hardened*	*No. of plants unsprouted*
Polybag I	65 (41%)	60 (37%)	35 (22%)
Polybag II	7 (4%)	145 (91%)	8 (5%)

Table 12. Comparative Performance of Normal, 'Sarong' and Polybag Methods of Establishing GT 1 Stumped Buddings in wet Period+

Establishment methods	*3 MAP*	*6MAP*	*12MAP*	*18MAP*
Normal	78 (98%)	75 (94%)	74 (93%)	74 (93%)
'Sarong'	79 (99%)	67 (84%)	65 (81%)	65 (81%)
Polybag I	70 (88%)	68 (85%)	64 (80%)	64 (80%)
Polybag II	76 (95%)	76 (95%)	76 (95%)	76 (95%)

+*Rainfall* = *At Planting (Nov. '82)* – *19 days rain, 416.1 mm*
3 MAP(Jan. '83) – *4 days rain, 56.0 mm*
4 MAP (Feb. '83) – *3 days rain, 8.9 mm*
5 MAP (Mar '83) – *2 days rain, 22.9 mm*
6 MAP (Apr. '83) – *4 days rain, 47.1 mm*
7–10 MAP (May–Sept '83) – *34 days rain, 620.6 mm*

MAP-Months After Planting

Figures in parenthesis are percentage of plants survived.

the poorest vigour after planting.

There was no definite trendobserved between the various root treatments after field planting, but sample size was small and weather conditions favourable. at the time of planting.

Transplanting polybag stumped buddings in the field during dry weather

In this planting, the initial low establishment success of the polybag methods was mainly due to the breaking of soil cores during transport and removal of polybags during planting. However, the Polybag II method with watering still showed the highest transplanting success (about 77 per cent); there were also no casualties thereafter. Without watering, transplanting success was much lower (about 43 per cent). The Polybag I method was more susceptible to moisture stress when compared with the Polybag II method. The normal and 'Sarong' methods suffered even higher casualties after planting (*Table 14*).

Effects of retention period of stumped buddings in polybags

Retention of stumped buddings in the polybags for a longer period befere planting (in dry weather) appear to show better establishment success in this trial (*Table 15*).

Discussion

The present series of investigations supplement earlier efforts to improve the establishment success of stumped buddings. It should be pointed out that this is only a preliminary report and some of the interim results should be regarded as tentative at this stage. In addition, some of the trials are actually observation plots which were laid down to confirm certain findings emanaitng from other trials in this series. Notwithstanding these limitations the following tentative assumptions can be based on the trials.

The tailing trials suggest that the duration of tailing rest beyond six weeks and up to twelve weeks is not detrimental for field establishment whether conditions are favourable or unfavourable during planting. This gives managemen flexibility in programming the tailing operation from twelve weeks before transplanting where labour is in short supply and better supervision could be achieved. The minimum tailing rest before transplanting however has not been clearly established. Whilst it is indicative that topping immediately before transplanting adversely affects the establishment success of stumped buddings its minimum interval is also not established. The effect of shorter tailing rests in combination with variable topping rests therefore needs to

Table 13. Comparative Growth of gt 1 Stumped Buddings Established by Different methods

Methods of planting	*Girth at planting (cm)*	*Girth at 12 MAP (cm)*	*Girth at 18 MAP (cm)*	*Girth increment (cm) 0-12 mth*	*0-18 mth*
Normal	11·5	13.1	16.8	1.6	5.3
'Sarong'	11·2	12·8	15.8	1.6	4.6
Polybag I	11.2	13.5	17.5	2·3	6·3
Polybag II	11.3	14.0	18.3	2.7	7.0
S.E OF DIFFERENCE	0.19	0 34	0.59		
LSD (5%	0·39	0 72	1·22		

MAP-Months After Planting

be looked at to determine the optimum for both operations.

Topping below the leaf whorl has advantages over topping above or at the middle of a leaf whorl as less pruning rounds are required. For stumped buddings, the height of branching required would depend on the intended tapping policy towards the end of the tree's life. This would determine the height at which the stumps should be topped Also, leaving two to three branches unpruned showed better girthing than retaining a single leader. This confirms Yoon's findings (1973) that by inducing branching, extra girthing can be achieved.

Smaller stumps, of about 9 cm girth at planting, showed better vigour after planting than bigger stumps with initial girth of about 14 cm. Results also indicated that smaller stumps were less susceptible to drought during planting. These suggest that there was little advantage in using stumps bigger than 9 cm girth at field planting. Results reported elsewhere showed that stumps smaller than this were also less desirable. The effect of weather on stump sizes also snggest that bigger stumps should be the first to be established, at the onset of wet weather, whilst the smaller stumps should be kept until last as they seem to resist drier conditions better.

The 'Sarong' method gave better establishment success when field planting was done in drier months. It gave no advantage over the normal method when planting was carried out during wet weather. When there is drought following removal of the 'Sarong' heavier casualties were experienced. Under such circumstances, it may be better to retain the 'Sarong' for a longer period and continue with watering, if drought is expected.

It is indicative that root treatment with IBA, Agricol and their mixture improved transplanting success in stumps raised in polybags but there was little difference in their efficacy. However, with bare root stumped buddings, variable responses with root treatment were observed in the field trials. This could be due to the small plot size and the weather conditions during and after planting. The effects of

Table 14. Comparative Performance of Normal, 'Sarong' and Polybag Methods of Establishing GT 1 Stumped Budding in Dry Period

Establishment methods	*No. of plants survived*							
	No watering				*Watering once every 5 days if no rain occurs*			
	1 MAP	*6 MAP*	*12 MAP*	*16 MAP*	*1 MAP*	*6 MAP*	*12 MAP*	*16 MAP*
Normal	1/20*	1/20	1/20	1/20	–	–	–	–
'Sarong'	–	–	–	–	2/10*	1/10	1/10	1/10
Polybag I	5/31	5/31	4/31	4/31	13/34	10/34	10/34	9/34
Polybag II	9/21	9/21	9/21	9/21	17/22	17/22	17/22	17/22

Note: Denominators represents the original tree numbers at planting
Month of Planting = February 1983:3 days rain 8.9 mm
Rainfall figures after planting in Table 12
Watering was done for 2 months till the rainy spell set in
**-observation at 3 MAP*

Table 15. Effects or Retention Period of Establishment Success of Stumped Buddings in Polybag (Polybag II)

Planting months	Rain days	Rain vol. (mm)	No. of plant survived Time in polybags 3 months	5 months	7 months
Nov'82	19	416.6	10/10	–	–
Jan'83	4	56.0	4/5	5/5	–
Mar'83	2	22.9	0/5	1/5	4/5

February '83 rain - 3 days 8. 9 mm
April '83 rain – 4 days 47. 1 mm
Denominator represents number of trees per treatment
Measurement taken in January 1984.

root treatment on establishment success of bare root stumped buddings need further evaluation in bigger scale trials to confirm the usefulness of the technique.

Stumped buddings with tailing and topping rests before transplanting into the polybags, and retained in the bags for three to seven months, gave better establishment success and growth than the normal and 'Sarong' methods. This method has the advantage over the latter two methods in that at the time of planting, both the canopy and root system are relatively well formed whilst the bare stumped buddings require about two to three months to there months to develop a root system (Pakianathan *et. al*, 1978) and about one to two months to achieve a hardened whorl of leaves. This explains why even under adverse condition, stumped buddings in polybags performed better than the bare root stumped buddings in the trials. Watering improved establishment success further when planting was done during very dry period. A longer retention period than three months in the polybag was indicated; however, the optimal period would have to be determined from further trials.

The main difficulties in the use of stumped buddings in polybags were in handling and transportation. Polybag nurseries should therefore preferably be located close to a water source near the final planting site. Improved handling methods and mechanised transport would be advantageous to increase labour productivity. The logistics of large scale planting with these aids will have to be investigated further.

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(The Planter) □

NATURAL RUBBER: INTENSIVE RESEARCH SOUGHT

Mr P.C. Cyriac, Chairman of the Rubber Board, has stressed the need for intensive research into the potential uses of natural rubber. He was delivering the valedictory address of a short term institute in polymer technology organised by Cochin University's Department of Polymer Science and Rubber Technology in Cochin.

Mr Cyriac said that in oder to step up demand for natural rubber, new technologies and production strategies should be evolved.

The function was presided over by the University Vice-Chancellor Dr. K. Gopalan.

Institute Director Prof. D. Joseph Francis welcomed the gathering and Mr K.E. George proposed a vote of thanks. Dr. P. Sundaram of the American college, Madurai, spoke representing the participants.

Dr Gopalan issued certificates to the participants all of whom were university-level teachers from the Southern States. The Institute sponsored by the University Grants Commission was started on September 9, 1985.

NEWS IN PICTURES

Shri P. C. Cyriac, Chairman, Rubber Board is inaugurating the seminar at Malothu in Kasargod District.

Shri. V S Vijayaraghavan M P inaugurating the new office of the Junior Field Officer at Kalladikodu in Mannarghat Taluk. Shri. P S Kuriakose, Jt. Rubber Production Commissioner presided over the meeting. The speakers included S/Shri M P Cheriya, Manager, Federal Bank, Kalladikodu, Sreekumaran Unni, Former Panchayat President, Karimpa, Haji Abdul Rahiman Sahib and TMS Nair. A rubber growers seminar also was held.

Shri. M R Ramunni Menon, Branch Manager, State Bank of India, Changanacherry inaugurating the seminar held at Meenadam. Shri. John Philip, Dy. Director, Agriculture is also seen

The participants at the Kalladikodu Seminar.

news and notes

SPECIALITY POLYMER USE TO GROW

Manufacturers increasingly will turn to speciality polymers in the future to tackle a host of rubber product performance problems-often in the area of temperature resistance - and to cut costs.

As a result, demand for speciality elastomers can be expected to grow 9 percent per year, while worldwide elastomer growth limps along at a 3 percent annual rate, according to two Uniroyal research and development executives.

Emmanuel Kontos, section manager of elastomer research and development, delivering a speech he wrote with Daniel Sheridan Jr, senior group leader of Royalene research and development, discussed the emerging opportunities for speciality elastomers during the International Institute of Synthetic Rubber Producers' 26th annual meeting in San Francisco.

Kontos singled out five rubber products to demonstrate trends in speciality polymer use-single-ply rubber roofing, sponge rubber, hose, tyres, and wire and cable. In each market, scientists are turning to speciality elastomers to save money and solve trickly performance problems.

In roofing, the top rubber product growth market in the US, Kontos said one challenge is to improve membrane weathering properties so that longer-term guarantees can be made. Work in this area has found that differences in weather resistance exist between termonomers used in EPDM, while evaluations continue in an effort to find how carbon black types and levels in a polymer structure affect weathering in black sheets. In white sheets, scientists are trying to improve EPDM stock to allow to compete with Du Pont's more expensive Hypalon chlorosulphonated polyethylene.

Another problem in roofing is devising heat-sealable seams for ease of operation in the factory and during roof installation. Kontos said studies of ionic EPDM thermoplastic elastomers are in progress, while other TPEs are being considered in the attempt to improve and speed up the procedures.

Additionally, companies are examining radiation curing as an approach to reducing sheet-forming processing costs. Also, a number of oil-extended, high-molecular-weight EPDM polymers are under study, with the goal of improving the strength properties of the sheet.

Turning to sponge, Kontos said one need is to produce kual-durometer sponge weather stripping to accommodate the soft closing efforts of the lighter weight doors on "downsized" automobiles. The Uniroyal executive said elastomers for this application must accept large quantities of plasticiser for softness in a short mixing cycle, but maintain sufficient green strength at these high loadings to assure stability before curing. Recent developments for applications in this area include the introduction of ethylene and high ENB EPDM polymers.

Kontos said that in the hose market more temperature resistance is required because of the greater heat produced under the bonnet in the smaller, high speed engine compartments. As a result, nitrile use is declining in favour of more temperature-resistant elastomers, such as Hyaplon chlorinated polyethylene, silicone and fluoroelastomers.

Other uses for speciality polymers in automotive hose are as a response to the use of "sour" gas, as a way to increase resistance to alcohol in hoses in areas where ethanol or methanol blends are available and as an aid to cutting compound costs for general-purpose hose, Kontos said.

The wire and cable field too, is faced with higher underbonnet temperatures, and also needs abrasion resistant elastomers.

conductive polymers and compounds for strand shields and jackets and flame-resistant insulation.

Finally, the authors said they see improved ageing resistant elastomers, such as EPDM and its blends, as gaining use in tyres where ageing is a problem in low-weight tyres with thin sidewalls.

Speciality polymers also will gain ground in the tyre field as an answer to weight and handling problems.

CHINA ENTERS JOINT VENTURE

Polysar Ltd and a Chinese petrochemical company have agreed to a joint venture involving the production and marketing of carboxylated rubber latex.

The plan calls for trebling synthetic rubber production at the Gao Qiao petrochemical corp. in shanghai; researching possibilities for building a second latex plant there; and exploring other synthetic rubber and latex business opportunities in China.

In the three-phase agreement, Polysar will provide the four-year-old shanghai plant with the technology to raise its annual capacity to 3,000 tonnes by April next year. Most of the latex produced at the plant will be used in the paper coating industry in China. Polysar said the contract for this phase will be signed by the end of this year.

The Joint-venture company, which has yet to be named, will conduct a feasibility study for building a second latex plant in Shanghai with a 10,000 tonne capacity. The company also will study market development opportunities in the Asia pacific area.

Finally the company will explore other possibilities for marketing and producing synthetic rubber latex in China.

Polysar, which did not reveal the cost of the venture nor the specific type of rubber involved, said the move is part of a long-standing relationship between the company and China going back to 1959.

The recent venture is one of many business opportunities polysar is pursuing in the Chinese petrochemical industry, according to the firm's president Robert Dudley. Other efforts in the past have included joint research projects and technical assistance to Chinese end-user industries.

China's capacity for synthetic rubber in 1984 was an estimated 229,000 tonnes, according to the Institute of Synthetic Rubber producers.

POTENTIAL MARKET FOR TYRES

United Tire & Rubber Co. Ltd and three Far East companies have informed a joint venture to build an off-the-road tyre plant in Tianjin, China.

Also taking part in the US 29m project are; Tianjin Rubber Industrial Co., Tianjin International Trust &Investment Co. and Trinity Development Co. of Hong Kong. Tianjin Rubber will hold the largest share, followed by United, which will own 20 percent of the joint venture, according to vice president of marketing Robert Sherkin.

In addition to its capital investment' Sherkin said United will sell the joint venture $10.2m in equipment and technology for tyre production.

The venture will build tyres ranging in size from 12.00-24 to 36.00-51. The largest size is used on 170 tonne mining trucks.

The joint venture, which was formed in early March, is still working on plant design. Actual size of the factory has yet to be determined, according to Sherkin.

However, plans call for the plant to open within 30 months, with initial employment expected to be between 600 and 650. When operating at capacity, it will produce $36.3 m worth of tyres annually, Sherkin said.

The executive said United, which had 1984 sales of US$37.7m, decided to enter into the venture because of the large market potential in China. 'There is no present domestic production of many of the tyre size we are going to make,so we can capitalise on China's needs'' he said.

In addition, establishing a Far East plant will permit United to compete better in the entire Eastern Asian area. It will establish a new base in the region, much the same as Goodyear recently did by purchasing half of Toyo Giant Tire Co.Ltd, Sherkin said.

He also expects production costs to be much lower in China than at the Cobourg plant, although he declined to discuss typical wage figurers for the Chinese workers.

TYRE PLANT

Goodyear is considering a tyre production arrangement in South Korea because several of its customers are increasing their involvement in car making there, said the company, which also recently signed a footwear manufacturing pact in South Korea.

The firm stressed, through, that it has not made any offers or commitments concerning the proposed tyre move, and declined further comment.

According to South Korean sources, Goodyear is thinking about a joint venture with the debt-ridden Wuon Poong Industrial Co Ltd, which began construction on a radial tyre plant early this year in Yangsan, near Pusan.

Earlier this year, Goodyear signed a pact with Kwang sung Chemical Co., which in April began making Goodyear-brand athletic, work, dress and casual shoe and boot bottoms in Seoul, South Korea.

RMA PRESENTS AWARDS

The Rubber Manufacturers Association has presented seven rubber companies with its first Safety and Health Improvement Awards at the annual RMA Industrial products division meeting.

Three companies chosen for showing improvement in reducing injury and illness rates are; American Rubber Manufacturing Co. of Oakland, Calif., Gates Rubber Co. of Denver and Rubber Covered products Co, Inc. of Smithfield, R.I.

The RMA recognized four rubber firms for consistent excellence in safety and health care practice. They are: Akron Rubber Lining Inc., Goodyear, Republic Roller Corp, and Uniroyal.

The "Improvement" awards are given to companies that have shown improvement of 20 percent or better in their safety record from 1983 to 1984, and the "excellence" award is given to firms demonstrating a 50 percent better-than-average performance in lost workign days during that period, the RMA said.

The group said it will award members of other RMA divisions at a later date,

The Industrial products Division presented its awards at the group's annual meeting in Tarpon Springs, Fla.

REDUCTION IN NR PRICES

Natural rubber producers are viewing the Aug. 15, 1985 reduction in NR prices at which the International Natural Rubber Organization begins to enact its price support mechanism as a compormise, rather than a defeat.

"We have accepted reality and come to a compromise", said Ahmad Farouk, controller of the Malaysian Rubber Research and Development Board, about the INRO Council's decision to reduce the bufferstock reference price 3 percent. "With the demand so low for NR, there is really nothing we can do about this."

The reduction in the buffer stock reference price to 201.7 Malaysian cents per kilogram is the maximum price cut allowed under the rules of the NR pact. Producers, led by Malaysia, pushed for a nominal cut at the meeting in Kuala Lumpur, but consumer nations, led by the U S., sought the maximum reduction.

The cut automatically lowers by the same percentage the entire range of prices by which the INRO buffer stock manager must sell or buy NR. The INRO stockpile now exceeds 300,000 metric tons.

The price of RSS 1 natural rubber on the Kuala Lumpur market fell by 3.5 cents (Malaysian) on the eve of the INRO meeting to the lowest level since March 6. Following the announcement o the INRO changes prices on both the markets rose slightly.

Some sectors in Malaysia are suggesting the nation leave INRO, with most of suoport for this move coming from the 500,000 member Malaysian National Smallholders Association.

However, the major NR producers oppose such action.

Tan Sri Dr. B. C. Sekhar, former controller of the MRRDB and an architect of INRO, said the NR organization would collapse without Malaysia's participation.

The United Planting Association in Malaysia said the most sensible approach for NR producers is to keep negotiating for upward price revisions.

CONFERENCE ON GUAYULE

The Fourth International Conference on Guayule Research and Development, Sponsored by The Guayule Rubber Society and the University of Arizona, College of Agriculture, took Place from October 16-19, at the Hilton Inn, Tucson, AZ. Approximately 60 technical papers were Presented ranging in subject from direct seeding to bioregulators. Additionally, there were detailed reviews of the current status of guayule research and development in Argentina, Australia, India, Israel Mexico and South Africa. An optional all day field trip to the Commercial Plantings of guayule on the Gila River Indian Reservation was also arranged.

TWENTYFIVE YEARS OF PRI

The Plastics and Rubber Institute (Sri Lanka) had organized an international conference and an exhibition in Colombo, Sri. Lanka to celebrate 25 years of service to the polymer industry in Sri. Lanka. The international conference was held at the Hotel Lanka Oberoi and Bmich in Colombo. An exhibition was also arranged at Bandaranaike Memorial Intenational conference Hall in Colombo. Technical sessions for the conference covered such areas as materials (new developments in thermosets, thermoplastics and elastomers, and compounding ingredients for polymers); processing (automation in polymer industry including robotics, process monitoring and control using microprocessors, process technology for small scale investors and specific process technologies and their advantages); and marketing (marketing strategies and economics in rubber and plastics processing)

NATURAL RUBBER AS EXCELLENT ENGINEERING MATERIAL

The importance of natural rubber as an excellent engineering material, especially in the areas of earthquake protection, vibration and isolation was stressed by Mr. C. J. Derham, manager of MRRDB (D Consultants of Britain, during a recent visit to India.

Extensive R & D work has been done by the Malaysian Rubber Producers Research Association in association with the University of California, Berkley, in the U. S. Experiments using a 20-tonne three-storey steel frame test model mounted on a "shaking table" fixed on rubber blocks to simulate the behaviour of a building during earthquakes have proved beyond doubt that the natural blocks—properly compounded, designed and engineered —can be used to protect buildings from earthquake damage. Both horizontal and vertical movements of the buildings can be controlled.

Mr. Derham pointed out that even though India is not considered prone to earthquakes, natural rubber blocks similar to the ones used against earthquakes would be useful to protect nuclear installations from any ground—borne vibrations.

FAIR PRICE FOR RUBBER STRESSED

Mr. K. Karunakaran, Chief Minister of Kerala, the State which accounts for over 90 per cent of the total production of natural rubber in the country, stressed the need for evolving a fair price for rubber acceptable to both producers and consumers.

Inaugurating the agency division of the Kerala State Co-operative Rubber Marketing Federation, Mr Karunakaran, also underlined the necessity to operate a buffer stock to maintain the fair price. He hoped that the Rubber Board will take necessary steps in this direction.

Referring to the complaints of the consumers of higher prices and non-availability of high grade rubber, the Chief Minister, called for a thorough examination of factors responsible for the price fluctuations.

In this context, he also pointed out that the share of big plantations in the total production of rubber was considerably low and their share was expected to come down in the future. The small holders accounts for 79 per cent of the total area and 72 per cent of the total production in 1983-84. This means that a lion share of the rubber produced in the country would have to come from small producers. Therefore, it was necessary to examine whether the small producers get good share of the price difference, Mr. Karunakaran felt.

Mr. Jiji Thompson, Managing Director of the Federation (KSCRMF), said his organisation had fixed a target of marketing 21,000 tonnes of rubber in the current, year.

Mr. M. Kamalam, Kerala Minister for Co-operation, Mr. B. K. Modi, President of All India Rubber Industries Association, also spoke. □

RUBBER LATEX COLLECTION MODELLED ON 'AMUL'

P K Narayanan

In order to relieve the rubber small holders from the cumbersome post harvest technology, involved in processing natural rubber latex to ribbed smoked sheets, the Rubber Board has fielded a massive programme for organising Rubber Latex Collection centres in rural areas modelled on the AMUL pattern successfully practiced at Anand in Gujarath. Unlike other agricultural crops, processing of rubber latex into sheets is highly complex, time consuming, expensive and strenuous. In conventional processing the latex collected after tapping the rubber trees has to be brought to the farm house, bulked and strained through metal sieves to remove dirt and foreign particles. Then it is diluted adding double the quantity of water. The latex so diluted is transferred to Aluminium pans and treated with acid. It is kept for half a day or full day as the case may be to farm into a coagulam. The coagulam is then pressed between plain and grooved rollers and spread into sheets. These sheets are shade dried for a few hours and then transferred to the smoke house where it is subjected to controlled smoking by burning fire wood procured at high prices. The sheets will be kept in the smoke house for 4-5 days and then sent to the market. It is anybody's guess as to how complex and tiring this whole exercise is.

With the escalation in the cost of processing materials and equipments, small holders are finding it extremely difficult to get this technology going. It is estimated that to process a Kg of rubber sheet in this fashion it would cost around Paise 80. This is in addition to the energy and time spent for it.

Fully convinced of the hardship suffered by small growers of rubber, the Rubber Board has decided to organise Rural Rubber Latex Collection Centres in villages to be fully managed by the rubber producers themselves. The whole idea is to buy rubber from small growers as latex and pay for the dry rubber contained in it at the rate of lot sheet prices prevailing in leading markets. These centres would later be converted to tiny Cooperatives of small holders and linked to one of the larger Marketing Cooperatives operating within the area.

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The Fourth International Conference on Guayule Research and Development, Sponsored by The Guayule Rubber Society and the University of Arizona, College of Agriculture, took Place from October 16-19, at the Hilton Inn, Tucson. AZ. Approximately 60 technical papers were Presented ranging in subject from direct seeding to bioregulators. Additionally, there were detailed reviews of the current status of guayule research and development in Argentina, Australia, India, Israel Mexico and South Africa. An optional all day field trip to the Commercial Plantings of guayule on the Gila River Indian Reservation was also arranged.

TWENTYFIVE YEARS OF PRI

The Plastics and Rubber Institute (Sri Lanka) had organized an international conference and an exhibition in Colombo, Sri. Lanka to celebrate 25 years of service to the polymer industry in Sri. Lanka. The international conference was held at the Hotel Lanka Oberoi and Bmich in Colombo. An exhibition was also arranged at Bandaranaike Memorial Intenational conference Hall in Colombo. Technical sessions for the conference covered such areas as materials (new developments in thermosets, thermoplastics and elastomers, and compounding ingredients for polymers); processing (automation in polymer industry including robotics, process monitoring and control using microprocessors, process technology for small scale investors and specific process technologies and their advantages); and marketing (marketing strategies and economics in rubber and plastics processing)

NATURAL RUBBER AS EXCELLENT ENGINEERING MATERIAL

The importance of natural rubber as an excellent engineering material, especially in the areas of earthquake protection, vibration and isolation was stressed by Mr. C. J. Derham, manager of MRRDB (D Consultants of Britain, during a recent visit to India.

Extensive R & D work has been done by the Malaysian Rubber Producers Research Association in association with the University of California, Berkley, in the U. S. Experiments using a 20-tonne three-storey steel frame test model mounted on a "shaking table" fixed on rubber blocks to simulate the behaviour of a building during earthquakes have proved beyond doubt that the natural blocks—properly compounded, designed and engineered —can be used to protect buildings from earthquake damage. Both horizontal and vertical movements of the buildings can be controlled.

Mr. Derham pointed out that even though India is not considered prone to earthquakes, natural rubber blocks similar to the ones used against earthquakes would be useful to protect nuclear installations from any ground—borne vibrations.

FAIR PRICE FOR RUBBER STRESSED

Mr. K. Karunakaran, Chief Minister of Kerala, the State which accounts for over 90 per cent of the total production of natural rubber in the country, stressed the need for evolving a fair price for rubber acceptable to both producers and consumers.

Inaugurating the agency division of the Kerala State Co-operative Rubber Marketing Federation, Mr Karunakaran, also underlined the necessity to operate a buffer stock to maintain the fair price. He hoped that the Rubber Board will take necessary steps in this direction.

Referring to the complaints of the consumers of higher prices and non-availability of high grade rubber, the Chief Minister, called for a thorough examination of factors responsible for the price fluctuations.

In this context, he also pointed out that the share of big plantations in the total production of rubber was considerably low and their share was expected to come down in the future. The small holders accounts for 79 per cent of the total area and 72 per cent of the total production in 1983-84. This means that a lion share of the rubber produced in the country would have to come from small producers. Therefore, it was necessary to examine whether the small producers get good share of the price difference, Mr. Karunakaran felt.

Mr. Jiji Thompson, Managing Director of the Federation (KSCRMF), said his organisation had fixed a target of marketing 21,000 tonnes of rubber in the current, year.

Mr. M. Kamalam, Kerala Minister for Co-operation, Mr. B. K. Modi, President of All India Rubber Industries Association, also spoke. □

RUBBER LATEX COLLECTION MODELLED ON 'AMUL'

P K Narayanan

In order to relieve the rubber small holders from the cumbersome post harvest technology, involved in processing natural rubber latex to ribbed smoked sheets, the Rubber Board has fielded a massive programme for organising Rubber Latex Collection centres in rural areas modelled on the AMUL pattern successfully practiced at Anand in Gujarath. Unlike other agricultural crops, processing of rubber latex into sheets is highly complex, time consuming, expensive and strenuous. In conventional processing the latex collected after tapping the rubber trees has to be brought to the farm house, bulked and strained through metal sieves to remove dirt and foreign particles. Then it is diluted adding double the quantity of water. The latex so diluted is transferred to Aluminium pans and treated with acid. It is kept for half a day or full day as the case may be to farm into a coagulam. The coagulam is then pressed between plain and grooved rollers and spread into sheets. These sheets are shade dried for a few hours and then transferred to the smoke house where it is subjected to controlled smoking by burning fire wood procured at high prices. The sheets will be kept in the smoke house for 4–5 days and then sent to the market. It is anybody's guess as to how complex and tiring this whole exercise is.

With the escalation in the cost of processing materials and equipments, small holders are finding it extremely difficult to get this technology going. It is estimated that to process a Kg of rubber sheet in this fashion it would cost around Paise 80. This is in addition to the energy and time spent for it.

Fully convinced of the hardship suffered by small growers of rubber, the Rubber Board has decided to organise Rural Rubber Latex Collection Centres in villages to be fully managed by the rubber producers themselves. The whole idea is to buy rubber from small growers as latex and pay for the dry rubber contained in it at the rate of lot sheet prices prevailing in leading markets. These centres would later be converted to tiny Cooperatives of small holders and linked to one of the larger Marketing Cooperatives operating within the area.

Structure of a centre

A latex collection centre would be economically viable only if it is able to collect around 600 Kg of latex (3 drums) containing about 200 Kg of dry rubber, from 50–60 rubber producers within a radius of one to two kilometers. Producers selling latex to a collection centre should organise themselves in the form of a Farmers' Forum and take up the management of the centre by hiring the services of an educated youngster as latex collection agent, preferably nailing from a farm family of the locality. He could be given a remuneration of 15 Ps. per Kg. of dry rubber, he collects every day.

Estimation of Dry rubber content (DRC)

A sample of 20 gms of latex is drawn from the quantity of crop brought to the centre by each producer and each sample transferred to a crucible. This is treated with one or two drops of acid, coagulated and dried in an electric oven. Then it is weighed in a sensitive balance. If it weighs 7 gms the DRC of that sample could be estimated as 35%.

Equipments

The essential equipments required in a latex collection centre are platform scale, sensitive balance, Ammonia Cylinder, Drums, Sieves, buckets, crucibles, Acid, Electric oven and furniture. These equipments together would cost around Rs. 12500/–. Out of this the Rubber Board will pay Rs. 10000/-. The remaining Rs. 2500/- will have to be raised by the producer members of the society by subscribing at the rate of Rs. 50/per head.

The latex collected in each centre will be arranged to be sold to the nearest group processing unit by the Rubber Board.

Pricing System

The latex brought to a centre by the producer is at first weighed and entered in a Pass Book given to him from the centre. The weight of the Dry Rubber Content in the latex brought by each producer is estimated the same day, but entered in the Pass Book only the next day against the previous days' crop. Payment of the price to the producers is effected at the end of the week based on the DRC contained in the latex sold by them and at the average price of lot rubber prevalent in major markets during the previous week. Since such a norm is followed, the price paid to the producers would invariably reflect the favourable and unfavourable trends exhibited by the market mechanism.

Future of the centres

The Latex Collection Centres primarily organised for procuring natural rubber latex from small holders, are proposed to be converted later into Small Holder Development Centres, which would render a package of techno-economic services to the producer members of the centre including delivery of inputs and appropriate technology. In a traditional rubber growing region like Kerala a facility of this type would ensure individual attention to each rubber producer enabling the adoption of intensive cultivation practices and resultant upgradation of the productivity from his holdings. More so, because scarcity of land imposes constraints for extending rubber to more areas in Kerala. □

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DRYING OF SHEET RUBBER USING ELECTRICITY

N Radhakrishnan Nair, E V Thomas & Mathen Parappuram

Although electrical drying systems have already been standardised for drying crumb rubber, a simple electrical drying system for sheet rubber has not been standardised. Solid block rubber is an expensive proposition for small holders. Small holders are drying their sheet rubber either in smoke houses or kitchen hearths. A Suitable drying system is yet to be evolved which could be beneficial to the small growers. The article prepared by N. RadhakrishnanNair,E.V.Thomas Research Assistant and Dy. Director of Rubber Research Institute of India respectively and Mathen Parappuram of Kedco Dryers & Thermal Systems, Pallom, Kottayam, throws light as to how the new system fabricated by M/s. Kedco Dryers functions.

Important forms of processed natural rubber are; (1) Sheet rubber (2) Solid Block rubber (3) Estate Brown Crepe (4) Pale Latex Crepe and (5) Concentrated Latex. For the processing of first four forms, there is a stage in which heat energy is to be supplied to the processed rubber to drive out moisture. After coagulation and machining, the moisture content will be 10–25% in the rubber before it is fed into the drying chambers or smoke houses. Although electrical drying systems have already been standardised for drying crumb rubber, a simple electrical drying system for sheet rubber has not been standardised. Processing of rubber in solid block form is capital intensive and cannot be adopted by small planters. Small rubber planters of this country are presently drying their rubber sheets either in smoke houses or over kitchen hearths. Many small holders are not able to set up a smoke house because of the difficulty in providing the recurring fuel requirement. A suitable electric drying system that can be used for drying rubber sheets may find acceptability among small planters.

Electric Dryer

The electric drying system used for trial purpose was fabricated by M/s Kedco Dryers and Thermal Systems, Pallom, Kottayam. The dryer had internal dimensions of 1200 mm x 900 mm x 900 mm capable of accommodating 90 sheets in 2 layers conveniently. The walls of the dryer was 25 mm thick with heat insulating materials to minimise loss of energy due to dissipation. An exhaust vent was provided at the top for the escape of humid air. The oven was also provided with a watt-hour meter and a thermostat. Proper care was taken to protect the heating elements from being spoiled by water dripping from the sheets and also to distribute the heat energy uniformly to the bottom layer of the dryer. The cost of the dryer was around Rs. 12,000/-.

Preparation of Sheets

Field latex was diluted to 12.5 drc and the sheets were prepared by coagulation using formic acid. Sodium bi sulphite was added at a rate of 1.2 gm/kg of dry rubber to prevent discolouration of sheets. The coagulam was pressed down to 3 mm thickness and passed between ribbing rollers. Pressed sheets were

hung in open air for 4 to 6 hrs to drip and then transferred to the dryer. After noting the wattmeter reading, the dryer was set for a temperature of 60+5°c inside the drying chamber After the sheets have completely dried up, final wattmeter reading and the weight of the dried sheets were noted. Energy consumed ie; KW/kg of dry rubber was calculated.

The drying of sheet rubber was carried out under different conditions to study the nature of drying and power consumption.

Batchwise Loading

This was similar to drying of rubber sheets in a producers smoke house by loading the dryer upto 1/3rd its capacity on cnosecutive days. Initially, the sheets were hung at the bottom region and subsequently removed to the top. The drying of sheets was effected under the influence of convection currents within the dryer. Results are given below.

Full Capacity Loading

During the second trial, the sheets were charged into the oven in one lot and observations made on the drying process. Results are given below.

Properties of The Sheets

Properties of electrically dried sheets were determined and compared with smoke dried sheets prepared from the same lot of latex.

Technical Properties

Smoked and electrically dried sheets were compounded in a typical recipe given below and the properties of the vulcanisate so obtained were evaluated in accordance with ISI/ASTM procedures. Results obtaind are tabulated below.

Recipe:

Natural Rubber	-	100
Zinc oxide	-	5
Stearic acid	-	2
HAF black	-	50
CBS ,,	-	0.6
Aromatic Oil	-	5
Sulphur	-	2.5

Energy Consumption For Drying Operation

Date	Wattmeter reading (KW)	Fresh charge into the dryer		Weight of sheets in the dryer
		No. of sheets	Weight (Kgs)	
25.9.1984	210	29	25	—
26.9.1984	229	28	22.5	—
27.9.1984	248	29	18.5	—
28.9.1984	266	—	——	48
1.10.1984	304	—	——	44.2

Energy consumed = 94/44.2 = 2.13 KW/kg.

Energy Consumption For Drying Operation

No.	Date		Wattmeter reading		Wt.of sheets		Power Consumption (KW/Kg)
	From	To	Initial	Final	Wet	Dry	
1.	9.1.85	14.1.85	822	866	36	21.5	2.05
2.	29.3.85	2.4.85	1042	1094	31	22.5	2.3

Raw Rubber Properties

Property	Electrically dried	Smoke dried
Colour	Golden	Brown
Volatile matter %	0.5429	0.5801
Po	50	46
PRI	78	89

Comparison of Processing and Vulcanisate Properties

Property	Smoke dried	Electrically dried
Rheometrics (150°C,3°Arc Model R-100)		
Minimum torque (Range 100)	11	9.5
Maximum ,, ,,	86	86
Scortch time (Min)	4	3.75
Optimum cure time (Min)	13	12
Physicals		
Tensile strength (MPa)	23.3	24.9
M-300 (MPa)	10.1	10.5
Elongation at break (%)	598	617
Tear strength (N/mm)	84.7	82.9
Demattia Flexing		
Kcs to (1) Pin head bubbles	14	15
(2) Small crack	24	24
(3) Complete crack	35	35

Evaluation of Drying Cost

No.	Date	Weight of dried sheets (Kgs)	Energy consumed (KW)	KW/Kg.
1	1.10.1984	44.2	96	2.13
2	22.11.1984	47	97	2.06
3	14.1.1985	22.5	44	2.05
4	2.4.1985	22.5	52	2.3

Drying Cost

Consumption of electrical energy for drying/making sheet rubber during different trials is summarised below.

Energy consumed for drying sheet rubber is roughly 2 KW/Kg of dry rubber.

The raw rubber and vulcanisate properties of the sheets are comparable. Electrically dried sheets have a better colour. It is likely that the sheets dried in electrical drying chambers will substitute air dried sheets (ADS) and may fetch a good price if supplied to the market in large quantities. □

INCREASE IN USAGE OF RUBBER

Rubber consumption by the Malaysian rubber products manufacturing industry increased 14.1 per cent to 18,584 tonnes in the third quarter of 1985, the highest quarterly uptake recorded so far.

The increased consumption was a reversal of the decline in the second quarter.

It was also 5.2 per cent higher than the consumption figure in the same quarter of 1984, according to the latest issue of the Malaysian Rubber Review.

Total consumption for the first nine months of 1985 reached 51,796 tonnes, up 1.4 per cent over the same period in 1984 but far below the 10 per cent growth rate needed to meet the target of 300,000 tonnes by the year.

The latex sector accounted for 30.2 per cent of total rubber uptake followed by the tyre and general rubber goods sector which consumed 26.6 percent and 25.1 per cent respectively.

With the exception of the tyre and foot wear sectors, all sectors maintained positive consumption trends.

Although the third quarter uptake by the tyre sector was higher by 38.2 per cent than the previous quarter, it was 6.6 per cent short of consumption in the same quarter of 1984.

The footwear sector, on the other hand, surpassed the 1984 third quarter consumption by 14.5 per cent but fell 5.1 per cent relative to the second quarter of 1985.

Output

Tyre sales reached $136.1 million, up 70 per cent from that of 1984 while sales of inner tubes reached $11.1 million compared with $9.9 million reported for the first five months of 1984.

Tyre exports grew 15.6 per cent to $292.6 million in the first 8 months of 1985 compared with the same period in 1984 while imports dropped 27.8 per cent to $92 million.

Passenger car registrations were 38.6 per cent below those of the same quarter in 1984 despite the introduction of the attractively-priced Saga, but commercial vehicle registration were up by 39.5 per cent. Malaysian motor vehicle assemblers have lowered their output to about 30 per cent of daily capacity. Two passenger car assemblers have suspended operations because of the slump in the market.

It is believed that the dullness of the market resulted from the general economic situation which had not improved much, the review said.

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ECONOMIC STATUS OF WOMEN WORKERS IN RUBBER PLANTATIONS - A CASE STUDY

Dr. V. Haridasan

Plantation work is a sort of specialised agricultural work and is therefore more familiar to women with rural background. In the course of time, family became the unit of recruitment. A study undertaken by Dr. V. Haridasan, Dy. Director (Economics) regarding the economic status of women workers in Rubber Plantations, reveals that the economic status enjoyed by women is not bad compared to other category of women workers. The literacy level of women workers and their husbands is also comparable to the general standard in the state. In this article the author also analyses the various aspects of the socio-economic status of the women workers in plantations.

Introduction:

The main plantation crops of India are tea, coffee and rubber. An estimated one million workers are employed in these crops. Tea and coffee are beverages, while rubber is an industrial raw material of strategic importance. They occupy around a million hectares in India. An important feature of plantation industry in India is the employment of large percentage of women in them compared to other forms of organised industry. Although plantations are a form of agriculture, they are organised on the lines of industry for management and control, eventhough there is a growing sector of small holdings in them.

There are some reasons for the higher percentage of employment of women. In the first place plantation work is only a special kind of agricultural work and is therefore more familiar to women with rural background. In the olden days when plantations were developed, workers were recruited and brought to the plantations from distant places. In the course of time their families also joined them, and gradually the family became the unit of recruitment. The family employment is more common in tea and coffee than in rubber. The rubber plantations employed around 2 lakhs workers at the end of 1984. The percentage of employment of men, women and children in the rubber plantations is shown in Table I.

Table-I. Percentage Employment in Rubber Plantations

Year	Men	Women	Children
1944@	72	24	4
1961@	69	30	1
1984ǂ	64	36	Insignificant

Nature of work in rubber plantations:

The work carried out in the rubber plantations can be classified under three major heads: field operations, factory operations and office work. The bulk of workers are employed in the field: the factory provides work to a few and the office still fewer persons. The main operations carried out in the field are clearing and preparation of land, maintenance of planting material-nurseries, planting, weeding, mulching, manuring, pruning, plant protection and tapping. Tapping is the operation by which latex is collected from the rubber tree. The latex is converted into various forms of rubber after processing in the factory.

Land clearing and soil preparation are done mainly by male workers. In the maintenance of nurseries and planting, both men and women workers are employed. Large number of women have customarily been employed for weeding. But technological change is affecting their employment in some plantations, where chemical weedicides are used. Men and women are employed for manuring, while more men are engaged in plant protection and tapping. In the factory very few women get employed while employment of women is virtually nil in the office.

Plantation wages:

Plantation wages are higher than the wages of agricultural workers, but less than those received by workers in mines, industry or administration. Within the plantation, factory workers are better paid than tappers or field workers. In India Equal Remuneration Act has abolished wage differentials between men and women, when the work is identical. Minimum Wages Act has prescribed statutory wages for rubber plantation labour. Both time rate and piece rate are in vogue in rubber plantations. Piece rate wages are generally paid to tappers, while time rate is common in the field and factory.

Findings of the study

With the above background, a study was undertaken in April/May 1985, taking the entire women workers in the Central Experiment Station of the Rubber Board at Chethackal in Pathanamthitta District of Kerala to evaluate the economic status of women workers. The reference period of the study was the financial year 1984–85 and the number of women workers employed in that plantation was taken as at the end of March 1985. The details were collected in a questionnaire after personal interview of the women workers.

There were 157 women workers in the plantation. Out of that 110 women workers were engaged in the field and the remaining workers as tappers. The plantation had a total labour force of 361 at that time. The sex ratio of men and women being 57 per cent and 43 per cent respectively. The percentage of women workers is slightly higher in this plantation than the industry's average. The 157 women workers consisted of 124 married women, 11 divorcees,15 widows and 7 unmarried persons.

Age distribution of women workers is shown in Table II.

Table-II. Age Distribution of Women Workers

Age group	No. of women workers	Percentage
Up to 20 Years	4	2.5
21 to 30 ,,	61	39.0
31 to 40 ,,	65	41.5
41 to 50 ,,	25	16.0
Above 50 ,,	2	1.0
Total	157	100.0

Eighty per cent of women workers belonged to the age group 21 to 40 years.

With the highest level of literacy in Kerala among the Indian states, it was inevitable that the women workers too had reasonable level of education.

The literacy level is shown in Table III.

Table-III. Literacy Level of Women Workers

	No. of women workers	Percentage
Illiterates	19	12
Can read and write	3	2
Primary and below	86	55
Above primary, up to S.S.L.C.	49	31
Total	157	100

Table III shows that 86 per cent of women workers had attended school and there was a good percentage of workers who studied upto high school level.

Out of the 157 workers, 150 were women with families and 143 had children. The number of children in the 143 families is shown in Table IV.

Table-IV. Children per Family

	No. of women workers	Percentage
1 to 3 children per family	108	76
4 to 6 ,,	30	21
Above 6 ,,	5	3
Total	143	100

The average children per family was 2.8 and the average members per family was 5.1.

Age distribution of the children is shown in Table V.

Table-V. Age Distribution of Children

Age (Years)	No. of children	Percentage
5 years and below	78	20
6 to 10 ,,	81	20
11 to 15 ,,	80	20
Above 15 years	161	40
Total	400	100

Of the 400 children, 191 were studying in schools and other institutions. Table VI shows the details.

Table-VI. Education of Children

	No. of children	Percentage
Below primary level	57	30
Above primary, up to S.S.L.C.	109	57
Above S.S.L.C.	25	13
Total	191	100

Twenty five students or 13 per cent were studying in post-SSLC classes, most of them in colleges. The majority of husbands of the 124 women workers too had education.

Table-VII. Education of Husbands

	No. of Husbands	Percentage
Illiterates	8	6.5
Can read and write	7	5.5
Primary and below	68	55.0
Above primary up to S.S.L.C.	40	32.0
Above S.S.L.C.	1	1.0
Total	124	100.0

The employment position of husbands is show in Table VIII.

Table-VIII. Employment Position of Husbands

	No. of Husbands	Percentage
Unemployed	15	12
Agriculture & Allied workers	60	48
Employees of the same Plantation	43	35
Other employment	6	5
Total	124	100

It will be seen that 88 per cent of husbands were employed and that a sizable percentage was employed in the same plantation. The income of husbands and the women workers including the wives is shown in Table IX

Table IX Monthly Income

Monthly Income	Men (Husbands) No.	Percentage	Women workers (including wives) No.	Percentage
No income	15	12	Nil	Nil
Up to Rs.200 per month	20	16	91	58
Rs. 200 to 300	49	40	20	12.5
Rs. 301 to 400	3	2	1	0.5
Above Rs. 400	37	30	45	29.0
	124	100	157	100.0

Nine children were also earning and contributing to the family kitty. The average income of the 150 families was Rs. 574 per month and the average expenditure was Rs. 555 and the expenditure formed 97 per cent of the income. The percentage of expenditure on different heads is shown in Table X.

Table X. Percentage Expenditure on Different Heads

Heads of expenditure	Rs.	Percentage
Food	416.70	75.0
Clothing	43.73	7.9
Firewood & Light	12.32	2.2
Education	21.40	3.9
Medicine	20.90	3.8
Travelling	14.47	2.6
Cinema	5.75	1.0
Others	20.20	3.6
Total	555.47	100.0

Out of the 157 women workers 47 were permanently employed and therefore had subscribed to Provident Fund and 33 husbands had also subscribed to P. F. Ten women workers had subscribed to chit funds as well.

131 women workers lived in the houses belonging to them or their husbands while ten women workers were provided with houses by the plantation and the remaining 16 women lived in rented houses. Of the 131 own houses, 39 were tiled and the remaining thatched.

Information on family planning was also collected from the women workers during the study. Of the 124 women with husbands, 90 (72.5%) were following permanent methods of family planning. Of these forty six women workers and 44 husbands of women workers underwent sterilisation operations.

Conclusion

The broad finding of the study which reflects the situation in the rubber plantation industry in Kerala is that the economic status of women workers is not bad compared to other category of women workers. The literacy level of women workers and their husbands is high and is comparable with the general literacy level in the State. All children in the age group of of five and fifteen years are going to schools, where education is free. There is also a conscious effort to limit the size of the family and this is reflected in the large number of families adopting family planning.

Acknowledgement:

The assistance rendered by Sri. V. Purushothaman of Economic Research Division is acknowledged. Thanks are due to Sri. Raghunathan Nair, Sr. Superintendent of CES, Chethackal. I am grateful to Shri P. Mukundan Menon, R. P C, for his valuable suggestions. □

The Chief Minister Shri. K. Karunakaran inaugurating the Agency division. Others in the picture are Smt. M. Kamalam, Minister, Shri. O. Lukose, President of the Kerala State Rubber Marketing Federation, Shri. K. D. Shaw, Rubber Industries Association, Shri. P. C. Cyriac I. A. S., Chairman, Rubber Board, Dr. B. K. Modi, President, Rubber Industries Association and Shri. Jiji Thompson I. A. S., Managing Director, Rubber Marketing Federation.

THE AGENCY DIVISION OF THE RUBBER MARK INAUGURATED

Rubbermark

The Kerala State Co-operative Rubber Marketing Federation, popularly known as 'Rubbermark' is the apex body of thirty three primary rubber marketing societies in Kerala. It is the largest supplier and stockist of all grades and forms of natural rubber in the country. The Federation has been confining their sales in terminal markets in other states through their branches located at Jullunder, Ghaziabad, Faridabad, Delhi, Kanpur, Calcutta, Ahemedabad and Bombay hitherto. In order to achieve a better market share and also to serve the consumers even better, it has decided to go in for agency transactions, which have by now become a common practice in rubber trade. A function was therefore, organised under the joint auspices of the Federation and the All India Rubber Industries Association in the Crystal Room of Tajmahal Hotel, Bombay on 29th in December, 1985. Bombay, happens to be the nerve centre of quality conscious rubber consumers right from the beginning. Besides, agency operations are more common in Mahsrashtra State due to the tax structure prevalent there. Above, all there has been persistent pressure from some leading customers of the Federation in Bombay for starting agency operations. It was, therefore, in the fitness of things to choose Bombay as the venue for this auspicious function.

The Agency Division of the Kerala State Co-operative Rubber Marketing Federation was formally inaugurated by Shri. K. Karunakaran, Honourable Chief Minister of Kerala on 29th December, 1985 at Bombay. The meeting organised in this connection was presided over by Shri. P. C. Cyriac I.A.S., Chairman, Rubber Board.

Smt. M. Kamalam, Minister of Co-operation, Government of Kerala formally handed over the documents of the first two consignments of rubber sent from Cochin under the agency system. Dr. B. K. Modi, the noted industrialist and President of the All India Rubber Industries Association, Shri. K. V. Harikrishnan Nair, I.A.S., Registrar of

Shri. P. C. Cyriac IAS, Chairman, Rubber Board delivering the presidential address.

Co-operative Societies, Kerala and Shri. S. V. Lathia, were the other distinguished guests who spoke on the occasion. Shri. Jiji Thompson I.A.S., Managing Director of the Federation made an introductory speech while Shri. O. Lukose, President of the Federation gave a summing up talk.

The meeting started with a welcome speech by Shri. K. K. Kapoor, Secretary of the All India Rubber Industries Association. Shri. Jiji Thompson, Managing Director of the Federation introduced the distinguished guests to the audience before commencing his introductory talk. In his talk, he dwelt at length on the multifaceted activities of the Federation. With facts and figures, he presented the progress made by his organisation in various spheres significantly in the field of rubber marketing. Rubber sales during the current year, he added has already crossed 12,000 metric tonnes, which was the total sales turn over achieved during the whole period of last year. He also expressed confidence that the target of 21,000 metric tonnes laid down for the current year, will be achieved. Further, he explained the circumstances leading to the starting of a new agency division by the Federation.

Fair Price

The Chief Minister, in his speech congratulated the Federation for opening an Agency Division to give better services to the rubber consumers. He felt that this will dispel the common misgiving that the Kerala Government is not doing anything tangible to protect the interests of rubber consumers.

Coming to rubber prices, he observed that this is an issue which often generates controversies with divergent and conflicting views being expressed by the producing sector on the one hand and the consuming sector on the other. The interests of both these sectors are not conflicting as it is always made out to be, but complementary and interdependant he added. The prosperity of one sector is dependant on the other. The Chief Minister therefore, wanted that a fair price should be evolved

The Chief Minister and the Rubber Board Chairman

A group discussion during interval:
Dr. B. K. Modi, P. C. Cyriac, O. Lukose and Jiji Thompson.

at the earliest, fair to the producers and consumers alike. This price level has also to be uniformily maintained throughout. He also felt that the Rubber Board could take the initiative in this regard.

Rich Tributes

Commenting on the frequent complaints about deterioration in quality of indigenous rubber and scarcity and exhorbitant prices of higher grades he admitted that this will upset the cost structure of the manufacturing industry. He however, repudiated the common feeling that the producer gets the advantages of such higher prices. In reality, a major share of this price advantage goes into the pockets of middlemen, and not to the small producers because of the present marketing system for small holders rubber and the visual grading system being followed for conventional grades. While highlighting the role played by the small producers in the rubber industry, he made a strong plea to devise ways and means to ensure a better return to them for their produce. The role played by the Rubber Federation in this regard, by cutting down the marketing chain and thereby marketing margins to the minimum, is therefore, the ideal approach to alleviate the difficulties of small producers. He went on to pay rich tributes to the Federation for the growth and progress achieved by them in the past without sacrificing the social objectives and responsibilities. He wanted the Federation to continue serving the small producers and consumers alike by imbibing the same spirit of dedication so that they could climb further steps in the ladder of progress.

Immediately after the speech, the new Agency Division of the Kerala State Co-operative Rubber Marketing Federation was formally inaugurated by the Chief Minister in the traditional Kerala style by lighting the 'Nilavilakku' amidst wide cheers and applause from the audience.

Commendable Progress

The next item on the programme was the fomal handing over of documents of the first two consignments sent under the agency system. Before performing this, Smt. M. Kamalam, Minister of Co-operation, made a brief talk. At the very out set she stated that the Federation has lived up to the expectation of the Government of Kerala. Recalling the commendable progress made by the Rubber Federation in the past, she went on to express full confidence that it will continue to protect and safeguard the interests of small rubber producers, without of course, ignoring their commitment to the rubber consumers. She then handed over the documents of the first two agency transfers to Shri Ashok Mittal representing the Maharashtra Tyre and Rubber Industries and Shri. S. V. Lathia, representing M/s. Lathia Rubber Manufacturing Company.

In his talk. Dr. B. K. Mody, President of the All India Rubber Industries Association, pointed out that indegenous prices of natural rubber are indeed very high vis-a-vis international prices. He also stated that erratic supply position and wide fluctuations in the premiums of higher grades matters still worse. These are very disturbing trends, he continued because it affects the cost structure of the rubber goods manufacturing industry. He made a strong plea to increase productivity and quality of rubber and also to make superior grades easily available at reasonable prices.

Chain of units

Shri P. C. Cyriac, Chairman, Rubber Board, delivered the presidential address. He complimented the Federation for the significant progress made by them in the past. He also expressed firm belief that under the dynamic leadership of persons like Prof. O. Lukose, and shri Jiji Thompson, the Federation, will prosper and flourish further. After having achieved a stable position in the rubber market, he added, it is time for the Federation to diversify into other areas so that the small rubber producers are served even better. A main line of diversification suggested by him was the setting up of a chain of small scale rubber manufacturing units. while endorsing the need for a fair price as proposed by the Chief Minister, he stated that the Rubber Board has already taken theui i tiative in thsr

regard and it will continue to do so in future also. Commenting on the high price of indigenous rubber, pointed out by Dr. B. K. Mody, he stated that high price is not a phenomenon entirely to rubber alone. He further added that if the cost escalation of other raw materials of the rubber goods manufacturing industries is also considered, this will be very clear. He was also of the view that comparison of the price of rubber in India with that of Malaysia in isolation without taking into account all the related aspects may not be a correct approach. Coming to productivity, he endorsed the views of Dr. Modi on the need to increase productivity. In this context he emphatically stated that rubber has recorded comparatively better productivity increase in comparison to many agricultural commodities in the past. He also stressed the need to avoid wide fluctuations in prices, which may do more harm to the rubber goods industry than slightly higher prices Priority should, therefore, be given to this aspect, he added.

Targets to be achived

Shri K. V. Harikrishnan Nair IAS, Registrar of Co-operative societies while offering felicitations on the occasion revealed that Rubbermark is the best apex organisation under his control which made a harmonious blending of commercialism with social responsibilities. He further stated that in the field of Co-operative banking, Kerala is right on the forefront. But in marketing field it has yet to catch up with states like Maharashtra, Gujarat, Tamilnadu etc. This could be achieved by emulating the dynamism exhibited by agencies like the 'Rubbermark'. Shri S. V. Lathia also offered felicitations thereafter. While placing on record the useful role played by the Rubber Federation in the past, he expressed the hope that it could be able to serve the consumers better with the opening of the Agency Division.

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Prof. O. Lukose, President of the 'Rubbermark' made a brief summing up talk thereafter. He glanced through the ambitious targets laid down for his organisation in the coming years and sought the help and cooperation of all concerned particularly the consuming sector to achieve it. He also made a special mention of the support, help and guidance given by the All India Rubber Industries Association for making the function a grand success. On behalf of the Federation and on his personal behalf he thanked all the distinquished guests for the interest and patronage extended by them to the Federation. This was followed up with a vote of thanks by Shri K. D. Shah, Hon. General Secretary of the All India Rubber Industries Association. The first part of the function thus came to a close.

Technical Seminar

The second part of the programme for the day was a technical seminar on the uses of natural rubber. Mr. C. M. George, Project officer chaired the first session and Mr. K. J. Jacob, General Manager (Technical) of M/s. Rishiroop Polymers gave a talk on product compounding with natural rubber with particular referencc to crumb rubber. Shri K. P. George, Marketing Manager of the Federation introduced the chairman and the speaker to the audience.

Mr. Jacob, in his talk highlighted the advantages of using crumb rubber vis-a-vis conventional grades in product compounding in various fields. He also stated that the present problem is not the resistance of consumers to use crumb rubber in increasing quantity as in the past; instead it is the non-availability of crumb grades significantly higher grades to meet the growing demand of the consumers. A very active and lively discussion followed. Initiating the discussions, Mr. C. M. George, explained briefly the reasons for the lack of enough supplies of higher grades of crumb rubber and the steps being taken to augment the production of such grades. The main point emerged in the discussion was lack of enough supplies of latex based crumb. A few participants made a strong plea for increasing the production of such grades on priority basis. The pricing of scrap based crumb rubber also came up for discussion, Shri P. C. Cyriac, Chairman, Rubber Board participating in the discussion drawn the attention of the audience in devising new systems for drying preferably solar drying techniques to cut down the overall cost of production of crumb rubber. The Rubber Board on its part is going ahead with research projects on this and he requested the manufacturing sector, also to make some studies in this regard at their level.

Processing Systems

The Chairman of the second session was Shri K. J. Jacob. Shri K. S. Gopalakrishnan, Chemist of the Rubber board, gave a detailed talk on the production of various forms and grades of natural rubber with special significance on crumb rubber. Shri. K. P. George, Marketing Manager of the Federation introduced the Chairman and the speaker to the audience.

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Director of the Federation.

The function was intended to create public awareness on Federation's activities mainly the commencement of agency operations. It can be confidently said that this has been achievd to a very great extent which is evident from the fact that transactions to the tune of 400 tonnes per month under agency system was booked at the venue of the meeting itself. Besides, it has generated lot of enquiries, which are being followed up earnestly by its Bombay branch. Coinciding with the inaugural function, the entry of 'Rubbermark' into agency operations has been widely publicised through news papers and other publications having extensive circulation all over the country. All these efforts have given an impetus and a boost to the Federation for achieving or even exceeding the target of 21,000 tonnes laid down for the current year. □

SHEEP UNDER RUBBER

The Planter's Bulletin (Number 183) carries certain valuable information on the results of a ten-year experiment by the Rubber Research Institute of Malaysia on sheep rearing under immature and mature rubber areas. In this issue of the Rubber Board Bulletin, an article on "Biological control of Asystasia by sheep crazing" is also reproduced elsewhere. The results of the experiments show that the project is viable by providing additional income to the farmer as well as providing effective biological weed control. Sheep rearing is therefore said to be beneficial for both the estates as well as small holdings. The ten-year experience of using sheep as labour for weed control has exciting potentialities. The relevant portion of the editorial is given below:

"The search for a new approach to weed control using sheep stemmed from the need of the industry to combat chemical-resistant, hardy and noxious weeds under rubber. In the sixties, sheep rearing under rubber was introduced only as an alternative or complementary project to intercropping.

Today, sheep rearing under rubber constitutes not only an innovation in mixed farming system but, in turn, provides further stimulus to livestock production—utilising the available vast grazing areas—and also leads to innovations in biological weed control systems.

By using sheep as weeders, the overall cost of weeding can be reduced by 15% to 25% compared to chemical means used alone. The sheep graze on almost all the major weed species, and allow leguminous cover crops to regenerate.

With the use of solar powered electric fencing system a shepherd can either return to the homestead area to do other duties or remain with the herd slashing the weeds which are not preferred by the animals. The grazing area can be allocated systematically according to weeding requirements. This system of sheep rearing has the following advantages: reduced use of chemical herbicides; erosion is controlled; through selective weeding, nitrogenous cover crops become dominant and nitrogen is fixed for the benefit of the rubber trees; soil structure is improved due to return and accumulation of organic matter whilst dung and urine are re-cycled to fertilise the ground; meat is produced from an area that would otherwise be wasted; the system is complementary to nature and environment; it is a flexible system and can easily be altered as the need arises.

It is interesting to note that this innovation has been diffused to planters and has been adopted by big plantation agencies and smallholdings alike. The traditional husbandry experience of the farmers is now being supported by science-based development of public and private research institutions.

It is hoped that with improved breeding and husbandry techniques, sheep rearing under rubber can one day be of great economic importance in terms of meat supply and probably wool production. It is in this area that the estate sector must participate and assist to develop marketing channels to support the industry."

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Biological Control of *Asystasia* by Sheep Grazing

Asystasia is a difficult weed to eradicate; in parts of Johore this problem has assumed importance and farmers are becoming worried. To alleviate their fears and to offer them assistance for control of *Asystasia*, a dialogue-cum-seminar session was organised. Most of the discussions centred on chemical control, and there was no offer of alternative method of control. This article considers biological methods of controlling the weed.

History of *Asystasia*

Asystasia is a herb belonging to the family of Acanthaceae. There are about thirty species of *Asystasia* and they are mainly found in Africa and Asia. According to Ridley, *Asystasia* was introduced to Malaya in 1876 as an ornamental plant for the garden. Another source claims that it was purposely planted in the early days as fodder for deer reared by the early Sultans.

Figure 1. Asystasia coromandeliana found in Segamat, Johore

Figure 2. Asystasia intrusa found in South Johore

There major species have been found in Malaysia, namely, *A. coromandeliana* (*Figure 1*), *A. intrusa* (*Figure 2*) and *A. chelomeides*.

In 1983, the Agriculture Department confirmed that *Asystasia* could be found in the whole of Peninsular Malaysia. Earlier, in 1977, it was reported that *A. intrusa* and *A. coromandeliana* were seen to have taken root especially in oil palm plantations. It has also been reported that *A. intrusa* and *A. coromandeliana* were observed to have established themselves in the plantations

Figure 3. Sheep grazing. A. intrusa

ever since 1950 but were not as widespread as today. Lately, it was also confirmed that most of the *Asystasia* found in Central, South and West Coast of Johore belonged to the species *A. intrusa*.

Impact and Uses of *Asystasia*

Asystasia has become the worst weed in Johore especially in the areas of Pontian and Batu Pahat. In some estates, FELDA, FELCRA and KEJORA schemes nearly 80% of the areas are covered with *Asystasia*. Some managers call it *'Rumput Cili'* because its pods look like *'Cili padi'*.

To the older generation of farmers in Pontian and Batu Pahat *Asystasia* was known as *'Rumput Bunga Putih'*, *'Ruas-Ruas'* or *'Penggorok'*. During the Japanese Occupation, the plant was eaten as vegetable and cooked as *'masak lemak'*. According to local folks it tastes like *'cekor manis'*. The present generation of farmers who now have to fight the weed daily, out of sheer frustration call it *'Rumput Jepun'*, *'Rumput Israel'*, *'Rumput Russia'*, *'Rumput Hantu'* and *'Rumput Setan'*. Despite the bad names, *Asystasia* has some good uses, namely:

- ☐ Used as traditional medicine sold by Sinseh shops under the name of *'Kow Kua Chai'*.
- ☐ In Moluccas, the juice of *Asystasia* is added with water and lime juice for cough, sore throat and chest pain,
- ☐ In the *kampongs*, it is eaten as vegetable.
- ☐ Honey bee species such as *Apis indica* and *Apis dorsata* are known to frequently visit *asystasia* flowers for honey. Accordingly, some bee farmers in Pontian purposely plant *Asystasia* for bee rearing.
- ☐ Of late, it was observed that *Asystasia* is found to be the favourite feed for sheep *(Figure 3)*.

Adaptability and Spread of *Asystasia*

Asystasia adapts well on almost any type of soil. It grows well on well aerated deep soil, peat and even on the sandy beaches. The plant is also shade-tolerant and thus it can invade areas that already have established under-growth. It can grow to a height of lm to 1.5m and retards the growth of other weed species *(Figure 4)*.

Many theories have been discussed on how *Asystasia* spreads very fast in most plantations and small-holdings. Some of the ways are:

- ☐ Seed borne in soil in polybag where the soil used to fill the polybags were obtained from *Asystasia* infested fields.
- ☐ Seeds trapped together with soil sticking on tyres of

Figure 4. A. intrusa under immature rubber before grazing at RRIM Station, Kota Tinggi, Johore

vehicles moving through fields infested by *Asystasia*

- Seed dispersed through the explosion of its pods (fruits) *Asystasia* is known for its high seed production.

Chemical Control of *Asystasia*

Many smallholders in Johore felt frustrated because herbicide such as Gramoxone, which was the most easily available in the market, could only scorch the plant. Pineapple smallholders were the worst hit and a few had abandoned their holdings for other jobs as they could not control the invasion of *Asystasia*. The most effective chemical to control *Asystasia* is 2, 4-D Damine plus paraquat which is relatively expensive. Some oilpalm estates are using Garlon 250 for its eradication. MARDI reported that the cost of weeding (chemical and labour) for this herb is as follows:

Manual spraying using knap-sack sprayers:	177.80–190.30 Rgt/ha
Using low volume sprayer:	25.00– 38.00 Rgt/ha
Using the Wistone equipment:	17.00– 39.00 Rgt/ha

Figure 5. Using the solar powered electric fencing to control sheep while grazing

Biological Control

Since chemicals cannot do a satisfactory job in controlling *Asystasia*, a biological approach might be the answer to the problem. As such, the RRIM looked into the possibility of using sheep to control the vigorous growing *Asystasia* at its Experiment Station at Kota Tingi since 1982. The Station now has about 470 sheep grazing under an immature rubber area of approximately 32 ha infested by *Asystasia*. Previously before replanting (1980), the whole area, in fact three-fifths of the station's areas, was covered by *Clidemia hirta*. Grassse such as *Ottochloa*, *Paspalum*, *Axonopus*, *Brachiaria* and also *Mikania* started to take over the area when leguminous covers faded away. However, the area was then infested by *Asystasia* in 1982 (*Figure 4*). The *Asystasia* plants were about 1 m to 1.5m tall. In controlling the weeds in this area the sheep flock was allowed to graze in a rotational paddock system. At first portable nylon netting was used to contain the animal in paddocks but later in 1984, solar-powered electric fencing was used (*Figure 5*). When the sheep grazed in the paddocks it was observed that they ate the *Asystasia* first and they would go for other weeds such as *Otochloa* and *Mikania* when almost all of the *Asystasia* was grazed. The result of the grazing is shown in *Figure 6*. From observation, the sheep ate all meristematic parts of the *Asystasia*, *i.e.*

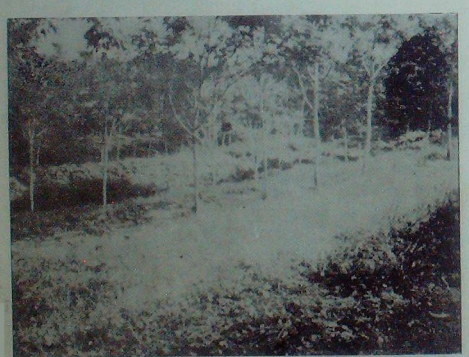

Figure 6. Two days after sheep grazing

Figure 7. Condition at one and half months after sheep grazing

leaves, young stems, flowers and green pods, leaving the old stems and older leaves behind. The grazed area was allowed to regenerate. *Figure 7* shows the result of regeneration of *Asystasia* after one and half months of regrowth. The *Asystasia* did not grow back to its original height as before. After three rounds of grazing the height of the weed was maintained down to about 10cm above the ground (*Figure 8*)

Discussion and Conclusion

Asystasia is not as obnoxious as most smallholders and planters claim it to be. It can be turned into beneficial use, *i.e.* as feed for sheep. The *Asystasia* has a very high protein content (24%) compared to other weeds and this protein can be turned into meat by sheep. Our orthodox thinking and training prompt us to eradicate or remove at all cost anything that competes with the main crop and *Asystasia* was no exception. Some planters even practised blanket spraying of *Asystasia*, exposing the valuable top soil to erosion hazards. By sheep grazing, only the *Asystasia* tops are removed and the soil surface is not exposed. Little do we realise that the naturally growing weed, otherwise considered as an enemy, can be converted into an asset by feeding it to sheep. So far, there has been no adverse effect on sheep feeding on *Asystasia* except for the excretion of softer dung than normal due to the higher moisture content of the plant.

Biological control of *Asystasia* by sheep grazing is therefore a practical solution to prevent the invasion of this weed in smallholdings or plantations.

By feeding *Asystasia* and other suitable weeds to sheep we can achieve several benefits among which are:

- ☐ Reduce the cost of weeding by savings on the purchase of herbicide and payment for labour.
- ☐ Return of organic matter and nutrients to the soil through sheep dung and urine.
- ☐ Production of mutton and getting extra income through the sale of meat produced.
- ☐ Reduce the hazards of using chemicals and the pollution problem in our environment.

Article credit: Rosley Abdullah (RRIM Planters' Bulletin)

Figure 8. Height of A. intrusa after three rounds of grazing

FERTILIZER RECOMMENDATIONS AND EXPLOITATION SYSTEMS

The available status of soils in Kanyakumari, Trichur, Palghat, Calicut, Karnataka, Goa and Maharashtra is high and therefore the incorporation of magnesium in the general fertilizer recommendation for immature rubber was stopped.

The results of experiments conducted by the Rubber Research Intitute of India revealed that the rubber trees could be puncture tapped an year prior to normal opening of the trees using 2.5% Ethephon as a stimulant.

The following recommendations have been approved at the workshop on the general recommendations of tho Board at the Rubber Research Institute of India.

A. General Fertilizer Recommendations

1. In Kanyakumari, Trichur, Palghat, Calicut, Karnataka, Goa and Maharashtra Regions the available magnesium status of soils is high and hence the incorporation of magnesium in the general fertilizer recommendation for immature rubber was decided to be stopped forthwith. Thus the new recommendation would be as follows:

2. Research findings of the Rubber Research Institute of India indicate that the water soluble sources of phosphatic fertilizer have favourable effect on the growth and establishment of rubber during its early immature phase. Hence it was decided to incorporate water soluble phosphorus in the fertilizer recommendation for the first two years of immaturity of rubber. The recommendation is 50% of the total phosphatic fertilizer requirement in the first and second year will be given as water soluble phosphorus (super phosphate) and the rest 50% as water insoluble source (rock phosphate). Thus in the first year, of the 10 kg requirement of P_2O_5, five kilograms will be supplied through rock phosphate and the rest five kilograms through water soluble source. In the second year, of the total requirement of 40 kg P_2O_5, 20 kg will be supplied as rock phosphate and the rest 20 kg P_2O_5 as water soluble source. There is no change in the recommendation for other years. The composition of fertilizer mixtures for immature

Nutrients	Existing recommendation (kg/ha)				New recommendation (kg/ha)			
	I	II	III	IV	I	II	III	IV
	(Years after planting)				(Years after planting)			
Nitrogen	10	40	50	40	10	40	50	40
Phosphorus (P_2O_5)	10	40	50	40	10	40	50	40
Potassium (K_2O)	4	16	20	16	5	20	25	20
Magnesium (MgO)	1.5	6	7.5	6	0	0	0	0

Instead of the 10:10:4:1.5 N:P:K: Mg mixture currently being used, a 12:12:6 N:P:K mixture is recommended and the schedule of fertilizer to be applied as per the new recommendation for the first four years after planting is given below:

Year of planting	Months after planting	Time	Dose/Plant (grams)	Dose per ha (kg)
First Year	3	Sep-Oct	190 (225)	85 (100)
Second Year	9	Apr-May	380 (450)	170 (200)
,,	15	Sep-Oct	380 (450)	170 (200)
Third Year	21	Apr-May	480 (550)	215 (250)
,,	27	Sep-Oct	480 (550)	215 (250)
Fourth Year	33	Apr-May	380 (450)	170 (200)
,,	39	Sep-Oct	380 (450)	170 (200)

Figures in bracket indicate the dose of 10:10:4:1.5 N:P:K:Mg mixture as per the existing recommendation.

Composition of 10:10:4:1.5 N: P: K: Mg mixture with water soluble source of phosphorus

Fertilizer	Quantity (kg)	N	P_2O_5	K_2O	MgO
Urea	22	10	–	–	–
Super Phosphate	32	–	10 (5)	–	–
Mussoorie Rock Phosphate	25				–
Muriate of Potash	7	–	–	4	–
Magnesite	4	–	–	–	1.5
Filler	10				
Total	100				

Figure in bracket indicate the quantity of water soluble source of phosphorus.

Composition of 12:12:6 N: P: K mixture with water soluble source of phosphorus

Fertilizer	Quantity (kg)	N	P_2O_5	K_2O
Urea	26	12	–	–
Super Phosphate (16% P_2O_5)	37	–	12 (6)	–
Rock Phosphate (22% P_2O_5)	27			
Muriate of Potash	10	–	–	6
Total	100			

Figure in bracket indicate the quantity of water soluble phosphorus.

rubber using water soluble sources of phosphorus as per the new recommendation is given below:

Recommendations on Exploitation Systems.

1. **Puncture tapping one year prior to normal opening.**

The results of experiments conducted by the Rubber Research Institute of India revealed that the rubber trees can be puncture tapped one year prior to the normal opening of the trees using 2.5% Ethephon as a stimulant. This would give an additional yield of about 275 kg/ha and would result in a net profit of Rs. 1800/–. In the back drop of this, at the workshop, it was decided to recommend the following:

a) Puncture tap trees which have attained a girth of 40-45 cms, one year prior to the normal opening of the tree following the precautions mentioned below:

i) Punctures should avoid cambium, but it should be deep enough.

ii) Punctures should be distributed uniformly along the stimulated portion (50x1.5 cm vertical bands below tapping height) and should not be concentrated on the same point.

iii) Specification of the needle to be used–diameter one mm with blunt tip.

iv) Concentration of ethephon-2.5% active ingredient (500ml 2.5% a. i. per hectare). Ten applications per year will be required.

It was also decided that this recommendation should be restricted to large estates on an observational basis

2. **Recommendation for Ethephon stimulation.**

a) The experimental results using different carriers for ethephon stimulation reveal that water can effectively serve as a carrier. The present recommendation is to use Palm oil as a carrier. The change of carrier, to water would bring in a saving of Rs. 8/– per application per hectare. It was decided to recommend water as a carrier for ethephon stimulation.

b) The experimental evidences bring to light that even young trees at B O_1 stage can be stimulated. A single application of ethephon, 5% ai with one month's tapping rest, maintained higher yield from **Hevea** trees. The advantages highlighted point to the high vigorous growth of trees apart from saving tapping/production cost and increased returns. On the basis of this approval was given to recommend stimulation of young trees tapped on BO_1 and BO_2 stages with 5% single ethephon application. The recommendation is to be confined to large estates only on an experimental basis.

3. To ward off the incidence of brown bast it was recommended to adopt d/3 tapping system in cases where a high incidence of brown bast if encountered.

After considering the various aspects it was decided at the workshop that it is preferable to resort to d/3 system at BO_1 and BO_2 stages if high incidence of dry trees is encountered in new high yielding clones. Botany Division will carry out extensive survey to monitor brown bast incidence in new high yielding clones. □

FERTILIZER RECOMMENDATIONS AND EXPLOITATION SYSTEMS

The available status of soils in Kanyakumari, Trichur, Palghat, Calicut, Karnataka, Goa and Maharashtra is high and therefore the incorporation of magnesium in the general fertilizer recommendation for immature rubber was stopped.

The results of experiments conducted by the Rubber Research Intitute of India revealed that the rubber trees could be puncture tapped an year prior to normal opening of the trees using 2.5% Ethephon as a stimulant.

The following recommendations have been approved at the workshop on the general recommendations of tho Board at the Rubber Research Institute of India.

A. General Fertilizer Recommendations

1. In Kanyakumari, Trichur, Palghat, Calicut, Karnataka, Goa and Maharashtra Regions the available magnesium status of soils is high and hence the incorporation of magnesium in the general fertilizer recommendation for immature rubber was decided to be stopped forthwith. Thus the new recommendation would be as follows:

2. Research findings of the Rubber Research Institute of India indicate that the water soluble sources of phosphatic fertilizer have favourable effect on the growth and establishment of rubber during its early immature phase. Hence it was decided to incorporate water soluble phosphorus in the fertilizer recommendation for the first two years of immaturity of rubber. The recommendation is 50% of the total phosphatic fertilizer requirement in the first and second year will be given as water soluble phosphorus (super phosphate) and the rest 50% as water insoluble source (rock phosphate). Thus in the first year, of the 10 kg requirement of P_2O_5, five kilograms will be supplied through rock phosphate and the rest five kilograms through water soluble source. In the second year, of the total requirement of 40 kg P_2O_5, 20 kg will be supplied as rock phosphate and the rest 20 kg P_2O_5 as water soluble source. There is no change in the recommendation for other years. The composition of fertilizer mixtures for immature

Nutrients	Existing recommendation (kg/ha)				New recommendation (kg/ha)			
	I	II	III	IV	I	II	III	IV
	(Years after planting)				(Years after planting)			
Nitrogen	10	40	50	40	10	40	50	40
Phosphorus (P_2O_5)	10	40	50	40	10	40	50	40
Potassium (K_2O)	4	16	20	16	5	20	25	20
Magnesium (MgO)	1.5	6	7.5	6	0	0	0	0

Instead of the 10:10:4:1.5 N:P:K: Mg mixture currently being used, a 12:12:6 N:P:K mixture is recommended and the schedule of fertilizer to be applied as per the new recommendation for the first four years after planting is given below:

Year of planting	Months after planting	Time	Dose/Plant (grams)	Dose per ha (kg)
First Year	3	Sep-Oct	190 (225)	85 (100)
Second Year	9	Apr-May	380 (450)	170 (200)
"	15	Sep-Oct	380 (450)	170 (200)
Third Year	21	Apr-May	480 (550)	215 (250)
"	27	Sep-Oct	480 (550)	215 (250)
Fourth Year	33	Apr-May	380 (450)	170 (200)
"	39	Sep-Oct	380 (450)	170 (200)

Figures in bracket indicate the dose of 10:10:4:1.5 N:P:K:Mg mixture as per the existing recommen-

Composition of 10:10:4:1.5 N: P: K: Mg mixture with water soluble source of phosphorus

Fertilizer	Quantity (kg)	N	P_2O_5	K_2O	MgO
Urea	22	10	–	–	–
Super Phosphate	32	–	10 (5)	–	–
Mussoorie Rock Phosphate	25				–
Muriate of Potash	7	–	–	4	–
Magnesite	4	–	–	–	1.5
Filler	10				
Total	100				

Figure in bracket indicate the quantity of water soluble source of phosphorus.

Composition of 12:12:6 N: P: K mixture with water soluble source of phosphorus

Fertilizer	Quantity (kg)	N	P_2O_5	K_2O
Urea	26	12	–	–
Super Phosphate (16% P_2O_5)	37	–	12 (6)	–
Rock Phosphate (22% P_2O_5)	27			
Muriate of Potash	10	–	–	6
Total	100			

Figure in bracket indicate the quantity of water soluble phosphorus.

rubber using water soluble sources of phosphorus as per the new recommendation is given below:

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CO-OPERATIVE MARKETING IN RUBBER

By George Jacob, Dy. Secretary, Rubber Board.

Marketing of agricultural produce through co-operatives has been recognised from earlier times as an effective method to protect and safeguard the interests of farmers, significantly small farmers. However, this concept took many years to get a firm footing in the Indian soil due to the ignorance of the agriculturists of its advantages, resistance from middlemen and public apathy to such a novel ideal. In states like Maharashtra, however, co-operative marketing of agricultural commodities has made considerable headway, Unfortunately in Kerala, eventhough co-operative movement as a whole has made noteworthy progress, the achievement in the field of agricultural marketing has been lagging very much behind the development in the area of co-operative banking. Since the intitiative for setting up rubber marketing co-operatives did not come from the growers themselves the Rubber Board came to the scene and started encouraging the formation of rubber marketing co-operatives. This heralded the beginning of co-operative marketing in rubber.

Origin and Growth

The organisation of rubber small growers into co-operatives had engaged the attention of the Rubber Board since the fifties. The Development committee of the Government of India appointed for rubber plantation industry had recommended the formation of co-operatives on an experimental basis. In 1954, the Rubber Board appointed a committee to examine the scope of establishing co-operative marketing Societies. The Committee in its report stated that a few educated holders were critical of the scope of co-operatives. The resistance on the part of dealers was also cited as another reason in this respect. Even some of the small growers were doubtful about the success of co-operative movement. The Rubber Board therefore, waited to see whether the initiative for setting up co-operatives would come from the growers themselves. Unfortunately this was not forthcoming. In the meanwhile, the Plantation Enquiry Commission (1956) examined these points in detail and came to the conclusion that co-operative marketing societies should be formed with co-operative supply and banking societies. The functions of such marketing societies were also envisaged by the Commission. In 1958, Government of India accepted the recommendations of the Commission. Subsequently, in order to promote the growth of Rubber marketing co-operatives, the Rubber Board obtained the services of a Deputy Registrar from the Department of Co-operation, Kerala Government in 1960. Due to the concerted efforts of this officer, a few societies were set up. The first few societies established were the Trivandrum District Rubber Planters Co-operative Society, Kanjirappally Co-operative Rubber Marketing Society, Palai Marketing Co-operative Society, Ranni Marketing Co-operative Society and Kozhikode District Co-operative Rubber Marketing Society. The decision of the Rubber Board to channelise various aid schemes to rubber growers through co-operatives gave a fillip to the movement as a whole. Special mention may be made in this regard of the Quota Card Scheme operated during the mid seventies when rubber prices fell to an unprecedented low level. Under the scheme, STC purchased rubber at controlled rates through co-operatives. So also, the decision of the Rubber Board to route schemes on share capital contribution, working capital loan, financial assistance for the production of technically specified rubber, and old schemes like spraying subsidy, loan for the purchase of rollers and so on through the co-operatives gave further encouragement for the development of rubber marketing co-operatives. Gradually, more societies were set up and at present there are 37 marketing societies dealing in rubber with a total membership of around 69,000. New Co-operative marketing Societies function in almost all the important rubber growing areas. A federation of the primary societies namely the Kerala State Co-operative Rubber Marketing Federation popularly known as 'Rubbermark' was also set up to guide, co-ordinate and strengthen the activities of the primary societies, with headquarters at Cochin. This apex body has now grown into a big co-operative marketing organisation in the country with an annual trade turnover of over 20,000 metric tonnes of rubber. Besides, it has also branched out to other related fields like aerial spraying, fertilizer mixing and supply of various plantation inputs to its member co-operatives.

Relevance of Co-operative Movement in Rubber Marketing

Co-operatives are often the targets of public criticism. The common tendency observed is to evaluate the performance of a co-operative solely on the basis of its financial achievements: While admitting that commercial results are the most important factors to be considered for assessing the performance of a business organisation, it is equally important atleast to recog-

nise the useful service rendered by a co-operative to the community at large. This is something which is often lost sight of in the midst of the criticism against a co-operative for its poor performance on the commercial front. Unfortunately, the public consider processing and marketing co-operatives as establishments making recurring losses. This may not be true in all cases since there are co-operatives who have a clean record of good financial performance. But, let us ask ourselves, whether this is the case of a majority of rubber marketing co-operatives? Since co-operatives with such a good record of past performance are seldom found, there is no point in blaming the public to have such an attitude towards the marketing co-operatives, as these institutions themselves had made a bad reputation in this regard by being in the red for most of the time.

Public opinion is also divided on the prospects of rubber marketing co-operatives. The fact that marketing co-operatives have taken firm roots in the rubber small holding sector does not however, mean that all have reconciled with the bright prospects of these institutions. Many people still feel that even-though the ideals of marketing co-operatives are indeed noble, the chances of their successful operation are bleak considering the various institutional problems as well special problems encountered by them. Some of the problems faced by marketing co-operatives are inherent in the very system itself and common to all agricultural crops. They also face problems which are peculiar to rubber alone. An attempt is therefore, made to pinpoint and identify some of the basic weaknesses seen in the co-operative movement in the field of rubber marketing and to analyse the peculiar problems faced by them. A few practical suggestions are also made towards the concluding part of this paper to tone up the system of working of rubber marketing co-operatives and to put them on a sound footing and track so that it can achieve better financial results and also serve as an effective tool for the general upliftment of the rubber small holding community as a whole.

Role of Rubber Marketing Co-operatives

Before going into the problems, it is necessary to examine the specific role expected to be played by a rubber marketing co-operative. This will enable us to understand and appreciate the problems and difficulties experienced by the co-operatives in the correct perspective.

Is it necessary to have marketing co-operatives in the small holding sector, which is effectively catered by a well spread out network of rubber dealers? Has it got any specific role to play? These are questions often asked. In order to understand the vital

role to be played by a co-operative, it is necessary to glance through the marketing system in vogue for small holders rubber. Bulk of the latex produced by small holders is converted into ribbed smoked sheets. The scrap is often sold as such without any processing. The sheet rubber produced by small holders goes through a chain of agencies before it reaches the final consumer. This is often called the marketing chain which starts from the primary dealer, who buy bulk of small holders, rubber. From the primary dealer, it goes to the middle dealer, who generally operate at taluk headquarters and towns. From the middle dealer rubber moves on the big dealer located at important rubber marketing centres like Cochin and Kottayam. The big dealers arrange for the proper grading and packing of this rubber, and then sell it to the ultimate consumers. Since there are many agencies involved in this process, there will be deduction at each level which is normally termed as 'marketing margin'. More the levels of agencies, higher will be the total 'marketing margin'. Similarly, the conventional system of grading based on visual inspection and the offshoot of this system, the 'lot price' results in the denial of grade differentials to the primary producers. The cumulative effect of all these is a higher difference between the farm gate price received by the grower and the price paid by the ultimate consumer. Of course taxes and other normal trade charges are also a part of this difference. Under the present marketing system as explained above, the ideal method to ensure a better return to the grower is to minimise the number of marketing agencies so as to cut down marketing margins to the minimum. This is precisely the role expected from a primary society. A primary society can buy the crop from the growers and can arrange its sales through the apex organisation which has built up sales infrastructure in the terminal markets. This ensures maximum price realisation which enables the ploughing back of a portion of it to the growers in the form of increased prices for their crop. The operation of a co-operative also helps indirectly to maintain the price level at the highest level. This has been confirmed by the studies conducted by various agencies including the Rubber Board. In other words, a co-operative helps to prevent exploitation of small growers by unscrupulous traders to a considerable extent.

Problems Faced by Co-operatives

Let us now proceed to analyse the problems faced by the rubber marketing co-operatives, which can be grouped under two main headings namely general problems and special problems. While general problems are common to all co-operatives in the field of agricultural marketing special problems relate to those which are peculiar to rubber alone.

General Problems

Lack of the Spirit of Co-operation

A common drawback seen in the functioning of marketing co-operatives is lack of the spirit of co-operation and proper involvement in the routine functioning and operations of the society, on the part of the members Rubber is no exception to this general phenomenon. This may, perhaps be due to the fact that a membership in a co-operative is not often considered indispensible since the members have other sources through which they could effectively sell their produce, some times even at a higher price and also enjoying certain advantages and privileges from the traders, which a co-operative can not normally afford to offer. The result is that we have marketing co-operatives with a sizeable number of inactive members, which does not augur well for the healthy development of the entire movement. If the total membership of a marketing co-operative is analysed, it will reveal that it consists of three categories of individual members namely members with no participation at all, members with little involvement for name sake and members who are actively associated with the functioning of the co-operative. Unfortunately, the main weakness seen in the marketing co-operatives in the country is the predominance of the first two categories of members and not the last category. Such a development will defeat the very purpose for which the co-operative is set up.

Over Politicalisation

The primary objective of a co-operative is to promote, protect and safeguard the interests of its members. Since this is a voluntary organisation to achieve certain definite goals, it goes without saying that it has to be managed by the members themselves strictly according to democratic norms and principles. As such, the Board of Directors in which the management of the society is vested, are to be elected from among the members. It is sometimes found that dedicated people with proven record of service to the society are not elected to this body mainly because elections are fought on political basis eventhough outwardly it does not appear to be so. We have got to admit the fact that there is over politicalisation of the co-operative scene. Co-operatives sometimes become the forum for political tussle, rivalry and trial of strength. This brings in its wake, infighting in the Board of Directors and as a result the Board members get little time to do something tangible for the benefit of its members. Besides, it also paves the way for mismanagement, undue favouritism, court cases and so on, which put the progress of the society in the reverse gear. The point to be stressed in this context is that in the hectic race for political supremacy what is sacrificed is the interests of the members.

Comparative Less Accountability

This is a criticism often levelled against all public institutions including the co–operatives. It is claimed that accountability is not so rigid in the case of a co-operative as in the case of a private organisation. This does not however mean that there are no legal provisions under the statutes to make the persons concerned responsible for any lapse. The fact is that there are clear provisions but its application is riddled with many problems. To make matters worse, there may be an overplay of political influence, even in the routine functioning of the society. When the Board of Directors have political leniency, its supporters may get undue favours which ultimately may lead to corruption, nepotism and such other malpractices. Eventhough it is provided that the misdeeds of a Management Board can be questioned in the general body meetings, it often will not produce the expected results due to many practical reasons. Ths Board of Directors are supposed to be fully accountable for all their acts of emission and comission. But the fact is that they often escape without being penalised for their lapses.

Lack of Professionalism

The societies are often managed by officers and staff who are not suitably qualified in the particular branch It is, however to be admitted that many of them have put in many years of service and thus built up rich experience, which no doubt counts a lot. But the fact is that there is a clear lack of professional orientation and expertise. This often creates problems for running the co-operative on sound business principles and norms.

Role of the Government

There are divergent views on the role of the Government in the development of co-operatives. Some consider the supervision and control of the Government on co–operatives as an essential pre–requisite to promote their growth in the desired direction, while others feel that over involvement of any other outside agency, whether it is the Government or not may kill the spirit of co–operation. since this is a debatable point, this aspect is not analysed further. It is however, to be ensured that Government involvement may be reduced to the minimum possible so that co–operatives can prosper on its own.

Special Problems in Rubber

Rubber has certain special features which make its marketing distinctly different from similar other agricultural and cash crops. This is a crop which is subjected to wide fluctuations in the price level. This is brought about to some extent by the seasonal variations in production. Import of rubber to supplement the indigenous availability is also another factor in this regard. Untimely imports, can cause considerable dislocation in the price level. To make matters more complex in nature, there is the visual grading system by which the important grades of sheet and crepe are graded and marketed. The marketing of scrap is still more complicated and complex considering the lack of its homogenity. When compared to many other crops, there is also an organised marketing net work for rubber. Almost all the rubber growing areas are well served by a chain of rubber dealers. The competition among the dealers ensure minimum trade margins and maximum farmgate prices to the primary producers. Due to fluctuations in the price level, speculative trading is also a common feature in rubber.

Let us now examine these specific problems one by one.

Fluctuation in Prices

Price fluctuation is a common feature in rubber. This is brought about by the variations in the twin market forces of demand and supply. There are variations in total demand, sector–wise and region–wise demand. Similarly, supply is influenced to a great extent by seasonal variations in production, withholding of stocks by growers and dealers, imports and so on. As far as the co–operatives are concerned such a situation can cause many practical problems. It is common knowledge that under an increasing trend in price, a co-operative or for that matter any trading agency stands to gain while the reverse happens under a declining trend in prices. Similarly, seasonal variations in the demand of certain grades can also cause difficulties for the co-operatives. To cite an example- a spiralling premium for RMA 4 grade may tempt a co-operative to go all out to procure the maximum quantity of this grade by offering even a higher price. An unexpected decline in the premium of this grade within a short period can bring in its wake, financial losses to the society.

Visual Grading

Visual grading system is yet another contributing factor which can pave the way for financial losses to the co-operatives in two ways. In the first place, since grading is subjective and can vary from person to person, the grade finally accepted by the buyer will prevail irrespective of the grading done by the purchaser. It is, therefore, possible that the societies may sometimes have to reconsile to the downgrading of the buyer even if the rubber was bought as higher grades. Secondly, visual grading system gives room for malpractices in the routine purchase operations of the co–operatives.

Competition from Dealers

Competition from middlemen is another important factor weakening the co-operative movement. Competition from licensed as well as unlicensed dealers is indeed a major constraint for the growth of co-operatives. While there is stiff competition from licensed dealers for the purchase

of sheet rubber unlicensed dealers who visit the small holdings periodically and collect scrap rubber and sometimes off sheets also pose considerable difficulties to the co-operatives. The competition from unlicensed dealers is all the more felt in the procurement of scrap rubber. The competition between dealers ensure minimum marketing margin and the average deduction made by primary dealers from the market price is in the range of 10 to 20 paise per Kg. on an average. In the absence of any regular customers who will buy the entire quantity at a higher price, the co-operatives can not offer a higher price than the dealers.In fact, the co-operatives are placed in a disadvantage in offering a higher price because, when compared to proprietory primary dealers, they have much higher administrative overheads. So also, the dealer enjoy locational advantage as they operate at villages unlike the co-operatives which are mostly located in towns. If at all there is a marginal advantage in the price offered by the co-operative, it will get neutralised by the expenses for taking the rubber to the society. In order to offset this disadvantage, most of the societies are opening purchase depots in villages which is indeed an encouraging trend.

When compared to a co-operative, the dealer offers the package of incentives. The system of giving advances to growers is a common practice. Eventhough this system has its ill effects, the fact remains that this is a timely help as far as the petty holders who are depending solely on the income from rubber are concerned. During off seasons like the monsoon and annual tapping rest this affords considerable relief to such growers. Similarly, the dealers also provide the growers with the facility to settle the value of the rubber supplied from time to time at any point of time as preferred by the grower. This is a system commonly termed as 'stocking'. This is often practised by well to do growers. The dealer is also benefitted considerably under this system since he could profitably utilise the value of this rubber in business without any interest liability. As far as the growers are concerned, it is as good and secure as money deposited in a bank. There is also a specific reason why growers show reluctance to sell the entire crop to a co-operative. This is the common fear among growers that their entire production will be disclosed. As against this, the dealer may even be prepared to make adjustments in bills to conceal a protien of the production. Simi-larly, a co-operative can not also be a party to any malpractices in the trade. Most of these incentives can not normally be offered by a co-operative society.

After having examined the general as well as special problems faced by the rubber marketing co-operatives in brief, let us now consider certain practical suggestions to improve the working of the co-operatives. As already explained, the general problems faced by the co-operatives are common to all co-operatives irrespective of its nature of operation. Since these problems adversely affect the entire movement, an individual approach may not be appropriate and practical. Instead, it calls for a national approach through which a systematic effort has to be made to reorient and re-structure the entire movement. This being the position, certain suggestions which are directly related to the special problems are only put forward.

Membership

Membership in a rubber marketing society may be regulated and only those who tender atleast 25% of their production at the society need be admitted as members. So also only those who sell atleast 50% of their production at the society may only be made eligible to contest as a member of the Board of Directors. However, an exemption may have to be given to growers who have only immature areas. In such an eventuality membership may be granted only if they buy at least Rs. 500 worth of plantation inputs from the society in an year.

Professional Orientation

A professional orientation may be introduced in the functioning of the co-operatives. This may be achieved by inducting suitably qualified persons into the management set up to handle various jobs which call for special expertise and abilities, So also, the officers and staff who are already in the service may be given suitable orientation training and also encouraged to get themselves suitably qualified for their work.

Professional Representation in the Board

A qualified and professional person may be inducted into the Board of Directors of each Society to impart professional orientation in the entire working of the Board. They should not be politicians but persons who have rich experience and expertise in the required field.

Strengthening the Apex Body

All the primary societies should strive hard to remain within the co-operative fold by overcoming periodic temptations to go out of this discipline. It is advisable to leave all the problems of sales of rubber to the Federation which has developed the required expertise, experience and infrastructure for the same. Problems, if any between the apex body and the primary should be resolved within the broad framework of the operational arrangement between them. Individual attempts by primaries to arrange sales may appear lucrative initially but will ultimately result in weakening the bargaining strength of the entire co-operative sector. This will be exploited by the customers by adopting the divide and rule strategy. Once the Federation is in a position to command a major share of the market, it can dictate terms with the customers. This can result in the maximum

realisation of prices for the various grades in the terminal markets, which in turn will enable the primaries to offer a better price and thus counter the competition from private traders effectively. Once the Federation is powerful and enjoys a commanding position in the market, there is no need for it to canvass customers, instead customers will come after the Federation.

We have seen the problems and prospects of co-operative movement in the field marketing of rubber. A few practical suggestions have also been considered to improve the working of these co-operatives. Given the right orientation and leadership, there is no reason why a marketing co-operative should not succeed amidst all the possible constraints. It has been proved beyond doubt that the development of co-operatives is indispensible for the welfare and well being of rubber small growers. It is, therefore, our duty to identify the various problems and constraints which retard the growth of these co-operatives and weakening the entire movement and initiate timely action to put the co-operatives in the right track for sustained growth and progress. □

World Rubber Production

World rubber production for the third quarter of 1985 is estimated at 1.085 million tonnes compared to 1.065 million tonnes during the same period of 1984, an increase of 20 000 tonnes or 1.9 per cent. Malaysia and Thailand showed increases of output and Indonesia a decrease (*Table 2*)

Total world production for the first nine months of 1985 is estimated at 3.068 million tonnes, compared to 3.083 million tonnes for the same period in 1984, hence 15 000 tonnes or 0.5% lower. Among the major producing countries, only Thailand showed a production increase (of 42 000 tonnes) for the first nine months of the year, compared to the same period of 1984. Malaysian and Indonesian production showed decreases of 47 000 and 24 000 tonnes respectively.

Table 1. Shipments of SMR Grades from Peninsular Malaysia, Third Quarter 1985 (tonnes)

Month	(a) CV & L	SMR 5	SMR 10	SMR 20	(b) Others	Total
July	11 097	2 464	14 646	32 540	1 679	62 426
August	11 811	3 666	14 931	36 465	2 126	69 999
September	16 012	2 670	14 298	35 909	3 282	72 171
Total	38 920	8 800	43 875	105 914	7 087	204 596

(a) Total of SMR CV & L

(b) Total of SMR 50 & others

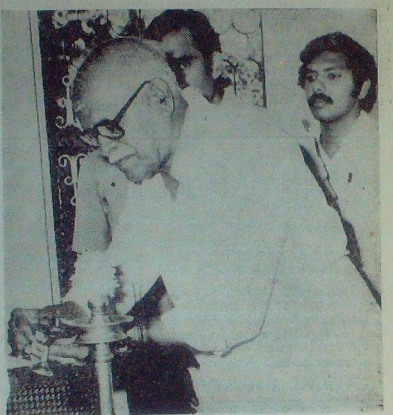
Source: Monthly Rubber Statistics of Malaysia, September 1985, Department of Statistics Malaysia.

Table 2. Estimated World Natural Rubber Production. Third Quarter 1984 and 1985 ('000 tonnes)

Countries	III/84	III/85	Difference	% Difference
Malaysia	367	380	+ 13	+ 3.5
Indonesia	306	297	- 9	- 2.9
Thailand	160	168	+ 8	+ 5.0
India	40	40	0	0.0
Sri Lanka	33	33	0	0.0
Rest of World	159	167	+ 8	+ 5.0
Total	1065	1085	+ 20	+ 1.9

Source: Monthly Rubber Statistics of Malaysia, September 1985, Department of Statistics, Malaysia; IRSG Rubber Statistical Bulletin, Vol. 40, No. 1; LMC Commodity Bulletin – Rubber, October 1985; and MRRDB estimates.

NEWS IN PICTURES



Shri N Krishna Pillay former secretary of the Rubber Board inaugurated the office of the Jr. Field Officer, Rubber Board at the Kattakada marketing junction.

Shri Mathew Kurian, Govt. Farm Superintendent inaugurating the rubber seminar at Chapparapadavu.

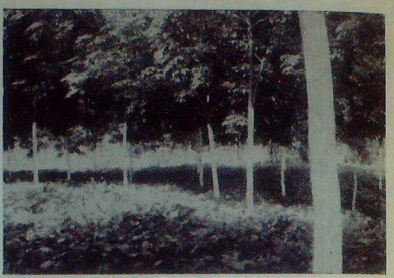
The participants of the rubber seminar at Thiruvampady.

Shri P C Cyriac I A S Chairman, Rubber Board distributing prizes to the successful growers who won the crop competitions held in connection with the annual day celebrations of Panackachira and Koruthodu units of the Malanadu Development Society.

Rubber in Assam

Among the states in non-traditional regions, Assam is considered eminently suitable for extensive development of rubber plantations. In about 10 years period, rubber has been planted in more than 800 hectares. In certain areas tapping is also in progress. Here are a few photographs:

1) 1982 planting at Baithalanse
2) Latex collection in an estate
3) The Rubber Board officials examining the tapping of rubber trees in an estate.



Shri P. C. Cyriac, Chairman Rubber Board visited the rubber research laboratory of the Dunlop at Cochin.

The Board's Pavilion at Kampur in Nowgong district of Assam. A large number of people visited the exhibition there.

THE NR STRUGGLE

The future of the International Natural Rubber Agreement is uncertain, NR prices are deteriorating, and Eastern Bloc countries are gaining dominance in synthetic rubber production.

The International Rubber Study Group's secretary-general John Carr reported these and other assessments of the rubber-producing industry at the organisation's 29th meeting here on Nov. 25.

The encouraging news for NR producers is that demand may increase by about 1m tonnes by 1990 and 2m tonnes by 1995, based on even modest assumptions about worldwide economic growth rates, Carr said. And, the share of NR consumption should remain for another 10 years at its relatively high level of 32 percent of total rubber used.

The challenge facing NR producing nations is the continuing decline of NR prices and the lack of effectiveness of the buffer stock provisions of the NR agreement, Carr said. The average NR price in 1985 is 15 percent lower than in 1984, the IRSG estimates. Already the reference price has been reduced by 3 percent and the buffer stock manager's purchases have exceeded 100,000 tonnes, boosting the buffer stock to about 375,000 tonnes.

While world commodity prices also have fallen, this fact is no consolation to rubber producing countries, Carr said, particularly those that also have to struggle with economic, social and political problems caused by price depression in other products, such as palm oil.

The lack of confidence some nations feel toward the INRA buffer stock provisions is not surprising, Carr said. Because of differences of opinion, conflicts of economic interest among producers and scepticism among consumers, "it is hard to be convinced of a positive outcome" when negotiations take place next spring to form and ratify a second agreement, he stated. "Statesmanship of a high order will be needed to steer a course through the conflicts -- to reach a decision which will be in the best interests of the industry and its customers," he added. The first agreement is valid until October 1987.

The failure of the Sixth International Tin Agreement, an intergovernmental price support mechanism similar to INRA, probably will heighten criticism of the rubber pact, Carr said. He pointed out several ways in which the two commodities are different, but cautioned that "there are lessons to be learned from the tin debacle," most important of which is that the damage caused by fixing an artificially high price range that doesn't take into consideration medium and longterm supply and demand projections will outweigh the short-term benefits of setting such prices.

Assuming that NR prices are unlikely to return to the high levels of past years, the rational response of producers is to seek ways of reducing the costs of production, improving marketing and enhancing the value of their product. Malaysia's Primary Industries Minister, Datuk Paul Leong Khee Seong, has "amply demonstrated" this view in speeches to the Malaysian Rubber Research and Development Board and the Rubber Research Institute of Malaysia and suggested the means that rubber producers can employ to prosper, Carr said.

For synthetic rubber producers, 1985 will end up as a disappointing year, as growth of demand has slowed and is unlikely to

exceed 1.5 to 2 percent worldwide, according to the IRSG.

Meanwhile, the only countries that have increased their production capacity are the Eastern Bloc or Centrally Planned Economy Countries. These nations have increased their annual capacity for general-purpose, styrene-butadiene rubbers — which account for 70 percent of world SR demand—by 150,000 to 200,000 tonnes, the IRSG estimates.

Important sources of change in the industry in the coming years are likely to be in the areas of improved technology, new product development, and particularly in developing speciality products.

Considerable amounts of money will be necessary to finance expansion of facilities to make solution SBR, which is in growing demand from tyre manufacturers because of its ability to reduce rolling resistance without loss of grip and wearing qualities, Carr said. As a result of this, SBR emulsion polymerisation plants, which now account for the bulk of SBR capacity, will be eliminated.

SUCK AND BLOW PUMPING

Dowty Seals Ltd says its heavy-duty rubber diaphragms are the prime working components in a new pump developed by Warwick Pump & Engineering Co Ltd.

The pump is used in Warwick's range of mobile pressure washing units. The principle of the unit is represented by a hydraulically-powered diaphragm working rapidly in a "suck-and-blow" mode to produce a high-pressure water jet.

The method employs three hydraulic cylinders with spring-loaded pistons operated by a rotating swash plate. As each cylinder operates in succession, oil pressure first deforms and then relaxes a diaphragm to draw water through an arrangement of inlet and outlet reed valves.

The diaphragms are made in a compound that resists hot water, oil or detergent at a temperature up to 90°C, Dowty says, and operates up to 1,500 cycles per minute.

KEEPING AN EYE ON TYRES

Krupp Industrietechnik GmbH has developed a micro-processor-controlled system to monitor car tyre manufacture. It can record and display the temperatures generated by all the heating media involved in the vulcanisation process and monitor the values.

In the event of, for example, temperature deviations, an alarm is triggered and the cause displayed. In this way, the company states, faults can be quickly detected and remedied.

Krupp says the unit can report faults to a central computer and control the vulcanisation period after standstill, for example, afte a power failure.

The system can be retrofitted to existing tyre curing presses, the firm added.

EASY RIDER ON RUBBER

Sutcliffe Rubber Co. Ltd together with UK cycle maker T. I. Raleigh Ltd has developed four rubber mouldings and a rubber-to-metal bonding for the Raleigh Vektar Electronic bicycle.

The mouldings hold in place the on-board information system, which can display speed, time and distance travelled, together with an AM radio and sound synthesiser, says the firm.

Sutcliffe, based in Osset, England says the mounting system protects the console during use and in the event of minor accidents.

RIDING THE WAVES

Rubber-to-metal shock absorbers are at work in the North Sea protecting a platform-to-seabed elevator used to transport divers. Andre Ltd—a division of BTR Silvertown, Burton-on-Trent, England—has supplied the absorbers which protect the system particularly against the impact of waves on the platform which is near Shetland, off the coast of Scotland.

Some 72 shock absorber assemblies are incorporated to spread the load through the guide rails. Andre has also supplied self-aligning slipper pads to reduce the loading on the rails.

POLAND TO HELP VIETNAM IMPROVE RUBBER GROWTH

Vietnam – Poland recently signed an agreement with Vietnam to aid the Asian nation's rubber industry during 1986-1990 according to a report by the Vietnam News Agency.

Under the plan, Poland will lend Vietnam an undisclosed amount of money to buy machines, equipment, spare parts, chemicals and other materials to grow rubber on 24,700 acres of land in Vietnam's southern provinces in the next five years, the report said.

The deal reflects the move by several Comecon countries to make Vietnam a more abundant source of rubber. Comecon, or Council for Mutual Economic Aid, is an association of communist nations designed to coordinate economic development.

Last year Vietnam signed agreements with the Soviet Union for its help in planting 271,700 acres of rubber on plantations during 1986-1990, as part of a program to plant 741,000 acres of new rubber in Vietnam between 1986 and 2000.

Currently, Vietnam's rubber plantations cover an estimated 370,500 acres or more, with a production level of 1.5 to 2 metric tons of rubber per 2.47 acres each year.

GOALS CHANGING FOR GUAYULE RUBBER RESEARCH

Since the Joint Commission on Guayule began issuing research grants in the late 1970s, its philosophy has been the same as Stated in its 1982 report to Congress. "A Commercial natural rubber industry must be based soley on economic viability," report began.

But now the economic factor has given way to an emergency/military concept of guayule breeding, even though the U.S. is not at war.

In the past, overseas shooting engagements have produced a knee-jerk reaction toward guayule seed stocking in both Congress and the military. The Emergency rubber Project during World War is the prime example. There also was a large guayule seed program in California and Texas during the Korean War, which produced 15,801 pounds. This seed, unfortunately, was lost, except for about 2,000 pounds still in the hands of a ' guayulero"– guayule rubber proponent-in South Pasadena, Calif.

Recently, however, the involvement of the Naval Air Systems Command in guayule has signified the government's entrance into assured guayule rubber production. NAVAIR's contract with the Gila River Indian Community is now in its third year of activity.

Despite the renewed government interest in guayule, there seems to persist-in the Agriculture Department and elsewhere-the feeling that much more research is necessary before guayule can compete with Hevea rubber.

It has become clear to some who have attended the Guayule Rubber Society conferences that plant breeding has not been given the priority it deserves. This research involves time, patience and luck. As new germplasm is developed, it receives little attention and the information is reluctantly disseminated.

At the GRS meetings, speakers have not reviewed the progress in various important fields, but usually present what they have done over the past year. Hundreds of papers have been written, and most of them delivered, but there is no hint as to how this information will be put into a form that can be used by the farmer who must ultimately produce the shrub.

The pullout of all major rubber companies except Firestone from guayule research indicates that Goodyear and B.F. Goodrich-which formerly had guayule programs-viewed the future as bleak. Uniroyal and Gen Corp limited their contact to one or two guayule conferences.

Duplication of research projects has become so obvious that a few guayuleros have quipped, "They're trying to reinvent the wheel."

Ed Flynn, who issued his "Guayule Rubber Newsletter" from San Marino, Calif., has bowed out. Recently, he reported that Dr. James Bonner, a distinguished guayule researcher at the California Institute of Technology, told him that guayule is dead as a practical product.

Work on extraction processing has been put off because not enough plants were being grown to feed an extraction mill. The aforementioned 1982 commission report states, "To support (a) small, 1,500 ton capacity processing facility would require a 2,000- acre planting each year for four years based on the present rubber yield of guayule varieties."

At least 2,000 acres of guayule have been produced since 1975, but the plots were scattered from California to Texas, and the logistics of an efficient guayule mill require proximity to mature shrub.

There is, of course, the pilot plant that Firestone has designed for the Gila River project. Firestone has given Dravo Corp. the go-ahead to construct that plant. But the proprietary agreements surrounding the project have kept it secret and this clouds and complicates the picture.

This is how matters stand: the Gila River project at Sacaton, Ariz., is aiming at military usage. The American farmer, who ultimately would be the producer, must wait. At this point, it also can be said that the American farmer rarely has been consulted and has shown little interest in guayule. Doubtless he is waiting for a high-yielding seed strain and an extraction mill, both of which are years away. □

RUBBER CULTIVATION IN ORISSA THE PEOPLE AND THE PRESS WELCOME THE MOVE

It is now time to set in motion massive endeavours to extend rubber cultivation in Orissa. All conceivable facilities are being provided to encourage new entreprenuers in taking up rubber cultivation in the State where agroclimatic conditions are suitable for growing this crop. The surveys so far carried out have identified sizable inland regions in Mayurbhanj, Balasore, Cuttack and Puri Districts having scope for rubber plantation. Dhenkanal District also has suitable agro-climatic conditions for successful growth and yield. Ganjam and Koraput are no different in the matter.

Being a non-traditional area, much propaganda is made to create a new awareness in favour of rubber cultivation in Orissa. The response is quite encouraging as more and more entrepreneurs come forward to start planting the crop. Apart from the enthusiasm and encouragement that has already emanated, the newspapers and other journals welcome the movement with editorials and features highlighting the urgency of such a step. The expectation is that the economy of Orissa would receive a boost by undertaking large scale rubber cultivation.

Proximity to calcutta

The State lies very close to Calcutta, the second largest rubber consuming centre in the country. The proximity to Calcutta city could make marketing the produce easy in the sense that the producer would find easy outlets. Particular emphasis is laid on the ecological aspect as well. From the ecological point of view also the State would benefit much following large scale rubber cultivation. The absence of torrential rains would reduce incidences of pests and disease when compared to the traditional regions. Rubber trees surviving out of those planted in Orissa during the sixtees have good growth and vigour. The camparatively low incidence on labour wages would be a matter of consolation even though the cost on fencing and irrigation in summer months would neutralise this advantage. However, freedom from pests and diseases is a contributing factor by any standards to curtail cost of production. The Economic Times, the financial daily of the Times of India Group, has complimented the Rubber Board

in taking steps to extend rubber cultivation to the State, in its editorial in the issue dated 17 July 1986, and stated that introduction of rubber to the inland regions of Orissa would give a fillip to its economy and help substantially to bale out the State from its backwardness. The editorial concludes with a clarion call for creative action at least from now onwards for widespread cultivation of rubber in order to narrowly reduce the gap in supply and demand of natural rubber by 2000 AD. Amrita Bazar Patrika Weekly Review dated 14 July 1986 has also welcomed the move initiated by the Rubber Board with a feature article in its columns.

Future Requirements

Rubber production in India is now of the order of 200,000 tonnes against the projected demand of 235,000 tonnes as per figures available for 1985/86. By 2000 AD the demand would rise to about 500,000 tonnes. The marjor portion of the rubber to be produced has to come from the non-traditional areas. With the massive preparedness and the willingness to rise up to the occasion, the Rubber Board intends to introduce rubber planting to all available non-traditional regions where the edaphic factors can support the crop.

A team of senior officers led by the Chairman Sri PC Cyriac has visited Orissa and other non-traditional areas time and again to make on the spot study of the situation and take quick decisions on issues that require immediate solution. The stage is now set for quicker action. The entrepreneurs who have conceived the idea should translate it into practice without delay. The more enthusiastic they are, the easier becomes the objective. The Rubber Board is with them and stands for them.

NEW APPROACHES IN DISEASE AND PEST MANAGEMENT IN NATURAL RUBBER*

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Rubber Research Institute of India, Kottayam-686 009.

Introduction

The para rubber tree, *Hevea brasiliensis* was introduced into India 106 years ago. It is a sturdy perennial tree growing to a height of about 25–30 m. Latex is present in almost all parts of the plant. Hundred years is a short period of history for a plant species. Hence, it has only a few major diseases and pests. The main rubber growing belt of India, the western ghat region, receives rainfall of 1500–4000mm annually. During South West monsoon period from June to August about 70 per cent of the total rainfall reaches this region and push the relative humidity to almost saturation level. This weather condition is quite different from that of the native land of Rubber, Brazil in South America, whereas almost identical weather condition exist in Kanyakumari District of Tamilnadu. The disease and pest patterns in these two regions are distinct.

In western ghat region diseases caused by the fungus *Phytophthora* spp. and Pink disease caused by *Corticium salmonicolor* are very severe resulting in considerable damage to rubber plants, whereas these diseases are not serious in Kanyakumari District. Dry season disease, Powdery mildew caused by *Oidium heveae* is severe and widespread in Kanyakumari District and the high ranges. This disease is not severe, but localised in western ghat. With regard to pests, the bark feeding caterpillar *Aetherastis circulata* is serious in Kanyakumari District and in low rainfall areas like Punalur but not so in high rainfall areas. So far there is no record of *H. brasiliensis* being attacked by any viral, mycoplasmal or bacterial pathogens in India or in any rubber growing countries in S. E. Asia. Recently, an unpublished report has appeared on the occurrence of a viral and bacterial diseases in Brazil.

Disease and Pest Control Spectrum

Disease and pest control is now dealt with in totality and not as an entity. The enormous control exerted by nature is also taken into account while controlling diseases and pests and the impact on environment due to such control measures is also given proper importance. Hence, integrated control approach leading to disease and pest management is the modern trend. In disease and pest management, total eradication of inimical organisms is not aimed, but only the suppression of the intensity of attack below the economic levels of damage. By such an action a small population of the natural enemies of the pathogens and pests could survive and continue to suppress the population of noxious organisms. In total eradication of diseases, and pests the natural enemies loose the ground to survive. When the revival of the disease or pest occur, the noxious organisms tend to grow prodigiously in the absence of natural forces of control and disease and pest resurgence occur. This type of approach is more practiced in control of pests rather than diseases.

There are many methods available for suppression of pathogens and pests like mechanical or physical, cultural, biological, legislative, preventive, curative, irradiation, chemical etc. The effective cultural and biological method for preventing diseases is breeding for resistance. In perennial trees like rubber, breeding process takes many years to produce new germplasms and screen them. Heterozygous nature of rubber makes it all the more difficult and delayed. Limited availability of resistant germ plasm and the genetic variability of the pathogens may make this approach unviable. When many races of pathogens are involved, horizontal resistance is preferred to vertical resistance. For producing horizontal resistant germ plasm a variety of resistant germ plasm is required and the breeding process is complicated and prolonged. Exploitation of natural enemies to control pests is successful to some extent but for disease control this method does not have much scope. All other methods of control except chemical control have limited application with respect to different diseases. In general, chemical control of diseases is at present the most practical and effective for all diseases and pests of rubber.

* The paper presented at the rubber seminar held at Mundakayam on 23rd April 1986.

There are three important land marks in the chemical control of diseases viz. the discovery of Bordeaux mixture in 1882, dithiocarbamate in 1934 and systemic fungicides in 1960. One hundred and four years history of chemical disease control compares well with history of rubber plantation industry in S. E. Asia and India. Copper and dithiocarbamate fungicides are wide spectrum and protectant, whereas systemics are narrow spectrum or specific and therapeutic. The problem of resistance is not very much encountered with copper and dithiocarbamate, but it is a major problem with specifically acting fungicides and antibiotics. Antibiotics with uses in human medicine are likely to have severe restrictions placed upon their use in plant diseases control. Use of clinical antibiotics in Agriculture should be discouraged, principally because of potential hazards of resistance transfer to human pathogens. Pesticides are diverse and have a history of more than hundred years. Pesticide development gave the lead in various aspects of fungicide development. The variety of pesticides give much ease for pest management.

Diseases of Rubber

Diseases caused by *Phytophthora* spp. : Abnormal leaf fall disease caused by mainly P. *palmivora* and *P. meadii* is well controlled by the prophylactic application of copper fungicides. The development of oil based copper fungicide and low volume application by micron sprayers and helicopters are boons in the control of this widespread and debilitating disease. Recent development of a micron sprayer cum duster with gross weight of only 63 kg., considerably relieve the burden of workers carrying them. This machine has better efficiency than any imported machine. Ultra low volume aerial applicationof copper fungicide will be tested when suitable equipments are available. Crown budding of tolerant clones like RRII 33, FX 516 and F 4542 is a biological method of prevention of this disease. RRIM 600 is found to be a good trunk clone for these three tolerant clones. Water based formulations of systemic fungicides like Aliette (specific to *Phytophthora* spp.) and Ridomil were field tested against this disease and found to be ineffective. Single application of water based formulation may be inadequate to protect the trees for a long period. Hence, oil based formulations are to be tested singly or in combination with copper fungicides. When suitable oil based dithiocarbamate fungicides are available they will be tested alone or in combination with copper fungicides. Combination fungicides belonging to different groups may help in reducing the dosage of costly copper fungicides by their synergistic action.

Other diseases caused by *Phytophthora* spp. are shoot rot, patch canker and black stripe. Copper fungicides give effective protection against shoot rot and organo-mercurials like Emisan against the latter two. Since, organomercurials are hazardous to the workers dithiocarbamates like Dithane M 45 can replace them.

Pink disease is a serious stem disease of rubber and some of the high yielding clones like RRII 105 and RRIM 600 are highly susceptible. Application of 10% Bordeaux paste after removing diseased tissue was the control measure recommended. At present use of systemics like Calixin 2% and Tilt 0.1% in latex media are advocated. Thiride is also effective in controlling this disease.

Powdery mildew disease is serious only in localised areas. In young trees repeated defoliation results in death of plants due to die-back and sun scorch. Sulphur dusting was recommended for its control. Fogging calixin 3 per cent in oil is also an effective remedy.

Dry rot caused by *Ustulina deusta* is becoming serious in some localised areas like Palai and Thodupuzha. Copper fungicides are ineffective for the control of this disease. Fungicides specific to ascomycetes like Benomyl, Bavistin or thiophanate methyl will be useful for controlling this disease. The trials are in progress.

Brown root disease caused by *Phellinus noxius* occurs only very rarely. The damage caused is often fatal. At present the disease is controlled to a large extent by drenching organo mercurial fungicide like Emisan 0.015%. Application of sulphur in soil to encourage the growth of antagonistic fungi *Trichoderma* spp. has been practiced in some rubber growing countries for the control of root diseases. However, sulphur application has other problems like increased soil acidity.

Leaf spot diseases caused by *Corynespora cassicola* and *Drechslera heveae* are dry season and *Gleosporium alborubrum* wet season diseases. The former two are better controlled by partial shading and by application of copper fungicides, Dithane M 45-0.2% and Bavistin 0.02%. The latter is controlled by copper fungicides.

Pests of Rubber

Bark feeding caterpillar *Aetherastis circulata* is well controlled by dusting Sevin 5 D or Metacid 2 D with a power tree duster. Parasites and predators that could be liberated in large numbers to control this pest is yet to be identified. Root grubs of the genus *Holotrichia* feed on the roots of rubber plants in the nurseries. This pest is controlled by an integrated approach of collecting adult beetles with light trap, poisoning adult's food plants, hand collection of grubs, exposing grubs to birds, poisoning the grubs by incorporating Sevidol 4:4 G and BHC 10 D in the soil. Scale insects and mealy bugs are well controlled in nature by many parasites and predators and the entomogenous fungus *Hypocrelia reineckiana*. Termites in rubber plantations are prevented by drenching Aldrin 0.2% in soil. Slugs and snails are effectively controlled

by applying Temik 0.1% in fine wheat flour as a paste on stem. The same treatment could be adopted for control of porcupines and rabbits. For effectively controlling rats, the single dose blood anticoagulant, Brodifacoum 0.005% is promising. Teimk is also good as bait poison.

Concluding Remarks

At present effective control measures and application techniques have been developed for all diseases and pests of rubber with available fungicides and pesticides in the country. A deadly disease of rubber, South-American Leaf Blight (SALB), which ruined the natural rubber plantations in Brazil is at present prevented from entering India by plant quarantine measures. The problems faced by research workers are non-availability of adequate quantity of new systemic fungicides and oil based formulations. Already copper fungicides are known to reduce yield in potato. A freely available and effective non-copper fungicide alone can help in investigating this problem in rubber.

CHINESE DELEGATION IN INDIA

Under a Sino-Indian bilateral exchange programme in science and technology a four member Chinese delegation visited the Rubber Research Institute of India. The members of the delegation were Lu Xing Zhen, Director, Rubber Research Institute South China Research Academy of Tropical Crops, Wang Ke, Vice Director, Yunnan Research Academy of Tropical Crops, Lin Tian Ming, Dy. Divisional Chief, San Jiang State Farms Bureau, Gnang Dong Province, Qian Fa Ngen, Dy. Divisional Chief, Foreign Affairs Bureau, State Farms Bureau, Ministry of Agriculture.

This was in return to an earlier visit to China by an Indian team comprising of Director of Research, Rubber Production Commissioner and the Tissue Culture Specialist last year. The Chinese delegation visited the Regional Stations of Rubber Research Institute of India in Maharashtra and North East. They also studied the situations in our small holdings and large public sector plantations. China grows rubber in its southern provinces and Hainan Islands. The climatic conditions existing there have many things in common with that of the situations prevailing in the North East Regions in India and this aspect forms the theme of the bilateral co-operation. We have already exchanged clones. Chinese also have given us clones which are cold resistant.

Rubber Cultivation in Goa, Maharashtra and Orissa

Rubber is a unique raw material which is vital and indispensable for the production of a wide array of strategic, industrial, agricultural and household goods. The world today uses as many as 50,000 different rubber products ranging from giant tractor and truck tyres to tiny button bushes, from hard ebonite products to soft foam goods and liquid adhesives and from life saving surgical aids to humble erasers, toy balloons and rubber bands. India occupies a prominent position in rubber goods manufacturing field and produces over 35,000 individual items, most of those for fast escalating internal use. Exports of rubber goods are also on the rise.

Natural and Synthetic Rubbers

There are natural and synthetic rubbers. Natural rubber is derived from the milky juice or latex extracted from the bark of *Hevea brasiliensis*, a tropical tree having its centre of origin in the rain forests of the Amazon valley of South America.

Successfully introduced to the east towards the close of the 19th century, the rubber tree today has grown in scientifically laid out plantations extending over 7.5 million hectares in Malaysia, Indonesia, Thailand, China, India, Sri Lanka, Nigeria, Liberia, Ivory Coast, Viet Nam. Cambodia, Philippines, Brazil, Burma, Bangladesh, Mexico etc. Synthetic rubbers, introduced commercially during the Second World War are produced mainly from petrochemical feedstocks by such industrialised countries as U. S. A, U S S R, Japan, France, Federal Republic of Germany, U. K, Italy, Brazil etc. China and India are also amongst the synthetic rubber producers. Although synthetic rubber accounts for about 68 percent of the total rubber used in the world today, the natural product is again gaining importance for the reasons that it is a renewable resource non-polluting in its production and cheaper. Quality-wise also it is superior for general and heavy duty purposes. Further, it is being progressively modified through chemical means to yield different varieties which meet standards for special purposes.

Need for Stepping up Natural Rubber Production

India has all along given prominence for the use of natural rubber and at present as much as 80 percent of the total domestic use is contributed by it. As a result of the rapid industrialisation taking place in the country, rubber remains to be a commodity that is internally in short supply. From the time of independence, the area under rubber cultivation in India has increased from 65,000 hectares to 350,000 hectares, the national average yield per hectare per year from 300kg to 900 kg and the production from 15,000 tonnes to 2 lakhs tonnes.

However, over the same period the consumption of natural rubber has risen from 19,000 tonnes to 230,000 tonnes. It is estimated that its domestic demand would reach 500,000 tonnes by the year 2000 AD. The country is now spending Rs 30 crores in foreign exchange for import of natural rubber. This can increase several-fold even in the next 15 years. No doubt, the scope for stepping

The general view of a rubber plantation with budded plants.

up the production is vast and its need urgent.

Non-Traditional Areas for Rubber Cultivation

Traditionally, rubber has been grown in India in the hinterlands of the south west coast, mainly in Kerala and adjoining districts of Tamilnadu and Karnataka. Owing to extreme pressure on land, the scope for further large scale expansion of cultivation in these areas is limited. Realising this situation, intensive efforts have been made over the last two decades to identify suitable non-traditional areas for future development. These have gone to prove that large tracts of land in such States and Union Territories as Assam, Tripura, Meghalaya, Manipur, Mizoram, Nagaland, Arunachal Pradesh, West Bengal, Orissa, Andaman & Nicobar islands, Goa, Maharashtra and Andhra Pradesh do provide agroclimatic conditions for economic rubber cultivation.

Choice for Location

The rubber tree flourishes and yields best in warm, humid tropical conditions. The desired produce being the latex from the bark, it should be ensured that the tree attains quick vegetative growth, clean and thick bole and soft and succulent bark. The optimum conditions required for the best growth and yield are the following.

* An annual rainfall ranging from 2000 to 3000 mm evenly spread out over all the months of the year.
* Copious sunshine.
* Equable temperature within a range of 21° to 35°C.
* High relative humidity in the atmosphere (75% to 95%).
* Deep (minimum 100 cm), well drained soil of acidic reaction (PH 4.0 to 6.5) and fair to good fertility.
* Freedom from factors that cause severe physical damages such as strong winds, cyclones, hail storms etc.

A plantation in flat, gently slopy land.

The above conditions are usually obtained in the plains and low hill tracts (Mean Sea Level to 300 metres above) of the equatorial tropics stretching to 10° North and South latitudes.

The rubber tree is however a hardy one which can perform with fair to admirable degree of success in conditions more or less varying from the above. Hundreds of strains developed through careful breeding and selection in various rubber growing countries and cloned by the vegetative propagation of budgrafting provide choice of planting materials suited to differing environments. Agro management practices have also been evolved over the years with a view to making young plants and trees to grow and yield satisfactorily even under somewhat inhospitable conditions. All these have enabled successful development of extensive rubber plantations in not so ideal locations in North Kerala, Karnataka, Goa, North Eastern India, Thailand, Vietnam, China, Burma, Bangladesh etc.

Flat, gently slopy and undulating lands are easy to work for

Nine months old young budded plant

planting, maintenance and tapping of rubber. Steep slopes are also being made use of for planting after providing such soil conservation measures as contour terracing, contour bunding etc. But it should be borne in mind that these would involve higher costs. Lands prone to inundation or sub soil waterlogging should be generally avoided unless artificial drainage can be provided easily and at reasonable cost.

Costs And Benefits

Rubber planting and production have attained high levels of sophistication. All operations have to follow modern scientific methods and management practices progressively evolved over decades if high levels of yields and profits are to be derived. Results prove good if all seasonal operations are promptly and meticulously done. The first three years are of critical importance in raising a successful rubber plantation. Prominent lapses and failures at this stage would prove crippling in the long run. Uniformity in the growth and yield of plants should be essentially achieved for which due care and attention should be bestowed on individual plants. The immaturity period of rubber in India is about 7 years. Consistent with the above, the direct agricultural cost of land preparation, planting and maintenance up to maturity at 1985-86 rates can amount to an estimated Rs. 18,000 to 20,000 per hectare in the non-traditional areas listed above.

The cost of engineering infrastructure and management overheads will be extra. Well managed rubber plantations planted with high yielding cultivars in traditional areas in India yield an average of 1,500 kg of dry rubber per hectare per year. Economically productive period is 25 years starting from the eighth years of planting.

A good yield in non-traditional areas can be an average 1,200 kg per hectare per year. At the prevailing steady price of Rs/ 16.00 per kg. the gross income will be Rs 19,200 per hectare. The net income before tax can then be Rs. 5,000 to Rs. 7000 per hectare.

The resale value of old trees cut down after the 32 year cycle can be additional terminal income. Rubber timber, it may be noted, is easily degradable soft wood.

By an easy chemical treatment, it can however be converted into light hard wood fit for furniture, light construction work, packing cases etc. Rubber seeds are oil bearing. The oil is of the non-edible type largely used for soap making etc. The oil cake is good for cattle or pig feed production. Another minor bye product of rubber plantations is honey obtained through bee-keeping. The extra floral nectaries occuring on flushes of tender leaves put out by the trees after annual wintering in December/January are a rich source of nectar for the bees.

The economic and social benefits can be summed up as following.

1. Enables productive and economic utilisation of cultivable fallows and under utilised lands.
2. Generates rural employment opportunities. Mature rubber plantations provide regular employment at the rate of 0.7 person per hectare.
3. Provides viable alternative to shifting cultivation (jhumming)
4. Affords soil conservation.
5. Brings about environmental improvement.
6. Opens up avenues for new rubber based industrial ventures.
7. Supplies timber, oil, oilcake and honey.
8. Adds revenue to the public exchequer.

A Small Holder Crop

Large plantations of rubber can enjoy the benefits of organised scientific practices and other economies of scale. However, small holdings today predominate over large plantations in most rubber growing countries. In India too, small holdings of 1 or 2 hectare size are common and successful. Cultivators can easily learn the planting and production techniques and make themselves self employed in their holdings. Procurement of chemical inputs, crop processing and marketing can be on group or co-operative basis. The Rubber Board provides free advisory and extension services and training. The Board or other local agencies can take up production and supply of high yielding planting materials.

In Kerala, rubber is proving attractive even as a home-stead or backyard crop. It is however safe to ensure that no family is

wholly dependant on rubber. Other supplementary sources of income should be available as an adequate standby for such eventualities as unfavourable market fluctuations and need for replanting.

Rubber in Goa & Maharashtra

The region comprising of Goa and South Konkan of Maharashtra has been found to be suitable for economic cultivation of rubber. However, this region, lies between 14.5 ° and 16° North latitude and is clearly outside the areas where rubber is being traditionally planted.

The Salient Agro-Climatic Characteristics

Flanked by the Arabian Sea on the west and the Western Ghats on the east, the landscape is marked by hills and mountain ranges interspersed by rolling and undulating lands, flood plains of rivers, marshy lands and salt pans and coastal plains. Most of the lands are situated between Mean Sea Level and 350 metres above.

Laterite formations predominate as far as soils are concerned. In certain places nearer to the coast large stretches of laterite sheet formations are found exposed. At other places shallow to deep soil cover exist. The lands are by and large, subjected to extensive soil erosion. The soils are generally lateritic, coarse and well drained.

Lands are mostly *denuded*. The natural vegetation is mostly of the tropical moist decidous type.

Annual rainfall varies from about 3,000 mm in costal areas to 5,000 mm in foot hill tracts. The rains are confined to the months from June to November. The remaining period of the year is dry. The average temperature range is from 23° c to 35° c. However it occasionally comes down to 20°c and go up to 42°c. The average relative humidity is high between 80% to 95%.

Seedling nursery

Rubber has been grown in the region on small scale trial basis as long as 60 years ago. One such plantation was by the Portugese at a place near *Sanguem* in Goa. Another was by the then Maharaja of Sawantwadi at Danoli in South Konkan. The vegetative growth or tree in both cases is fair and indicative of good potential. The trees have not been subjected to any systematic tapping.

The Forest Department of Goa, Daman & Diu pioneered the recent development of rubber plantations in Goa by undertaking progressive planting from 1960. They were actively assisted in this venture by the Rubber Board. For the first few years, the plantings were purely on trial basis, Subsequently, on obtaining encouraging results, commercial scale plantings were adopted. A number of individual entreprenеurs are now successfully raising small holdings of rubber. The total extent under rubber in Goa is well over 600 hectares.

In South Konkan also, the State Forest Department was the first in developing rubber plantations in the recent times. Their efforts are yet to expand to commercial dimensions. However, attracted by the performance of rubber in the local trial plantations as well as of the plantations in Goa, the Development Corporation of Konkan Ltd, Bombay are in the process of establishing a large scale rubber plantation from 1986 in Sindhudurg District.

The average yield of rubber plantations owned by the Forest Department in Goa is reported to be about 450 kg per hectare per year. This does not reflect the true potential productivity since the yielding areas are not planted with the high yielding varieties and certain amount of failures had occurred in these earlier plantations. The best available areas among those under yield are stated to be giving 1,000kg per ha/year. Plantations that are being raised now with high yielding clones should yield even higher by 25 to 50 per cent.

Nine months old young budded plant

planting, maintenance and tapping of rubber. Steep slopes are also being made use of for planting after providing such soil conservation measures as contour terracing, contour bunding etc. But it should be borne in mind that these would involve higher costs. Lands prone to inundation or sub soil waterlogging should be generally avoided unless artificial drainage can be provided easily and at reasonable cost.

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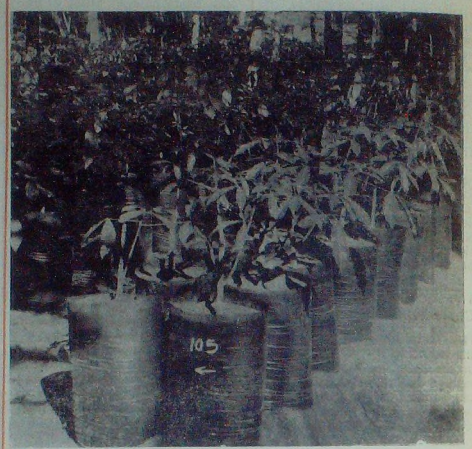
As a non-traditional area, the climatic constraints experienced for rubber in Goa and South Konkan are excessive intensity of rainfall for about four months in the year and pronounced drought period extending to about six months. In order to minimise the deleterious effects of these, close care should be given to appropriate site selection, choice of planting materials, cultural practices and plant protection. In selecting lands for rubber cultivation, adequacy of soil depth, retentivity of soil moisture at sub soil levels during dry periods and availability of water for light irrigation should be important considerations. Planting of poly bagged plants, selection of vigorously growing and disease tolerant clones, establishment of good ground covers, protection of plants from diseases and sun scorch, irrigation in early years and rain-guarded tapping are other essential care required.

As Goa and South Konkan are situated in proximity to Bombay which is the main rubber consuming centre in the country, rubber produced there should attract better prices than it fetches in traditional areas.

Rubber in Orissa

Among the states in non-traditional regions Orissa is considered to hold vast potential for successful rubber cultivation. This view has been arrived at after successive exploratory surveys and trials.

The State lies between 18° and 22° North latitude and is clearly outside the normal rubber growing regions. However, the surveys so far carried out have revealed that the inland regions of Mayurbhanj, Balasore, Cuttack and Puri districts and the district of Dhenkanal present agro-climatic conditions which are fairly suitable for successful growth and yield of rubber. Upland areas having deep, loamy, well drained soils could be selected for development of rubber plantations. Such areas are available in fairly extensive blocks in the above districts. The land



A nursery of budded stumps in poly bags

are at present lying as fallows or wastelands or as degraded or irregular forests.

The annual rain-fall in the above areas is generally on the low side for rubber. It varies from 1,400 mm to 1,800 mm. Its distribution over the different seasons of the year is however favourable. The monsoon season extending from June to October accounts for 60 to 80 percent of the total rain. The winter season which is from November to January is mostly dry. Occasional showers which can help maintain soil moisture to a fair level are obtained during the hot season from February to May. The rainfall will have to be supplemented with light irrigation during the dry months. Irrigation need not pose serious problems since water availability from both surface and under ground sources are excellent in Orissa. Variation in average temperature are generally from 15°c to 40°c. Relative Humidity is generally of high order although it drops significantly from December to May.

Drier climate of Orissa as compared to other rubber growing areas in India is in one way beneficial in so far as the risks of serious fungal diseases to rubber stand minimised. The possible savings on disease control can more than cover the extra expenditure on irrigation.

Coastal Orissa is known to experience strong gales, typhoons and cyclones at times. Rubber can fairly easily succumb to such capricious turns of wind. The damages which appear in the form of uprooting trunk snap and branch breakage can be heavy. It is therefore imperative that rubber plantations are raised only as far inland and away from the likely paths of strong and cyclonic winds as is feasible. Hailstorms are reported to occur in certain parts of Orissa at times during April-May. Small marble -sized hailstones may prove

harmless but bigger ones can cause laceration and fall of leaves, breakage of twigs and pock mark like injuries to bark on trunks and branches. Young plants in nurseries and in the field are easily susceptible to heavy damages. Hailstorms are however unpredictable and should be treated as a minor hazard.

Aprat from the surveyed parts, other areas as in the districts of Ganjam, Koraput etc. could prove to be suitable for rubber.

It is reported that rubber had been planted in about 6 hectares of land near Baripada in Mayurbhanj District as long ago as 60 years, probably at the instance of the then Maharaja of Mayurbhanj. According to a 1965 report by Rubber Board officials, the trees though badly neglected had growth comparable to that obtained in traditional rubber growing areas.

New trial plantations of rubber were established by the State's Soil Conservation Department in 1966-67 at *Aiginia* near Bhubaneshwar in Puri District, at Nilgiri in Balasore District and at *Chennadhua* near Baripada in Mayurbhanj District. These were also not cared for subsequently. 19 rubber trees are now existing at *Aiginia*. These are fairly tall and healthy and indicative of the potential growth and development of rubber in Orissa. The trial planting at *Nilgiri* has totally failed due to poor site selection. At Chennadhua about 170 trees stand distributed over an area of about 2 hectares. Owing to lack of maintenance, the general appearance is below par. However, the trees do not bear any signs of disease, past or present. Some of the trees are quite well grown.

Owing to the neglect in maintenance, the trial plantations of rubber in Orissa have not come to express the full potential of growth in the locality. The trees have not been subjected to any regular tapping although test tappings carried out recently yielded fair exudation of latex. In the case of rubber, vegetative growth as borne out by the height of trees, girthing of trunk, extent of canopy formation and bark characteristics is generally indicative of yield capabilities since in any given strain of rubber, latex production is directly linked to total biomass production.

Cost of production of rubber in Orissa could be relatively low in view of good availability of land and infra-structural facilities, reasonable cost of labour etc. In view of the proximity to Calcutta which is the second biggest rubber consuming centre in the country, rubber produced in orissa can enjoy a better market than rubber produced in traditional producing areas.

Rubber Plantation Development Scheme

With a view to promoting new planting and replanting of rubber and thereby maximising rubber production, the Rubber Board is implementing an integrated scheme from 1980-81. Under this Rubber Plantation Development Scheme, a package of assistance and incentives is granted.

These consist of the following:

1. A non-returnable grant paid in seven annual instalments for subsidising cost of cultivation and maintenance of plantation during pre-bearing period.

2. Long term agricultural loans from Banks for supplementing the Board's subsidy in order to meet the entire cost for cultivation. The interest on the loans is 10.5 percent for growers owning upto 2 ha of land and 12. 5 precent for others. There is a moratorium on payment of interest for the first 7 years. The accrued interest is payable during the 8th and 9th year. Repayment of loan principal together with the current interest is spread over 5 years there after.

3. Interest subsidy of 3 percent from the Board.

4. Free advisory and extension services. Though the scheme for implementation for the VII Five Year Plan period is yet to be finalised, the following rates of subsidy and loan have been proposed. It is expected that the proposals will be approved by the Government of India shortly.

The basic intention is that a farmer who owns or legally possesses land suitable for planting rubber should be provided with the entire financial and technical assistance required for raising a plantation to the productive level and that he should find it easily possible to refund the loan assistance with minimum interest utilising part of the earnings from the plantation. Growers who adopt use of planting material of advanced growth would be given additional financial assistance for the same.

Category of growers	Subsidy (per ha)	Loan (per ha)
Owning upto 5 ha of rubber including area proposed for newplanting.	Rs. 5,000	Rs. 13,000
Owning above 5 ha of rubber including area proposed for newplanting.	Rs. 3,000	Rs. 15,000

Plantation Practices

Slash down all the existing vegetation, leave it to get partially dry in the sun, collect the debris in convenient heaps and give a light burning (to be completed in March). Avoid extensive burning as it is harmful to the soil.

Spacing and Terracing

In flat or gently slopy or undulating lands, planting distance commonly adopted for rubber are 4.6m x 4.6m (15' x 15') and 4.9m x 4.9m (16' x 16'). For steeper slopes requiring contour terracing or contour bunding

for control of soil erosion, the spacings accepted are 6.4m x 3m (20' x 10') and 6.7m x 3.4m (22' x 11') The contour lines should be correctly aligned using an appropriate equipment.

The terraces should be 1.52m (5') wide slightly sloping inwards and provided with stops of uncut earth at intervals designed to check lateral flow of water. On gentle slopes, it will be adequate to have individual platforms (honeycomb type) of size 1.52m x 1.52m (5' x 5') size with slight inward slope. The above spacings give an initial stand of 425 to 500 rubber plants per hectare.

Pits

Pits of 75cm x 75cm x 75cm (2½' x 2½' x 2½') are to be dug at the pegmarked points in April-May after receipt of a few showers. The pits so dug are allowed to weather for about two 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 refilled soil, using 175gm of Rock phosphate (Mussoriephos) and 12 kg (one kerosene tin full) of well rotted cattle manure or compost.

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

Planting Materials And Planting

Budded stumps of clones RR II 105, RRIM 600 and GT I are the three important high yielding rubber planting materials recommended. Seedling material of polyclonal (hybrid) origin are easier to grow but are of lesser potential yield, It is advisable to consult local Rubber Board officials before deciding upon the choice and source of planting material.

A well grown budded stump raised in poly bag

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 en adequate area around the planting point in the shape of a pocket fit for accommodating the worl of pruned lateral roots at the collar of the stump.

A planting hole is then made with a *crowbar* to a deoth equal to the actual of pruned tap root. After thrusting the crowbar to the required depth, its top end is moved around and the hole widened sufficiently to allow easy insertion of the stump. The root portion is then inserted into the hole taking care to ensure that its lower end firmly touches the bottom of the hole and the lateral roots are properly seated in the pocket at the top. The tip of the tap root should not hang loose at the bottom of the hole as it could lead to failure of proper root establishment. Loose soil is put to till the hole around the root.

The soil in the entire refilled pit is then pressed and contracted against the root. This is best done as follows: Drive in the crowbar at the outer edge of

the pit 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. Using the toes, hold ths stump firmly in position. Pull the top of the crowbar towards the stump. Repeat this at four or five points around the stump. Give the soil in the pit a final pressing down by treading firmly around the stump, putting in additional quantities of soil if necessary to obtain complete levelling. Firm planting in this manner ensures maximum success.

Planting polybagged Plants

Stumps planted direct in the field take long to establish and grow to maturity. The method is therefore getting out-moded. In order to reduce the immaturity period in the field achieve uniformity of growth and avoid vacancies. It is highly desirable to plant the stumps at first in polythene bags in September/ October and later transfer the plant intact to the field in June/July *when those have attained* a height of 180–210 cm with 4-5 whorls of leaves. As the plants have to grow in the bags for 7 to 8 months, the bags should have 65cm x 35cm lay flat size and 500 gauge thickness. The polybagged plants should be kept in a nursery of appropriate lay out, lights shaded during summer and afforded necessary irrigation, manuring, disease control and other care. Only plants of good uniform growth are transferred to the field. Transfer should be effected only when top whorl of leaves fully mature and hardened. The bag should be carefully sliced through and removed at the time of planting.

Cover Crop

Exposure of soil to sun, rain and wind as it happens in a newly planted rubber field is dele terions in many respects. To avoid this a live ground cover should be grown. Pueraria which is a creeping legume could be gainfully raised as cover crop in rubber plantations; Its seeds need soaking in warm water for 4 to 6 hours before sowing is done on beds of size 120cm X 90cm (4'X3') made between the rubber plant rows at the rate of one bed each in the centre of 4 rubber plants. The cover crop seeds should be mixed with equal quantity of Rock Phosphate (Mussooriephos) at the time of sowing. The seed rate of Puerarias 4-4½ kg per hectare.

The cover crop could be planted along with rubber or even earlier. A well grown leguminous cover helps to smother weeds, prevent soil erosion, fix atmospheric nitrogen in the soil, add organic matter, improve soil tilth and aeration and moderate soil temperature. Rubber accordingly derives immense advantage in growth as well as yield.

After Care

Where budded stumps are planted direct in the field, the grafted bud starts sprouting 2–3 weeks after planting. Sprouts appearing from anywhere other than the bud patch should be nipped off. The tender bud shoot should be afforded protection from hot sun, wild animals etc. with tree guards made of woven bamboo/reed splints. These should be of 75cm (2½') length and 45cm (1½') diameter.

Pruning should be carried out from time to time to remove any low branches developing upto a height of 2.5 mts (8') from the ground level on the trunk shoot. The young plants require manuring twice an year as shown in page 9 using fertiliser mixture containing NPK in the proportion of 12:12:6.

During the first 4 years the fertilizer mixture is applied around the plant in progressively widened annular bands and mixed up with the top soil with a fork. From fifth year onwards manuring should be done based on soil and leaf *analysis*. If this is not feasible, the general recommendation to use NPK 12:12:12 or 15:10:6 mixture may be followed as shown here.

Instead of NPK 12:12:12, any of the complex fertilizer grades 15:15:15, 17:17:17 or 19:19:19 NPK may be used, dosages of these being 100kg, 87.5kg and 80kg respectively per application. 10:26:26 NPK complex (115 kg) mixed with Urea (40 kg) or Ammonium Phosphate Sulphate 20: 20 (115 kg) mixed with muriate of Potash (50 kg) are also suitable alternatives in which case the dosage per application should be reduced to 50 kg.

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

For mature rubber under tapping NPK 10:10:10 grade mixture at the rate of 900 grams per tree (approximately 300kg per hectare)

Manuring Schedule of immature rubber up to 4th year
NPK 12:12:6

Year of planting	Months after planting	Time of application	Doze of mixture per plant	Quantity of the mixture required per hectare with 440-450 plant point
Ist year	3 months	Sept-Oct.	190 gm.	85 kg.
2nd year	9 months	April–May	380 gm.	170 kg.
-do-	15 months	Sept-Oct.	380 gm.	170 kg.
3rd year	21 months	April-May	480 gm.	215 kg.
-do-	27 months	Sept-Oct.	480 gm.	215 kg.
4th year	33 months	April–May	380 gm.	170 kg.
–do–	39 months	Sept-Oct.	380 gm.	170 kg.

The process of tapping is defined as an operation of controlled wounding. It is a skilled job.

every year during March–April in single application is recommended. Instead of this 12:12:12 NPK mixture at the rate of 250 kg/hectare or any of the complex fertilizers of the grades 15:15:15, 17:17:17 or 19:19:19 NPK can also be used, quantities of these being 200 kg, 175 kg and 160 kg respectively. 10:26:26 NPK complex (115 kg) mixed with Urea (40kg) or Ammonium Phosphate Sulphate 20:20 (150 kg) mixed with Muriate of Potash (50 kg) are also good substitutes. The dosage in these cases is limited to 100 kg.

The following are the other upkeep operations:

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

2. The plant bases are to 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. This also helps to control weed growth around the plant bases.

3. Vacancies in the planted area require filling up preferably with polybagged plants, two-year old budded stumps or stumped buddings.

4. Brown portion of the stem of young plants needs white washing during summer from the second year onwards using quicklime to protect them against sun scorch. This is to be continued every year till the canopy closes.

5. Suitable plant protection measures may be adopted against diseases and pests at the appropriate time as recommended by the Rubber Board

6. The plantation should be properly fenced with available local materials to prevent cattle menace and other tresspasses.

7. If branches do not develop above a height of 2.5 meters (8') from the ground, it should be induced by artificial methods like notching or by temporarily suppressing the growth of apical bud by closing it with the leaves around.

8. The cover crop should not be allowed to climb over rubber plants as it will suppress growth or cause bending etc.

Irrigation

Rubber is a rain-fed crop all over the world. However, when under moisture stress, it responds well to light irrigation. During the long dry period extending from December to May in Goa and Maharashtra, it would be highly advantageous to irrigate young rubber just so much as to provide adequate soil moisture. This would help to promote continuous growth and attainment of early maturity, when the tree canopy becomes thick and closed, a favourable micro-climate can develop underneath dispensing away the essentiality for continued irrigation.

Diseases of Rubber

The major fungus diseases that attract rubber trees in India are Shoot Rot, Abnormal leaf fall, Powdery Mildew, Pink disease

etc. Shoot Rot and Abnormal Leaf-fall can be controlled by prophylactic spraying of copper fungicides like 1 per cent Bordeaux Mixture. Pink disease which occurs on the fork regions of young rubber trees could be controlled by timely detection and application of Bordeaux paste. Powdery Mildew affects tender leaves of young plants or grown up trees.

The disease is effectively remedied by dusting sulphur or sulphur talcum mixture or spraying wettable sulphur mixed with water. Whenever symptoms of any disease appears, the Rubber Board experts may be approached with disease affected specimen so that appropriate remedial measures should be recommended. Fortunately, rubber has no serious pest problems.

Rubber Tapping

Tapping is controlled wounding of the bark made with a specially designed knife in order to extract the latex. The tapping cut extends, over one half of the trunk in a half spiral shape. A budded rubber tree is ready for tapping when it attains a girth of 50 cm (20") at a hight of 125 cm (50") from the bud union. A seedling tree (tree raised from seed) can be tapped when it reaches a girth of 55 cm (22") at a height of 50cm (20") The tapping cut in budded trees should be given a slope of 30° from the horizontal, while it is 25° in the case of seedling trees because budded trees have thinner bark compared to seedlings and chances of the latex over flowing sideways are greater.

Budded trees are to be tapped alternate daily, while seedling trees are suggested to be tapped only once in three days at least for the first few years. More intensive tapping can cause physiological and other disorders.

A tree which is to be opened for tapping for the first time should be marked with necessary guidelines. In each subsequent tapping, a thin slice (about 1.5 mm) of bark from the top of the cut is shaved of enabling fresh exudation of latex. The depth of the cut towards the wood is so regulated as to leave l mm of bark intact. This untapped layer protects the thin, soft cambium tissue inside. Unhindered cambial activity results both in bark regeneration and thickening of wood.

Under alternate day tapping system, each tree is tapped 140 times a year. The annual consumption of bark in tapping is 20 to 25 cm. After exhausting the virgin bark on either side of the trunk which takes several years, tapping is resumed on regenerated bark.

The tapper requires training and a certain amount of skill to execute his job well. Shallow tapping fails to extract the optimum crop. Tapping if done too deep or in a careless manner causes permanent injuries and thereby destruction to a long term asset. A good tapper can tap 300 to 400 trees a day.

Latex is collectd in suitable cups. Coconut shells are used in Kerala while in Malaysia etc. either glazed earthern ware cups or glass cups are the choice. The cups are attached to the trees using a wire cup-holder, Latex is directed to the cup by means of a spout made of galvanised iron sheet and driven gently into the outer bark. The position of the spout and the cup can be changed from year to year.

Attached to each Regional Office of the Rubber Board competent Rubber Tapping Demonstrators have been posted whose free services can be availed of by growers for advice and demonstration of the correct systems of tapping.

Areas planted and maintained with legumiuons cover crops and plan bases mulched during the initial years.

NPK 12:12:12

Year	Time of application	Qty. per hectare
5th	April-May	125 kg.
-do-	Sept-Oct	125 kg.
6th	April-May	125 kg.
-do-	Sept-Oct	125 kg.
7th	April-May	125 kg.
-do-	Sept-Oct	125 kg.

For areas not planted with leguminous covers and plant bases not mulched during the initial years.

NPK 15:10:6

Year	Time of application	Qty per hectare
5th	April-May	200 kg
-do-	Sept-Oct	200 hg
6th	April-May	200 kg
-do-	Sept-Oct	200 kg
7th	April-May	200 kg
-do-	Sept-Oct	200 kg

Crop Collection and Processing

Rubber trees are tapped early in the morning. Exudation of latex takes place for 2 to 3 hours. On stoppage of the flow, the latex from tapping cups is collected and sent for processing. The latex contains about 35 per cent dry rubber by weight.

The latex collected is bulked and strained using 40 mesh and 60 mesh stainless steel sieves. Then it is diluted with clean water, twice in quantity and transferred to aluminium coagulating dishes at the rate of 4 liters per dish. Dilute formic acid (3cc in 300cc of water) is then added to the latex in the pan mixed well and resulting forth if any is skimmed and removed.

The latex in the pan fully coagulates by the next morning. The coagulum is first pressed with hands to remove as much of the acid–serum mixture as possible, then fed in to sheeting rollers and made into thin ribbed sheets. These sheets are thoroughly washed in water allowed to dip dry in shade for a couple of hours and transferred to smoke houses where they are subjected to controlled smoking and drying for 4–5 days. The sheets so dried and smoked are amber coloured and standard weight of each sheet is 1/2 kg.

The sheets are graded by visual appearance and other physical attributes. The graded sheets are baled before marketing. Latex forms only about 80 percent of the crop. Latex dried up on tapping cut, spout, cup etc. are also collected. The scrap rubber or field coagulum forms 20% of the crop. This is dried, cleaned and marketed as such or converted in to crepe forms before sale.

Ribbed smoked sheets (RSS) are the most common form of raw rubber.

Other forms are larex grade crepes, preserved centrifuged latex containing 60%dry rubber and solid block rubber or crumb rubber. The last two are subjected,to standard technical sampling and specification. □

TECHNICAL CONSULTANCY DIVISION UNDER RUBBER BOARD

Rubber Board has created a new Division entitled Technical Consultancy Division for providing technical consultancy services to rubber goods manufacturers and rubber processing units in the country. The facilities of the Division include market surveys, developments of rubber products, testing of various types of rubber components and products, rubber chemicals, evaluation of rubber additives, classification of rubber and rubber products as per the standards laid down by ISI, preparation of project reports and feasibility reports. The Division also undertakes programmes for training for the benefit of small scale rubber goods manufacturers, rubber processing units and analytical chemists attached to rubber industries. There is facility for analysis of latex, raw rubber, effluents and water samples. These services are provided on a commercial basis. The new Division functions under the Project Officer. Those who desire to make use of the facilities may contact the Project Officer, Rubber Board, Kottayam–686 009.

RUBBER WOOD AND WOOD REQUIREMENTS

A study of the Economic Research Division of the Rubber Research Institute of India has revealed that about 70 per cent of the requirement of wood based industry in the small scale sector in Kerala is met from rubber wood. Rubber wood is the mainstay of small scale plywood units and veneers and splinters units. These units consumed about 3 million cft of rubber wood annually.

In addition the packing case manufacturing industry which depends almost completely on rubber wood consumes about 13 million cft of rubber wood annually.

Potential for Future Natural Rubber Development

P. C. CYRIAC
(Chairman, Rubber Board)

Natural rubber is an important raw material used in the making of over 30,000 goods indispensable to industrial development and modern life. It is obtained from the latex of para rubber tree, otherwise known as *Hevea brasiliensis*. Though there are reports about bush plants like guayule and *crypstostegia grandiflora* promising to yield natural rubber under poor soils in the arid zones, their economic viability in commercial planting is yet to be established. Hevea brasiliensis is the only dependable source for producing NR at a reasonable price in the world today.

The para rubber tree flourishes in warm equable tropical climate, normally within 10° lattitude on either side of the equator. In India, Kanyakumari District of Tamilnadu and Nicobar Islands in the Andaman & Nicobar group of islands are the only regions falling within this geographic limit. Excessive rainfall, extended drought, drop in temperature during winter etc occurring outside this belt are said to affect the health, immaturity period and yield of rubber plants. But the ability of the rubber plants to tolerate climatic variations is well known. Kerala State lying outside this ideal geographic belt is the major producer of natural rubber in India. Regions with even less favourable climatic conditions also give good growth to rubber plants in our country.

India has today about 350,000 hectares under rubber cultivation, spread over many States and a Union Territory. Kerala, Karnataka and Tamilnadu are the states where rubber is traditionally grown whereas almost all the states in the north-east region, Goa and the Union territory of Andaman & Nicobar Islands form the non-traditional sector. Certain parts of Orissa, Maharashtra and Madhya Pradesh also hold out promise for rubber cultivation. Availability of land in the traditional region for any further expansion of rubber on a large scale is limited. It is to the non-traditional regions that we have to look up in future for the additional supply of this vital elastomer.

The demand for rubber has been steadily growing in the country from the dawn of independence, as can be seen from the table given below:

Production and consumption of rubber

	Production		Consumption	
	NR	SR	NR	SR
	(In metric tonnes)			
1950/51	15,380	....	19,854	....
1955/56	23,730	....	28,445	461
1960/61	25,697	....	48,148	7,397
1965/66	50,530	14,741	63,765	21,553
1970/71	92,171	29,791	87,237	33,160
1975/76	137,750	25,119	125,692	32,452
1980/81	153,100	25,293	173,630	47,050
1985/86	200,465	34,758	235,540	70,035

Though the demand could not catch up with supply of natural rubber during a few years in the 1970s, it was largely due to the sluggish growth rate in the rubber manufacturing sector. In a developing country like India the consumption of rubber is bound to go up substantially. The per capita consumption of rubber in India, as computed from figures of 1984, comes to only 0.36 kg while it is 12 kg in Canada and Japan and 8 kg in USA, France and Germany. Even China has a higher consumption rate, 0.58 kg per person. India is on the threshold of a leap forward in industrial development. It is certain that rubber consumption in our country will go up substantially in the coming years. Projection of natural rubber consumption for the future points to a higher growth rate in demand.

According to the estimation made by the Rubber Board, the demand for natural rubber will go up to 3 lakh tonnes by 1989/90. By 2,000 AD we would require about 5 lakh tonnes of natural rubber.

Prospects

Are we capable of meeting the increased demand? Rubber being a crop with a long immaturity period of seven years, the prospects of immediately bridging the gap between demand and supply is remote. However, the encouraging feature is that we have enough natural resources. By exploiting these judiciously, we would definitely be able to attain near self-sufficiency in natural rubber at least by the turn of the century. We would require about 2.5 lakh hectares to be newly planted upto 2000 AD to attain a production target of 5 lakh tonnes of NR per year. To exploit the natural resources we should proceed with a viable programme to popularise rubber cultivation in the non-traditional region. In recent times the Rubber Board has been labouring hard to systematically plan rubber developments in the non-traditional sector with the co-operation of the State Governments.

Land is the main natural resource required to produce natural rubber. Dearth of land in the traditional region should not give us any sense of despondency. There is plenty of land in the non-traditional belt spread over the States of Assam, Arunachal Pradesh, Meghalaya, Mizoram, Manipur and Tripura in the north-east region and Goa, Maharashtra and Orissa in the central Indian region. The north-east region has gone ahead fairly fast in expanding rubber cultivation; the planted area comes to about 12,000 hectares.

According to an estimate prepared by the Rubber Board in 1980, the avilability of land suitable for rubber cultivation would be about 1.35 lakh hectares in the non-traditional region. Exploratory surveys conducted later point to the possibility of getting suitable lands in much greater measure in Orissa and Madhya Pradesh. Bastar District in Madhya Pradesh with land area a little more than Kerala State, can offer at least a lakh of hectares for rubber cultivation whereas Koraput District in the State of Orissa, which extends to about 2/3 of the Kerala State, has vast stretches of rolling land where rubber can be successfully grown, judged from the physical features, soil and climatic conditions. Though we consider areas above 1500 ft above mean sea level as unsuitable for rubber, even areas at elevation of 2,000 ft are found to have minimum temperature not below 8° to 9°c in Koraput and the maximum temperature at 30 to 35°c. The rainfall is scanty at about 60", but these areas possess potentialities for collecting rainwater by constructing small check dams. Ground water potential also appears to be good.

Developments in Orissa

Rubber has yet to take root as a commercial crop in Orissa. The Forest Development Corporation is giving a lead in this matter. They have already planted rubber in about 25 hectares in Berhampur near Chilka lake. There is good scope for development of rubber plantation in the Dhenkanal and Koraput Districts of the State. Dhenkanal has the advantage of having lands close to river basins with potential for summer irrigation. Though the rainfall here is deficient and there is a fairly long period of dry spell in the year, irrigation could make up for the deficiency. The danger attendant with excessive rainfall in the form of ravaging diseases like the abnormal leaf fall would be absent in this region.

The Rubber Board has recently strengthened its field set up in the north-east by establishing a a Zonal Office under a Joint Rubber Production Commissioner and a Regional Office in Guwahati, and Regional Offices in Silchar and Agartala. In addition to the Regional Research Centre at Agartala, the board has started a Research Complex at Guwahati under a Project Co-ordinator, which is having sub stations in Meghalaya and Misoram. These research stations will look after problems specific to the north-east region and study factors that contribute to the growth parameters of rubber in the region. Nucleus Estate and Training Centres are proposed to be set up in Agartala, Assam and Meghalaya which will provide to the farmers training in rubber culture, crop harvesting and processing in addition to meeting a large portion of the high yielding planting material requirements in the region.

Gains

The States in the north-east would obtain many gains out of rubber cultivation. The most important is that it can be used as a tool to permanently settle the shifting cultivators (jhumias) on the land. The age old practice of shifting cultivation has virtually made the local people nomads and reduced the land into desolate waste. The cleared forest area remaining exposed after cultivation and cropping succumbs to soil erosion with consequent loss of fertile top soil. Rubber grown in association with leguminous cover crops is a sure medium to arrest soil run off, to help the surface water seep deep into the soil layers and to enrich the top soil with organic matter. Rubber farming could be used as a method of providing gainful employment to the educated unemployed; it opens up avenues for new rubber based industrial ventures in the rural sector and adds to the revenue of the public exchequer, in addition to ensuring a regular income to the farmer

Limitations

However, there are many hurdles to be crossed in making rubber cultivatoin a success in the north-east. Rubber cultivation is entirely new to a vast majority of local farmers. This points to the need for organising

motivational campains and training programmes in rubber planting. Extension of crop insurance to the region would help growers come forward to plant rubber with a sense of security. In addition to cash subsidy and technical support, the Rubber Board would supply free, planting material to the tribal region. Almost all the farmers in the region are poor. They cannot afford to plant rubber without credit. Commercial banks should come to their rescue by advancing money for the initial planting operations. At present the banks appear to be chary of advancing credit to the farmers on account of the peculiar nature of land tenure in the north-east. The land in general is owned by the District Council. In the absence of individual ownership commercial banks insist on credit guarantee from the State Government for the money advanced to the farmers. The State Governments should not be hesitant to give this guarantee.

An alternative to credit financing of plantations of individual farmers would be the example of the Tripura Forest Development and Plantation Corporation. In order to permanently settle the shifting cultivators on the land, the corporation allotted 1.5 hectares of land to each jhumia for planting rubber and half a hectare for planting other crops. The Corporation took up the task of planting rubber on the plots allotted to the jhumias. After completing the planting and maintaining the plots through immaturity period, the areas which have reached the production stage are handed over to the beneficiary jhumias. These jhumias would be working on the plantations during the entire immaturity period as wage earners. The crop harvested has to be surrendered for central processing. The cost of setting up the plantation is recovered from the sale proceeds of the crop in easy instalments and the balance is passed on to the jhumias. This pattern has been found to be very effective in permanently settling the jhumias on rubber plantations and has come up for praise from various quarters.

Almost all the State Governments in the non-traditional region welcome joint ventures in rubber planting utilising local labour. The cost of cultivation is comparatively low in these regions as compared to the traditional sector, mainly because of low wage rates and negligible cost on plant protection measures. Well maintained plantations in the north-east sector are found to compare very favourably with plantations in the traditional sector, giving over 1,000 kg of yield per hectare on the average. The crop loss in the traditional region on account of torrential rains and abnormal leaf fall is about 20%. Possibility of such losses in the non-traditional sector is remote. Major diseases occuring in the traditional regions have also not appeared here. There is good scope for experienced plantation companies to utilise their expertise in developing rubber plantations in these states in order to earn good yield returns. The answer to the growing demand of natural rubber lies in the large scale development of rubber plantations in the non-traditional sector. □

RUBBER BUFFER PROPOSED

Rubber goods manufacturers want a buffer stock of at least 20,000 tonnes against the present 2,500 tonnes.

Buffer stocking began recently with an initial 2,500 tonnes with the State Trading Corporation as the manager. But the quantity which works out to less than one percent of the country's consumption is grossly insufficient to maintain the indigenous price level, according to Dr. P. K. Modi, President of the All India Rubber Industries Association.

Addressing the annual general meeting of the association here on Saturday, Dr. Modi pointed out that though natural rubber is a vital and essential raw material accounting for 80 percent of the total new rubber requirements of the industry, its supply continues to be inadequate and high-priced.

During 1985-86, the country imported 41,500 tonnes of rubber to bridge the gap between demand and supply, he said. One redeeming feature has been the decision of the government, to continue imports till the indigenous price of RMA IV stabilises at Rs. 16.50 per kg.

However in spite of imports the price has been ruling at Rs.17.50, Dr. Modi noted, adding that any increase in the cost of natural rubber is ultimately borne by the consumer and it is necessary that rubber prices stabilise at a reasonable level.

During 1985, the consumption of new rubber (natural and synthetic) went up to 9.7per cent from 5.7 per cent in the previous year. The average annual growth rate for the last five years has been around 6.6 per cent.

But in the face of ever increasing raw material costs, Indian rubber goods manufacturers have been finding it difficult to maintain the cost of production, thus adversely affecting the growth rate, Dr. Modi said.

Rubb. Board bull. 21, No. 3

Experience in Development of Rubber Plantations in Non-Traditional Areas of North Eastern India

M. O. JOSEPH
(Jt. Rubber Production Commissioner, Rubber Board)

Abstract

Traditionally, rubber has been grown in India in the hinterlands of the South West Coast. In the bid for large scale expansion, the vast potential in non-traditional areas in the remote North-Eastern India have been explored and identified.

Naturally, the climatic conditions and physiographic features of this subtropical region are not so hospitable as in the traditional belt. But it has been proved that with special agromanagement practices and safeguards, economic cultivation of rubber is feasible in extensive slected tracts.

The importance of developing this perennial tree crop in N. E. Region has been duly acknowledged. Ambitious programmes are launched to accelerate development in all sectors, with special stress on the socio-economic upliftment of the small holder sector. Intensive efforts in the fields of promotional activities, extension and research support, material and financial assistance and training are absolutely essential to achieve the objectives envisaged.

Following is the paper presented by Shri M O Joseph Joint Rubber Prodution Commissioner, Rubber Board at the workshop and seminar on Small Holder Development under the auspices of the Association of Natural Rubber Producing Countries held at Palembang (Indonesia) from 22 to 26th July 1986.

Introduction

The equatorial tropics bountifully provides all the congenial environments for optimum growth and yield of *Hevea brasiliensis*. Such areas falling within 10°N and South latitudes are considered as the traditional rubber growing tracts the world over.

Non-traditional region

In India, rubber has been traditionally grown in the hinterlands of the South West Coast comprising of Kerala State and the adjoining districts of Tamilnadu and Karnataka States. These areas lie between 8° and 13° N Latitude. The mounting pressure on land in this thickly populated region had foreclosed scope for any further large scale expansion of rubber cultivation even years ago. Identification of suitable lands elsewhere in the country had, therefore, become imperative. Surveys carried out from early 1960s revealed that extensive tracts of lands in nontraditional areas could be economically exploited for rubber cultivation. The fact that India has long remained deficit in natural rubber production and imports of rubber from other countries would not only involve large scale expenditure in rare foreign exchange but also would make landed costs in consuming centres much higher than the world price, prompted the decision to make judicious use of marginally suited non-traditional areas for raising rubber plantations. Amongst such non-traditional areas taken up for development, the most important area in the North Eastern Region of India comprises of the States and Union Territories of Assam, Tripura, Meghalaya, Manipur, Nagaland, Mizoram and Arunachal Pradesh.

Salient features of North Eastern Region.

The NE Region of India is in the sub tropics covering an extensive geographic area lying between 22° and 29° North Latitude. Barring the high Himalayan mountain ranges on the north and eastern boundaries and the ridges interspersed within, vast tracts of foot-hill areas and plains situated at elevations upto 450 metres from Mean Sea Level can be gainfully utilised for rubber cultivation. The soil conditions are generally well suited for rubber cultivation. The other salient features are the following:

1. The rainfall obtained in the area is from 250 to 300cm spread over the months of April to November. The remaining months experience dry weather.
2. The dry season also coincides with winter season. During winter, the minimum temperature drops to 10°C. For a week or two during December/January, the temperature might even go down to 6° to 8°C.
3. The Relative Humidity during the winter season is generally low. During the remaining part of the year, it records high levels.
4. The region experiences occasional hail-storms, mostly towards the close of winter or at the out-break of monsoon.

5. Vast areas of the region are situated at elevations above 450 Metre above MSL. In such areas, the winter season is of longer duration and the fall in temperature is more pronounced. At higher altitudes, the atmospheric pressure and consequently the availability of carbon-dioxide in the atmosphere are of lower order than in the plains. Tropical crops can therefore suffer from low photosynthetic activities.
6. The relatively remote situation of the region has resulted in most of the areas remaining backward in development of such facilities such as transport, communication, power supply etc. The population is predominantly tribal.
7. The tribal people resort to the age old practice of shifting cultivation. This in turn results in severe erosion of soil and progressive degradation of land.
8. Availability of labour for plantation development is fair. The wage rates prevailing are at present reasonable.
9. The region lies in fair proximity to Calcutta, which is the second largest rubber consuming centre of the country. It is, therefore, relatively cheaper to transport rubber produced in the region to Calcutta rather than from the traditional rubber growing areas.

Advantages of growing rubber in N. E. Region.

North Eastern Region is rich in natural resources. For the socio-economic development of the region, rubber would be a choice crop in view of the following advantages:

1. Being a remunerative and long term crop suitable for development in large estates as well as small holdings, it will provide attractive features for widespread development of the region.
2. The crop can be grown on extensive denuded, fallow or underutilised lands. The tribal communities can be weaned away from the harmful shifting cultivation practices and made to adopt settled cultivation.
3. Being a labour intensive crop, the scope for generation of regular employment potential will be substantial.
4. The weaker sections of the society can be rehabilitated effectively through large scale settlement projects based on rubber plantation.
5. The unit cost for development of rubber plantation in the region will be less than that in the traditional rubber growing areas of the country. Therefore, even if the productivity levels would be lower, the cost of production would be more or less the same as elsewhere.

Present state of development

Development of rubber plantations in NE Region was taken up two decades ago. The total extent planted with rubber in the region as of now is 13,000 hectares. Pioneering efforts in this regard were made by various State Government Departments. Subsequently, Government owned Companies were also set up to undertake large scale rubber plantation. Private entrepreneurs, mostly in the small holding sector joined later in plantation activities. The State-wise extents of rubber plantations are presented in the following table:

State/Union Territory	Extent in the Estate sector (in ha.)	Extent in the Small holding sector (in ha.)	Total (in ha.)
Tripura	5000	3200	8200
Assam	950	475	1425
Meghalaya	1000	600	1600
Mizoram	415	305	720
Manipur	450	Nil	450
Nagaland	650	70	720
Arunachal Pradesh	35	Nil	35
TOTAL	8500	4650	13150

(Note: Plantations having extent exceeding 20 hectares are classified as estates in India.)

The earlier plantations were mostly raised with Tjir. 1 clonal seedling material. Budgrafted materials have been planted only during the course of the last 10 to 12 years. The yields obtained from clonal seedling material is in the range of 700 to 900 kg. per hectare per year. Budgrafted trees are yielding well over 1000 kg. per hectare per year.

Plantations now being raised are with modern high yielding clones. The plantation practices adopted are also more scientific and systematic. It could therefore be expected that future yield levels would be of the order of 1200 to 1500 kg.

Constraints.

The major constraints hindering widespread adoption of this crop in the small holding sector in NE Region can be summarised as given below:

1) Lack of general awareness about the benefits of the crop among the rural farming community.
2) Rubber being a new crop to the NE Region, the technical know-how of planting and maintenance has not reached the small holders in adequate measures.
3) Difficulties in obtaining supplies of high yielding planting materials and inputs.
4) Lack of financial liquidity for investment and during the long gestation period that follows.

5) The low level of overall economic and social development, especially among the tribal communities in rural areas.

Institutional support.

Considering the importance of promoting this unique crop, the Government of India, Ministry of Commerce, has approved the implementation of a scheme for Accelerated Development of Rubber Plantations in NE Region. Accordingly, the Rubber Board has opened up new bases in potential centres for organising research, development and extension activities. A Research Complex of the RRII has been set up in NE Region with regional research stations in representative locations for evolving clones best suited for the Region and also to formulate appropriate technology relevant to the local conditions.

To encourage small farmers to take up rubber cultivation, the Board is implementing a comprehensive scheme which offers a package of assistance in the form of cash subsidies, input supplies, institutional credit, extension support and practical training. As a result of all these endeavours, the Board has aroused very good response amongst the small land owners.

Strategy for future development.

The strategy for future development should be quite different from that applicable to the traditional areas. The future course of action may be shaped on the following lines:

1. Demonstration, training and extension service centres.

At the State-level, a model plantation and training centre each may be set up with the support of the State Governments for imparting practical training in farm operations and management to skilled workers, field supervisory personnel and also educated entrepreneurs. Further, in all important districts, small demonstration and training centres may be established to render practical training to the local farmers in all aspects of production and processing. The latter district centres should also serve as the base for extension service and supply of inputs. Group processing facilities would also be established in due course.

2. Planting materials.

A number of nurseries will be newly opened in all potential centres to supply high yielding budgrafts to farmers. As far as possible, use of plants of advanced growth raised in polybags would be got adopted.

3. Group-planting

As an area approach will be more effective and easy for operation, especially in tribal belts, group plantings in compact blocks will have to be organised with the extension support of the Board. Common nurseries, extension service centres, group processing and marketing facilities can be organised effectively in such group plantations. Associations of growers or their co-operative societies may manage the plantations with the individual beneficiaries sharing the profit.

4. Schemes for settlement of shifting cultivators

The State Governments would be encouraged to set up settlement projects for permanent rehabilitation of shifting cultivators and landless labour by allotment of land to individuals and providing common service and facilities. Already two public sector Corporations with the aforesaid objective are in existence.

5. Institutional financing.

Owing to the particular land tenure system, where land is owned by the community, operation of credit flow poses many problems. The modalities of institutional financing may have to be suitably modified and relaxed.

6. Large involvment of State Governments and local bodies.

To supplement the efforts of the Rubber Board, the State Government machinery also may be utilised for extension/advisory service, publicity, information and communication services and also raising nurseries for distribution of planting materials.

7. Research support.

Adequate research support for combating the stress situations of the region is highly imperative. The standardisation of agro-management practices such as optimum fertilizer usage based on soil and tissue analysis, appropriate planting techniques, plant protection, gainful intercropping practices etc. will form the major area of research. Besides, clones specially suited for the region are to be evolved by breeding and selection within the shortest span feasible. A few outstanding Chinese clones already obtained on exchange basis could be gainfully used for the breeding programmes.

Conclusion.

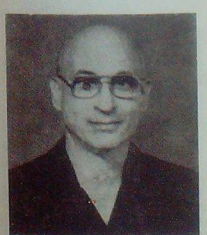
Acceleration and modernisation of rubber plantation development in the NE Region of India are expected to go a long way in increasing domestic natural rubber production on a substantial scale. Besides this main objective, the envisaged development programmes would bring about the much needed upliftment of rural economy of the Region. In the face of the various constraints, innovative and sustained efforts would have to be mounted. Institutional agencies involved in the programe are fully committed to take up the challenge. In this context, it is hoped that the exchange of ideas and sharing of experiences in the fraternity of ANRPC will be of immense help to India in the march towards securing better quality of life for the rubber small holders of the North Eastern Region.

NEWS IN PICTURES

TNV RETIRED

Shri TNV Namboodiri, Dy. Secretary, Rubber Board retired on 30th June 1986. Held in high esteem, his colleagues and friends in the Rubber Board called him affectionately 'Thirumeni'. He has completed 29 years of service. During his long span of service, he held several positions including Publicity Officer, Public Relations officer, Officer on Special Duty (Administration) and Assistant Secretary. He retired as Deputy Secretary.

He had also been the Editor of Rubber (Malayalam Monthly) and Rubber Board Bulletin (English Quarterly). His contributions to the Board's journals were widely acclaimed and appreciated. Besides being committed to the duties assigned to him, he distinguished himself as a rare combination of professional ethics and practical wisdom. He is the author of a Malayalam book which contains satirical essays depicting various phases of human life.



M K KAPOOR,
PRESIDENT
AIRIA

Shri M. K. Kapoor has been elected as President of the All India Rubber Industries Association in Bombay on 28th June 1986.

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5. Institutional financing.

Owing to the particular land tenure system, where land is owned by the community, operation of credit flow poses many problems. The modalities of institutional financing may have to be suitably modified and relaxed.

6. Large involvment of State Governments and local bodies.

To supplement the efforts of the Rubber Board, the State Government machinery also may be utilised for extension/advisory service, publicity, information and communication services and also raising nurseries for distribution of planting materials.

7. Research support.

Adequate research support for combating the stress situations of the region is highly imperative. The standardisation of agro-management practices such as optimum fertilizer usage based on soil and tissue analysis, appropriate planting techniques, plant protection, gainful intercropping practices etc. will form the major area of research. Besides, clones specially suited for the region are to be evolved by breeding and selection within the shortest span feasible. A few outstanding Chinese clones already obtained on exchange basis could be gainfully used for the breeding programmes.

Conclusion.

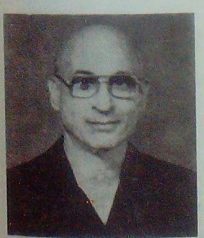
Acceleration and modernisation of rubber plantation development in the NE Region of India are expected to go a long way in increasing domestic natural rubber production on a substantial scale. Besides this main objective, the envisaged development programmes would bring about the much needed upliftment of rural economy of the Region. In the face of the various constraints, innovative and sustained efforts would have to be mounted. Institutional agencies involved in the programe are fully committed to take up the challenge. In this context, it is hoped that the exchange of ideas and sharing of experiences in the fraternity of ANRPC will be of immense help to India in the march towards securing better quality of life for the rubber small holders of the North Eastern Region.

NEWS IN PICTURES

TNV RETIRED

Shri TNV Namboodiri, Dy. Secretary, Rubber Board retired on 30th June 1986. Held in high esteem, his colleagues and friends in the Rubber Board called him affectionately 'Thirumeni'. He has completed 29 years of service. During his long span of service, he held several positions including Publicity Officer, Public Relations officer, Officer on Special Duty (Administration) and Assistant Secretary. He retired as Deputy Secretary.

He had also been the Editor of Rubber (Malayalam Monthly) and Rubber Board Bulletin (English Quarterly). His contributions to the Board's journals were widely acclaimed and appreciated. Besides being committed to the duties assigned to him, he distinguished himself as a rare combination of professional ethics and practical wisdom. He is the author of a Malayalam book which contains satirical essays depicting various phases of human life.



M K KAPOOR,
PRESIDENT
AIRIA

Shri M. K. Kapoor has been elected as President of the All India Rubber Industries Association in Bombay on 28th June 1986.

BOARD'S PAVILION IN ASSAM

An exhibition was organised at Kampoor in Naugong District of Assam to mark the 52nd anniversary of the 'Assam Sahitya Sabha'. The picture shows the crowd assembled before the pavilion jointly put up by the Rubber Board and the Assam Plantation Development Corporation.

SEMINAR AT NELLIYADI

A rubber seminar was held at Nelliyadi in Karnataka State. Fr. Mathew Perumpallil welcomed the participants. Shri Sadananda Swamy inaugurated the seminar. The Officials of the Board took classes on various topics. Shri Sadananda Swamy is seen inaugurating the Seminar by lighting the lamp.

RUBBER IN JASSAM

Shri P C Cyriac IAS, Chairman, Rubber Board gives a detailed account of the Board's schemes for the expansion of rubber cultivation in Assam to the Chief Minister Shri Profulla Kumar Mohanta. Shri P Mukundan Menon, Rubber Production Commissioner and Shri M O Joseph, Jt. Rubber Production Commissioner are also seen in the picture.

NURSERY FOR POLYBAG PLANTS

As part of the flood relief programme, a polybag nursery was set up by the Service Co-operative Bank, Ettumanoor. Shri P C Cyriac, Chairman, Rubber Board and Officers of the Rubber Board visiting the Nursery.

ESTATE IN TRIPURA

A well maintained estate in Tripura. Seen in the picture are Shri M O Joseph, Jt. Rubber Production Commissioner and Shri Dev Burman, owner of the estate.

RUBBER CULTIVATION IN TRIPURA

The Rehabilitation and Plantation Corporation of Tripura is undertaking rubber cultivation for the hill tribes. In the picture Shri MLR Hegdan is demonstrating the methods for preparing the pits for planting rubber. Shri H N Mathur, Managing Director of the Corporation and Shri Bimal Kanti, Junior Field Officer are also seen.

RUBBER TO COME UNDER IPR SCHEME

Rubber will soon be included in the International Price Reimbursement Scheme (IPRS) for the exporters of engineering goods, according to highly-placed official sources. The Commerce Ministry has already asked the Engineering Export Promotion Council (EEPC) to furnish details regarding the requirement of rubber as components in the export of engineering items.

This is mainly because of the high imbalance between the domestic and international price of rubber. The domestic price of rubber has increased during the past few months with good export demand for automobile tyres and tubes. As against the price of Rs. 19,500 to Rs. 20,000 per tonne of RMA-1, the representative grade of natural rubber, being quoted at the producting Centre at Kottayam, it is ruling at Rs. 22,000 to Rs. 22,500 per tonne in Calcutta, Delhi and Bombay markets. This is against the current international price of around Rs. 12, 000 per tonne.

To bring down the domestic price of natural rubber around Rs. 16,500 per tonne, the government, sources said, has already decided to import a higher quantity of rubber in the current year. Domestic production of rubber in 1985-86 was estimated at 2,15,000 tonnes against the demand for 2,50,000 tonnes. The State Trading Corporation, the canalising agency for import of rubber, was to import 30,000 to 35,000 tonnes but for various reasons actual quantity imported was much less.

Export of rubber-based goods, particularly automobile tyres and tubes, has picked up in 1985-86 and according to an estimate of the Chemical and Allied Products Export Promotion Council (CAPEXIL), it has touched Rs. 80 crore, against Rs.40 crore in 1984-85. The EEPC, however, could not immediately determine the quantity of rubber. The CAPEXIL, source said that the natural rubber subsidy enjoyed by exporters of rubber-based items for meeting the differential at the domestic and in international prices was operative up to March 31, 1986.

IMPORTED RUBBER NOT TO BE RELEASED

The government has agreed not to release imported rubber to the market to prevent undue fluctuations in price level, according to the Indian Rubber Growers Association.

The State Trading Corporation has also been directed to procure natural rubber from the domestic market if prices fell below remunerative levels, Association General Secretary Joseph Monipally said in a statement here today.

Mr. Monipally had met Commerce Minister P. Shiv Shanker, Minister of State for Commerce, Brahm Dutt and senior officials of the commerce ministry and discussed the problems of rubber growers.

He said the government would take immediate steps to bring down the present price differential between RMA-IV grade and lot rubber.

An exercise was also on to revise the estimate of production and consumption of rubber taking into account the unexpected changes in the factors affecting these estimates, he said.

Minister of State for Commerce Brahm Dutt has agreed to convene a meeting of all concerned to evaluate the latest rubber situation.

In the memorandum submitted to the Commerce Minister, Mr. Monipally pointed out that the difference of rupee one a kg. between the prices of RMA-IV grade and lot rubber, was the result of manipulation by the manufacturers. This was to reduce the price realised by small growers who sold their produce in lot sheets which accounted for 63 per cent of the total production, he said.

CHINA TO BUY MORE MALAYSIAN RUBBER

China is likely to buy more than 100,000 tonnes of natural rubber from Malaysia this year, Primary Industries Minister Datuk Paul Leong said yesterday.

Speaking to reporters after receiving a delegation from the China National Chemical Import and Export Corporation (Sinochem), he said China's offtake from Malaysia for the first quarter totalled 27,351 tonnes.

Sinochem, China's import export agency, handles more than 700 products including natural rubber. It has set up trade relationships with more than 130 countries.

China's purchase of natural rubber peaked at 130,000 tonnes in 1977. But in 1985, her import of Malyasian natural rubber was 88,804 tonnes or nearly 60 per cent of China's total natural rubber imports for that year.

Datuk Leong said China's natural rubber consumption would be on the increase because of its economic growth. In 1985, China's natural rubber consumption was estimated at 405,000 tonnes, nearly doubled its 1975 consumption.

He said Malaysia would continue to be a reliable natural rubber supplier to China.

The seven-man Chinese delegation hoped Malaysia would send more natural rubber technical missions to China to improve the trade relationship and to gather more trade and tecinical information on the commodity.

On the trade balance, he said it has always been in China's favour. For instance, Malaysia posted the biggest trade deficit with China in 1981 when Malaysia's imports from China totalled $631.6 million against her exports to China of only $203.1 million, giving rise to a deficit of $428.5 million. Last year, the deficit was reduced to $223.7 million.

Chairman of the Malaysian Rubber Exchange and Licensing Board (MRELB) Datuk Ahmad Sabki Jahidin said the Chinese delegation was here to strengthen the trade relationship between the two countries besides reciprocating the visit of a MRELB mission to China in 1984.

The delegation led by Sinochem president Zheng Dunxun will hold discussions with government agencies such as the MRELB, the Malaysian Rubber Research and Development Board, the Malaysian Rubber Development Corporation and the Federal Land Development Authority.

The delegation, would also talk to the Malaysian Overseas Development Sdn Bhd, the Federation of Rubber Trade Associations of Malaysia; the Northern Malaya Rubber Millers and Packers Association and visit the Port of Penang.

RUBBER OUTPUT WILL GROW 1.2PC ANNUALLY

Rubber production is projected to grow at 1.2 per cent per year between 1985 and the year 2000 despite the decline in area under rubber at a rate of about one per cent a year, an economist said yesterday.

Dr Lim Sow Ching, head of Rubber Economics and Planning Division of the Malaysian Rubber Research and Development Board, said the downward trend in rubber land would not adversely affect Malaysia's total rubber production on the basis of prevailing policies and organised efforts to enhance efficiency and productivity.

He was presenting a paper on "Malaysian Natural Rubber Production: Trend to Year 2000" at an international rubber forum on "Outlook for Rubber - 1990 and Beyond" in London.

Dr. Lim, whose paper was released

continued replacement of rubber by oil palm in the estate sector would see a relatively higher rate of decline of estates - about three per cent compared with 0.4 per cent in small holdings.

Since 1961, a total of 457,000ha under rubber were lost due to the switch to oil palm.

Planted rubber land in Peninsular Malaysia is projected to decrease from 1.67 million hectares in 1985 to 1.45 million hectares towards the year 2000.

Techniques

Dr Lim said the expected rubber output was likely to increase from 1.46 tonnes in 1985 to 1.52 million tonnes in 1990 to 1.63 million tonnes in 1995 and to 1.74 million tonnes in the year 2000.

Production increases are projected to be rather slow at first, at 0.8 per cent a year during 1985 to

elerating to about 1.2 to 1.5 per cent a year in the 1990s.

On the average, production growth will be about 1.2 per cent a year which is much lower than the historical rate of 2.6 per cent a year during 1960 to 1985.

He attributed this to the adoption of improved exploitation techniques and total agronomic inputs.

The high yields of new planting and replanting techniques, carried out in the late 1970s and the first half of the 1980s are also expected to contribute to greater output.

Dr Lim said Malaysia's share of the total world natural rubber output is expected to continue to decline.

Based on projected figures, Malaysia would account for about 30 per cent of the five million tonnes, and 29 per cent of the six million tonnes of total world rubber product, he added.

Rubb. Board bull. 21, No. 4

International Standards of Quality and Packing for Natural Rubber Grades

(The Green Book)

This manual of "International Standards of Quality and Packing for Natural Rubber Grades (The Green Book)" has been published under the direction of Part II. of the Fourth International Rubber Quality and Packing Conference (IRQPC) held in Brussels, Belgium, June 1968 and the authority of the endorsing organizations.

This manual supersedes and replaces "The Green Book" of july 1, 1962 of the same title.

The provisions of this manual become effective with contracts entered into on and after January 1, 1969.

In Part II are described the 35 standard international grades, within eight types, of natural rubber produced only from the latex of the Hevea brasiliensis tree accounting for nearly all of the international trade in dry natural rubber sold on a visual grading basis. The section I of part II is reproduced here:

International Natural Rubber Type and Grade Descriptions

The following general prohibitions are applicable to all of the grades listed in PART II.

1. Wet, bleached, undercured and virgin rubber and rubber that is not completely visually dry at the time of buyer's inspection is not acceptable. (Except slightly undercured rubber as specified for No. 5 RSS)

2. Skim rubber made of skim latex shall not be used in whole or in part in the production of any grade described in PART II. It shall not be used for marking patches as required under packing specifications set out in PART V

Section 1-Ribbed Smoked Sheets

Nothing but coagulated rubber sheets, properly dried and smoked, can be used in making these grades; block, cuttings or other scrap or frothy sheets, weak, heated or burnt sheets, air dried or smooth sheets not permissible.

No. IX RSS

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

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

Oxidized spots or streaks, weak, heated, undercured, over-smoked, opaque and burnt sheets are not permissible.

The rubber must be dry, clean, strong, sound and evenly smoked, and free from blemishes, specks, resinous matter (rust), blisters, sand, dirty packing and any other foreign matter. Small pinhead bubbles, if scattered, will not be objected to.

No Master or Official International Sample has been established for this grade.

No 1 RSS

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

Oxidized spots or streaks, weak, heated, under-cured, over-smoked, opaque and burnt sheets are not permissible.

The rubber must be dry, clean, strong, sound and free from blemishes, resinous matter, (rust), blisters, sand, dirty packing and any other foreign matter, except slight specks as shown in the sample, Small pinhead bubbles, if scattered, will not be objected to.

No. 2 RSS

Slight resinous matter (rust) and slight amounts of dry mould on wrappers, bale surfaces and interior sheets, found at time of

delivery will not be objected to. Should "Rust"or "Dry Mould" in an appreciable extent appear on more than 5% of the bales sampled, it shall constitute grounds for objection.

Small bubbles and slight specks of bark to the extent as shown in the sample will not be objected to.

Oxidized spots or streaks, weak, heated, undercured, over-smoked, opaque and burnt sheets are not permissible.

The rubber must be dry, clean, strong, sound and free from blemishes, blisters, sand, dirty packing and all other foreign matter other than specified above as permissible.

No. 3 RSS

Slight resinous matter (rust) and slight amounts of dry mould on wrappers, bale surfaces and interior sheets, found at time of delivery will not be objected to Should "Rust" or "Dry Mould" in an appreciable extent appear on more than 10% of the bales sampled, it shall constitute grounds for objection.

Slight blemishes in color, small bubbles and small specks of bark permissible to the extent shown in the sample. Oxidized spots or streaks, weak, heated, undercured, over-smoked, opaque and burnt sheets are not permissible.

The rubber must be dry, strong and free of blemishes, blisters, sand, dirty packing and all other foreign matter other than specified above as permissible.

No. 4 RSS

Slight resinous matter (rust) and slight amounts of dry mould on wrappers, bale surfaces and interior sheets, found at time of delivery will not be objected to. Should "Rust" or "Dry Mould" in an appreciable extent appear on more than 20% of the bales sampled, it shall contitute grounds for objection.

Medium size bark particles, bubbles, translucent stains, slightly sticky and slightly over-smoked rubber are permissible to the extent shown in the sample.

Oxidized spots or streaks, weak, heated, undercured, oversmoked (in excess of the degree shown in the sample), and burnt sheets are not permissible.

The rubber must be dry, firm and free of blemishes, blisters, sand, dirty packing and all other foreign matter other than specified above as permissible.

No. 5 RSS

Slight resinous matter (rust) and slight amounts of dry mould on wrappers, bale surfaces and interior sheets, found at time of delivery will not be objected to Should "Rust" or "Dry Mould" in an appreciable extent appear on more than 30% of the bales sampled, it shall constitute grounds for objection.

Large bark particles, bubbles and small blisters, stains, over smoked, slightly sticky rubber, and blemishes of the amount and size shown in the sample are permissible. Slightly undercured rubber is permissible.

Weak, heated, burnt, oxidized spots or streaks are not permissible.

The rubber must be dry, firm, free of blisters, except to the extent shown in the sample. Dirty packing, sand, and all other foreign matter other than specified above is not permissible.

AID TO RUBBER GROWERS IN MALAYSIA

Malaysia's Deputy Prime Minister Ghafar Baba has confirmed that the Malaysian government has approved an allocation of £15 million per year until 1990 to assist rubber smallholders in replanting their old trees. Normally a fund contributed by a 'replanting cess' levied on natural rubber exports finances all replanting activities in the country. This fund is managed by a government agency called the Rubber Industry Smallholders Development Authority. In recent years, however, a decline in rubber exports (and therefore, lower cess collection) plus the increasing cost of replanting has rendered the cess fund inadequate to meet its commitments. The additional funds should alleviate some of RISDA's replanting problems, the Deputy Prime Minister said. Malaysia, the world's leading producer of natural rubber has 1.7 million hectares of rubber trees. More than two-thirds of these are owned by about 500,000 smallholders scattered all over the country. About 32,000 hectares need replanting annually.

"Puncture Tapping" of Rubber Trees for early yield

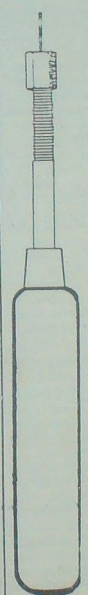
P K NARAYANAN

Deputy Director (P & PR), Rubber Board, Kottayam-1.

Budded rubber trees are normally tapped when they attain a girth of 50cms (20 inches) at a height of 125cms (50 inches) from the bud union in the ground. On an average it takes 7 years for a rubber tree to attain this girth. This is considered too long a gestation period for the farmer to wait.

A recent study at the Rubber Research Institute of India categorically reveals that the rubber trees could be subjected to a new method of exploitation called 'Puncture Tapping' as soon as they attain a girth of 43 cm (17inches) i. e. one year before the prescribed girth for tapping under the conventional system is attained.

"Puncture tapping" is the process by which a needle like device is used to "injure" the stimulated bark of the rubber tree by puncturing and cause exudation of latex. While subjecting the bark to "controlled wounding" by puncturing, care should be taken to see that the needle does not injure the cambium lest it will cause swellings and uneven growth on the tapped portion of the trunk. To ensure this, the length of the needle used for puncturing is adjusted in such a way that it penetrates only up to a depth safely leaving 1 mm still to reach the cambium This optimum length of the needle is ascertained and adjusted by gauging the correct depth of the bark through a random test check among the trees in a holding, set to be tapped the new way. The length of the needle is then regulated by a hexagonal nut fixed at the base of the needle by rotating it up or down. The tip of the needle should be kept blunt and not sharply pointed.



'Needle Knife' used for Puncture Tapping

Subjecting the rubber trees to "Puncture tapping" one year early, not only does not cause any adverse effect to the trees but also brings in an extra, early yield of over 300kgs of rubber per hectare in a year, which fetches a gross income of about Rs. 5000/-. Leaving the cost to be incurred for stimulation, puncturing and processing, the net return could be anything between Rs.2500 to 3000 per hectare.

'Puncture Tapping' technique

"Puncture tapping" is recommended to be done either above or below the point at which panels for tapping under the conventional system are to be opened. Puncturing of the bark using the 'needle knife' is performed on a panel, of length 50cm and width 1.5cms. After such a panel is marked, the dry rough outer bark within that panel is gently scraped at first, to make that portion smooth. Over scraping, resulting in the bleeding of latex should positively be avoided. Then a thin film of a chemical stimulant, called Ethephon, is smeared using a brush on this panel. The stimulant should be diluted to a concentration of 2.5% by adding 3 times the quantity of water, as the chemical

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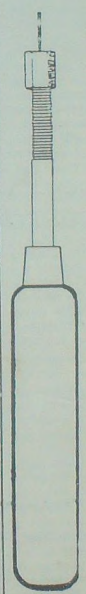

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available in the market under the trade name "Ethephon" is of 10% concentration stimulated panel is ready for puncturing.

At a time 10 punctures are made in succession, lengthwise, in the stimulated panel. Within seconds of puncturing, latex will start oozing out of the punctured holes in the bark. The stream of latex flowing down the punctured holes should be connected so as to move down in one line and drip into the shell fixed at the bottom of the puncture tapped panel through a metallic spout.

Puncture tapping should be done only every alternate day. The points in the panel, punctured once, should not be pierced again. Every time puncturing should be done at new points within the panel. A 50cm×1.5cm panel can be effectively puncture tapped for a month on the alternate daily system i.e. 15 days in a month.

After one month, another panel of the same size is marked, 4-5cms away from the first panel at the same level. This is stimulated and puncture tapped during that month. The same course is repeated round the full circumference of the tree. About 10 panels will have to be made one after the other for puncture tapping in one year, at the rate of one panel per month, giving allowances for periodical breaks caused due to rain and other climatic hazards.

By then, the trees would have attained the prescribed girth for tapping them under the conventional system. One of the beneficial effects of puncture tapping observed is that, when the trees are put on conventional system after one year's puncturing, the initial yield under the conventional system is found to be slightly more than what is usually realised. Also, as a result of puncture tapping, rubber trees are found to be girthing faster.

Though not practised at all in India, Puncture tapping is being adopted in Malaysia, Indonesia & Thailand. Once the rubber producers in India accepts this technique it will enable them to realise early yield resulting in reduction of the gestation period of rubber by a year. Another gainful feature of Puncture Tapping is that it does not require any special skill at all, whereas slicing of bark at uniform thickness using special tapping knives in the traditional system calls for intensive practice, training and skill.

To begin with Puncture Tapping is recommended to be adopted in the rubber plantations in our country only on an experimental basis. Wide spread practice is to be made only after the physical gains of this technique are convincingly proved, commercially

POLYMER REINFORCED CEMENT

Cement bottle caps, Cement hi-fi equipment, cement springs —several English and Irish researchers are deriving new strength and versatility from an old-fashioned construction material, the glue that holds concrete together.

Compared to metals and plastics, cement is inexpensive. Marking the dry powder takes less energy than making plastics or metals and requires only cheap, plentiful raw materials-chalk and clay. Blending in a bit of water creates a mouldable paste that hardens at normal temperatures, and the final product is an incombustible solid that a three-tone truck won't crush.

Cement does have drawbacks. Bend a piece and it breaks like dry spaghetti. Drop something on it and it cracks. But abalone shells, also made of chalk, are stiffer than aluminium, as tough as plexiglass, and 10 times more resillent than cement.

Researchers at Imperial Chemical Industries (ICI) found millimetre long holes in cement which causes the lack of resillence. Abalone shells have no such holes. Their crystals are orderly and tightly packed.

JCI researchers discovered that they could copy the structure of abalone crystals by kneading unhardened cement to remove troublesome air bubbles. They add a water-soluble organic polymer that causes the cement particles to slide easily over one another, melding together. As the polymer dries, it pulls the grains in even more closely.

This new "macro-defect-free" (MDF) cement has holes no more than a hundredth of a millimetre long. Since its resilience is 30 times that of ordinary cement, a spring made of it can tolerate 300 pounds of tension. The cement is also tough: a conventional lathe can turn a block of it into a tube without cracking it. And when reinforced with nylon fibres. MDF cement can take over 1,000 times as much impact as ordinary cement.

Load-bearing floors, ceilings, and partitions of MDF cement would be strong and soundproof. Pipes and containers would be resistant to solvents, acids, and alkalies. Freezing and thawing would not harm them, either, because at very low temperatures MDF cement becomes strong but not more brittle. It fails to hold up well outdoors or in water, however: either the polymer leaches out or the solid goes soft.

At Ulster Polytechnic in Belfast, Northern Ireland, scientists reinforce cement with a fabric woven of polypropylene. Adding fibres to cement impedes the growth of cracks, inereases flexibility, and helps hold the solid together.

(PTI Science Service)

PROSPECTS OF RUBBER PLANTING IN GOA

Goa holds promising potential for successful adoption of rubber cultivation among the states considered nontraditional in respect of this crop. This conclusion was drawn up after conducting successive exploratory surveys and trials there.

The Union Territory of Goa, Daman and Diu lies between 14.5 ° and 16° North latitude and is clearly outside the areas where rubber is traditionally being planted. But this region presents agro-climatic conditions which are fairly congenial for economic cultivation of rubber.

Flanked by the Arabian sea on the west and western Ghats on the east, the landscape of Goa is marked by hills and mountain ranges interspersed by rolling and undulating lands, flood plains of rivers, marshy lands and salt pans and coastal plains. Most of the lands lie between Mean Sea level and 350 metres above. Soils predominate in laterite formations. In certain tracts closer to the coast, large stretches of laterite sheet formations are found exposed. At other places shallow to deep soil cover also exists. The lands are by and large subjected to extensive soil erosion and mostly denuded. The soils are generally lateritic, coarse and well drained. Natural vegetation is mostly tropical, moist, deciduous type.

Annual rainfall varies from about 3000 mm in coastal areas to 5000 mm in foot hills. The rains are confined to the months from June to November. Remaining period of the year is dry. Average temperature ranges from 23° c and rises at times to even 42° c. Humidity is relatively high and maintained between 80%-95%.

Rubber has been grown in the region on small scale trial basis as early as 60 years ago. One such planting was done by the Portugese at a place near Sanguem in Goa. The vegetative growth of the trees here is fair and indicative of good potential. Unfortunately the trees existing here have not been subjected to any systematic tapping.

Since 1960, the Forest Department of Goa, Daman & Diu have been undertaking progressive planting of rubber with the active assistance of the Rubber Board. In the initial years the plantings were done by them purely on a trial basis. As the results were encouraging they switched on to commercial scale. A number of individual entrepreneurs also followed suit, which has helped in spreading rubber cultivation to well over 700 hectares in Goa. This example of Goa has motivated the Development Corporation of Konkan in Bombay for taking up rubber cultivation and they have embarked on an ambitious programme in Sindhudurg District from this year onwards.

The average yield of rubber from the plantations owned by the Forest Department in Goa is reported to be about 450 kg per hectare per year. This does not reflect the true potential since the areas now being tapped are not planted with high yielding materials and certain amount of failures occurred in these earlier plantations. The best areas among them yield up to 1000 kg per hectare per year. The Plantings done now are using better clones capable of yielding 1½ to 2 tons per hectare.

As non-traditional in respect of rubber, the climatic constraints experienced for this crop in Goa and South Konkan are excessive intensity of rain fall for about four months and prolonged drought extending to about six months in a year. These deleterious effects could be offset, if rigourous care is exercised in the selection of site, choice of planting materials, adoption of cultural practices and plant protection. The factors which should weigh while selecting sites for planting rubber here are adequacy of soil depth, capacity to retain soil moisture at sub-soil level during dry periods and availability of water for light irrigation. Planting of polybagged plants of vigourously growing and disease resistant clones, establishment of good ground covers, protection of plants from diseases and sun scorch, irrigation during early years and rain guarded tapping in mature areas are other conditions that ensure economic yield of rubber.

Cost of production of rubber in Goa could be relatively low in view of good availability of land and infra-structural facilities, reasonable cost of labour etc. In view of the proximity to Bombay which is the major rubber consuming centre in the country, rubber produced in Goa can enjoy a better market than elsewhere in the traditiona areas.

In a bid to popularise rubber planting in Goa the Rubber Board proposes to launch a promotional campaign through out the te ritory by organising group meetings in various parts to educate prospective growers on the advantages of the crop. The Rubber plantation Development Scheme of the Rubber Board, which is already being impleme-

nted in Goa provides the following incentives.

(a) A non-returnable grant of Rs.5,000/-per hectare paid in seven annual instalments for subsidising cost of cultivation and maintenance of plantation during pre-bearing period of 7 years.

(b) Long term agricultural loans at the rate of Rs. 13,800/- per hectare from Banks for supplementing the Board's subsidy, in order to meet the entire cost of cultivation. There is a moratorium on payment of interest chargeable by the Banks for the first 7 years. The accrued interest is payable during the 8th and 9th year. Repayment of loan principal together with the current interest is spread over 5 years thereafter.

(c) 3% of the interest on loans will be paid to the Banks direct by the Rubber Board as an additional cash subsidy. The growers share of the interest will therefore stand reduced to 9.5%.

(d) Free supply of high yielding planting materials. If polybagged plants are used for planting the cost of the same will be reimbursed at the rate of Rs.4/-per plant.

(e) Free advisory and extension services.

Costs and Benefits

The direct cost of land preparation, planting and maintenance up to maturity of a hectare of rubber plantation is estimated at Rs.18,800/- in the non-traditional regions like Goa. Well maintained plantations would yield an average of 1500 kg of dry rubber per hectare per year. Economically productive period is 25 years starting from the 8th year of planting. At the prevailing price of Rs. 16/- per kg the gross income will be around Rs. 24,000/-. The net income before tax can be anything between Rs. 10,000/- to Rs. 15,000/-.

The economic and social benefits of rubber planting can be summed up as follows:-

1) Enables productive and economic utilisation of cultivable fallows and under utilised lands.

2) Generates rural employment.

3) Provide viable alternative to jhumming.

4) Affords soil conservation.

5) Brings about environmental improvement.

6) Opens up avenues for new rubber based industries.

7) Supplies timber, oil, oil-cake and honey.

8) Add revenue to the Public exchequer.

The present production of natural rubber in India is only 2,20,000 tonnes against the projected demand of 2,54,000 tonnes. By 2000 AD the demand is estimated to be 5,00,000 tonnes. Major part of this additional production has to come from the plantation to be propagated in non-traditional regions like Goa, which are suitable for rubber cultivation.

To take up the work relating to development of rubber plantations in Goa the Rubber Board has already opened a full fledged Regional Office at Ponda. New Field Extension Centres at vantage points in different parts of the state would also be established shortly on a need based fashion.

— P K Narayanan

MODIFIED RUBBER FOR TOUGH USES

The declining natural rubber industry is hoping for a boost to its fortune from a completely different type of rubber which the Malaysian Natural Rubber Producers Laboratory at Hertford has developed.

Called epoxidised natural rubber(ENR) the product is a chemically modified form of rubber. The laboratory says it is so different from its natural counterpart, it is wholly a new product.

The industry believes, that it will open up huge new markets for natural rubber, including the biggest market of all, tyres for familiy cars.

Natural latex is treated with hydrogen peroxide and formic acid for 24 hours. This causes a proportion of the double bonds between carbon atoms to be transferred to epoxy groups. The resulting ENR absorbs impacts more slowly and less bouncily than natural rubber. This makes it good for vibration–absorbing mountings for engines, and could also make it suitable for use as the rubber mountings for buildings in earthquake–prone areas.

Reporting the new development, a British science journal says the ENR is also more resistant to penetration by oils or gases, which makes it suitable for use as rubber seals in pipes carrying oil or gas. It has good grip on wet surfaces and wastes less energy as it rolls over surfaces–UNI

Rubb. Board bull. 21, No. 4

Use of Solar Energy for the Drying of Crepe Rubber Part I Model Solar Collector and Drying Tower

N C C Walpita, M D R J Goonatilleka and S Weerasinghe

Summary

A model flat plate solar collector having collector area of 4.86 m² coupled with a model crepe drying tower of dimensions: 2.4 mX 2.4mX3.6 m and total capacity of 200 kg has been installed. The performances of the collector in the context of drying of crepe laces has been evaluated. It has been found that the drying rate when using a solar collector is much higher than the drying rate at ambient temperature. The performance of this system has been used to validate the theoretical analysis of a collector, capable of handling the complete heating load in an actual drying tower.

Introduction

To maintain good quality in crepe rubber, it should be manufactured under well controlled conditions. As such, drying plays a very important role, since, insufficient drying can cause mould growth and excessive temperatures can cause tackiness and discolouration due to oxidation. The best drying temperature is usually around 34°C.

Crepe rubber is usually dried as thin laces within specially built drying towers through which hot air is circulated. Lofts above factory floors are also sometimes used. Hot water to heat the air, circulates by thermosiphon action from the boiler to the radiators, which are installed at the lowest level of the tower.

It is estimated that rubber factories annually use in excess of 20,000 MT of firewood for heating purposes. The wood used is mainly rubber wood produced on each estate from trees lost by wind damage and disease and due to replanting programmes. In the present context, it is worthwhile investigating methods of conserving this valuable resource.

Tharmalingam (1980) investigated and popularised the use of electrical heating systems about 10 years ago, when electricity was very much cheaper than today. Electrical heating systems were found to be efficient and reliable but the present high cost of electricity and uncertain supply has meant that most estates with installations have discontinued its use.

The other freely available source is solar energy. The Rubber Research Institute (RRI) of Malaysia have carried out a number of experiments on this subject. Tharmalingam and Perera (unpublished data) started studies on solar drying of rubber at RRI Sri Lanka. A model collector and drying tower were constructed but only preliminary studies were done.

In this paper, the authors present the results of a series of experiments using a specially designed model collector and tower. A simple theoretical analysis is also done and some aspects of a basic collector *i.e.* the space between the roof and loft in a factory, are discussed.

Experimental

Solar collectors fall into two broad categories *i.e.* concentrating collectors and flat plate collectors. In the former the rays of the sun are collected and concentrated opticaly by means of suitably arranged reflecting surfaces or lenses. The most common example is a parabolic tough type collector in which the rays are concentrated on to a pipe which runs along the focus of a reflecting parabolic mirror. In the flat plate type of collector, the sun's rays heat up a flat surface from which heat is gathered by a gas or liquid medium flowing through the collector.

Concentrating collectors are capable of producing very high temperatures in the range 100°C –500°C or even higher. The maximum temperature required in drying towers is only about 34°C. Hence no purpose is served by using a concentrating collector. Flat plate collectors are capable of producing temperatures in the range 40–100°C. Since hot air is the medium which picks up the moisture from the crepe rubber, an air heater type solar collector is best used for these purposes.

The model collector installed at the RRISL, Ratmalana, consisted of a flat box in which the lower surface was matt black painted GI sheet (Fig. 1) (which acted

as the absorber plate). The top surface consists of panes of window glass supported on a steel framework and sealed by a rubber compound. The sides of the collector were made of flat asbestos sheets. Heat loss from the absorber plate to the ground is prevented by a layer of insulation. The total collection area was 4.86 m².

Air was blown through the collector by means of a small axial flow fan, the speed of which was controlled by a regulator. Air from the collector is fed by a 15 cm drainage pipe into the model drying tower.

The drying tower dimensions were approximately 2.4mX2.4m X3.6m high and has a capacity of about 200 kg of laces. In the centre, a "brick pit" has been constructed to act as a container for gravel which was to be used for heat storage. Hot air from the collector was routed through the bed. Gravel of about 2.5 cm size to a depth of about 30 cm was used in these series of experiments. However, no attempt was made to measure the effectiveness of the bed as it was felt that further study of this type of heat storage bed was necessary.

Results

Collector performance

Initially, the collector was tested on its own, disconnected from the drying tower. Air inlet and outlet temperatures and inlet air flow rates were monitored over periods of about 8–9 hours. A typical inlet and outlet temperature vs. time curve is given in Fig. 3.

The equation for temperature rise and efficiency in a flat plate air heater type solar collector is of the form

$$\Delta T = \frac{S}{U_L}\left[1 - e^{-\alpha/\nu}\right] \quad \ldots\ldots(1)$$

$$\eta = \frac{PC_P\nu}{U_L}\left[1 - e^{-\alpha/\nu}\right] \quad \ldots\ldots(2)$$

Where $\alpha = \frac{F' U_L}{PC_P}$ $\ldots\ldots(3)$

(See also Appendix I)

η = Efficiency

S = Solar Energy received on to solar collector

U_L = Overall heat loss coefficient from absorbing (i.e. air) to atmosphere

P = Density of air

ν = Air volume flow rate per unit surface area of solar collector

F' = Efficiency factor due to heat loss from absorber plate to atmosphere

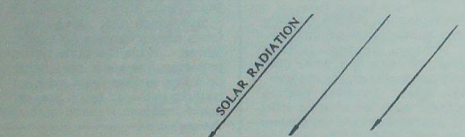
C_P = Specific heat of air

ΔT = Temperature rise across the collector

Replacing the various constants with values obtained empirically by investigators at the Malaysian Rubber Producers' Research Association (MRPRA) Matherell (1978).

$$\Delta T = 267\ R\ (1 - e^{-0.011/\nu})$$

$$\eta = 267\ \nu C_P\ (1 - e^{-0.011/\nu})$$



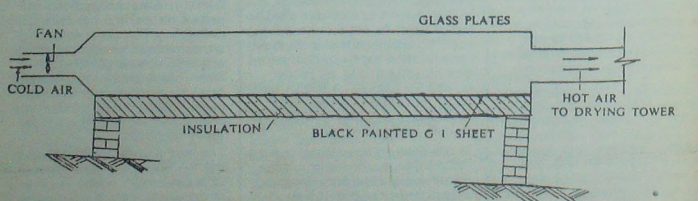


Fig. 1 Solar Collector

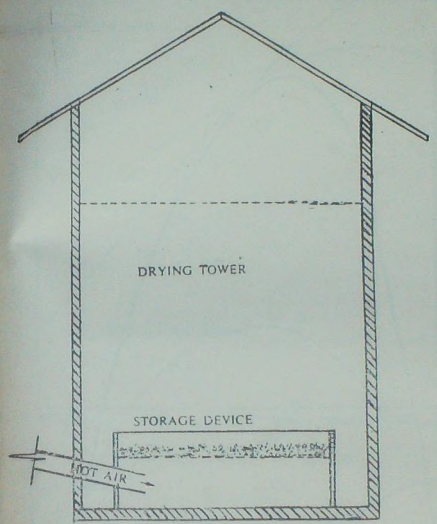


Fig. 2 Hot Air Distribution and Storage Device

Average temperature rise is estimated from:

$$\Delta T \text{ average} = \frac{\sum_{1}^{n} \Delta T}{n}$$

(the graph is divided into n eqnal intervals along the x axis)

Air flow rate $= 10.4 \text{ m}^3/\text{min}$

$\therefore$ Total heat pickup, by air $= 10.36 \times 0.24 \times 6.61 \times 600 \times 1.1$
$= 10{,}318$ kcal

The experiment was carried out in December 1983. Using an average insolation figure for this month of 0.0867 kcal/m/sec as provided by the Meteorological Department of Sri Lanka.

Total heat incident on the collector over a 10 hour period $= 0.0867 \times 3600 \times 10 \times 4.86$
$= 15{,}169$ kcals

$\therefore$ Collector efficiency (from measured values) $= \frac{10{,}368}{15{,}169} = 68\%$

Collector efficiency (from equation 5) $= 61\%$

Collector temperature rise (from equation 4) $= 6.1°C$

Where R is solar energy received and the units are kcal/cm²/sec. The units of ν and C_P are m³/(sec.m²) and kcal/(m³. K. sec) respectively.

From Fig. 3, average temperature during the period of the experiment = 6.61°C.

Hence the theoretical equations (4) and (5) give a reasonably good prediction of solar collector performance.

Drying tower performance.

After the tests on the solar collector standing alone were completed, the collector was connected up to the drying tower and a further series of tests carried out with an empty tower.

Collector inlet air temperature, and tower internal temperature were monitored at various times during the course of a day, on several occasions. Different air flow rates were used. The results are shown in Figs. 4 to 8.

In all cases, it was found that tower internal temperature rose above ambient temperature only after 11.00 a. m. even though the collector supplies hot air from about 9.00 a.m. onwards. This can be attributed to the thermal inertia of the cooler air accumulated within the tower overnight, with which the incoming air from the collector mixes initially. This effect is not expected to arise in cases where overnight heating is carried out by means of stored heat or auxiliary heating systems.

Equally, the thermal inertia within the tower caused temperatures to remain above ambient even after the collector was shut down each day at 6.00 p. m. It was observed that elevated temperatures were maintained until about 7.00—7.30 p.m.

As mentioned earlier, no effort was made to quantify the effect of the stone bed in the tower. The maximum internal temperature obtained in the tower during these experiments was 37.7°C.

Drying of crepe laces

After completing experiments, with the tower empty, some experiments were carried out with wet laces. In every case, the weight before drying was 50 kg.

Collector inlet air temperature, drying tower internal temperature and inlet and tower humidities were monitored. Moisture content was measured periodically by removing small samples and weighing immediately after removal and after drying in an electric oven. Tower inlet air flow rates were also measured.

The results of one set of experiments is presented in Fig. 9. A control experiment was also carried out using only ambient air. It can be seen that the drying rate is much higher when using the collector.

Drying rate with solar heated air = 0.28% per hour

Drying rate with ambient temperature air = 0.16% per hour

Discussion

There are spaces between the ceiling and roof in a rubber factory building. In many cases, it has been found that the air within the space reaches a fairly high temperature on bright sunny days. For example, at Padukka State Plantation Factory, maximum temperatures of about 34.4°C have been recorded at 12 noon—1.00 p. m. on bright sunny days.

In fact, this space corresponds to a collector of the uninsulated type, whose major characteristic is a high heat loss coefficient This would lead to rapid cooling. at all times other than when there is direct sunlight on the roof.

The MRPRA has also investigated this type of collector and recommend it as a cheap alternative to a purpose built collector. especially where the space is already available.

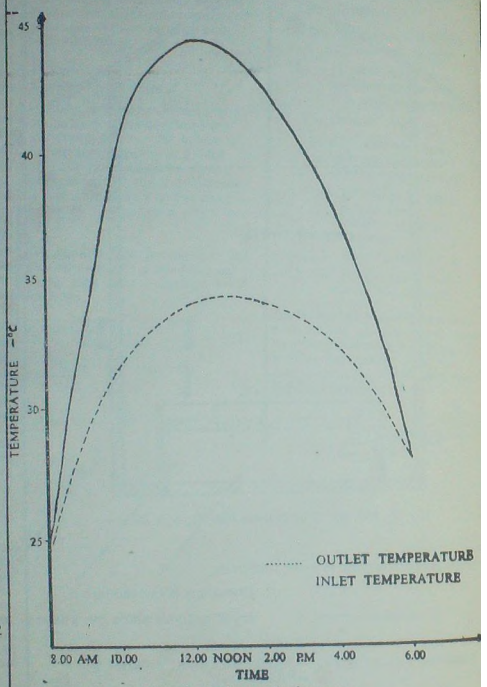


Fig. 3 Collector Performance

ments on the drying of crepe rubber using solar energy, without back up heating or significant heat storage.

Experiments with the model collector have also enabled validation of a theoretical analysis which can be used in collector design. Full size collectors which are capable of handling the

gned and fabricated for installation at RRISL, Dartonfield. The use of suitable heat storage methods and auxiliary heating for periods with little sunshine will also be investigated.

Roof loft type systems for the utilisation of solar energy will also be investigated in collaboration with a rubber estate where suitable space is already available

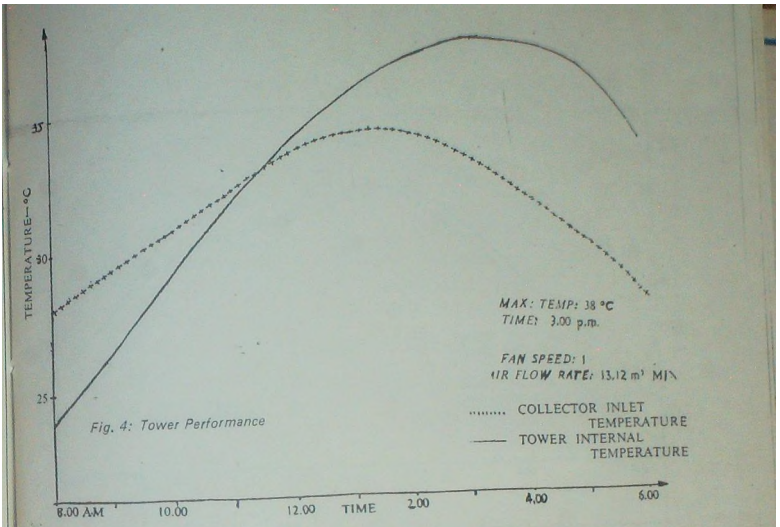


Fig. 4: Tower Performance

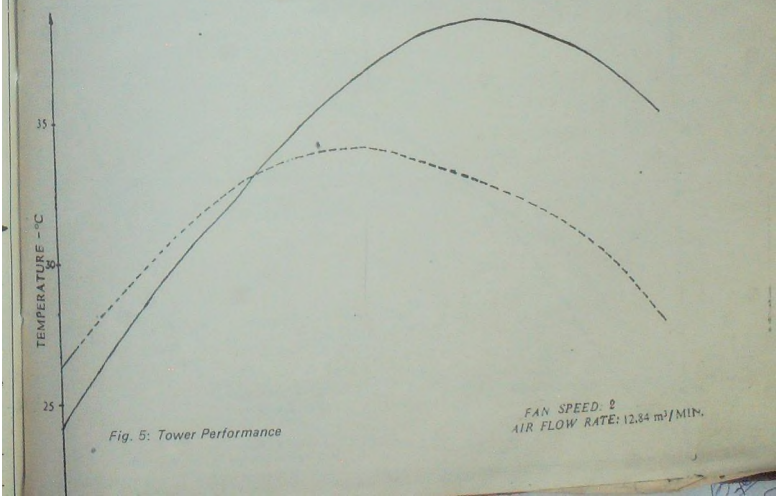


Fig. 5: Tower Performance

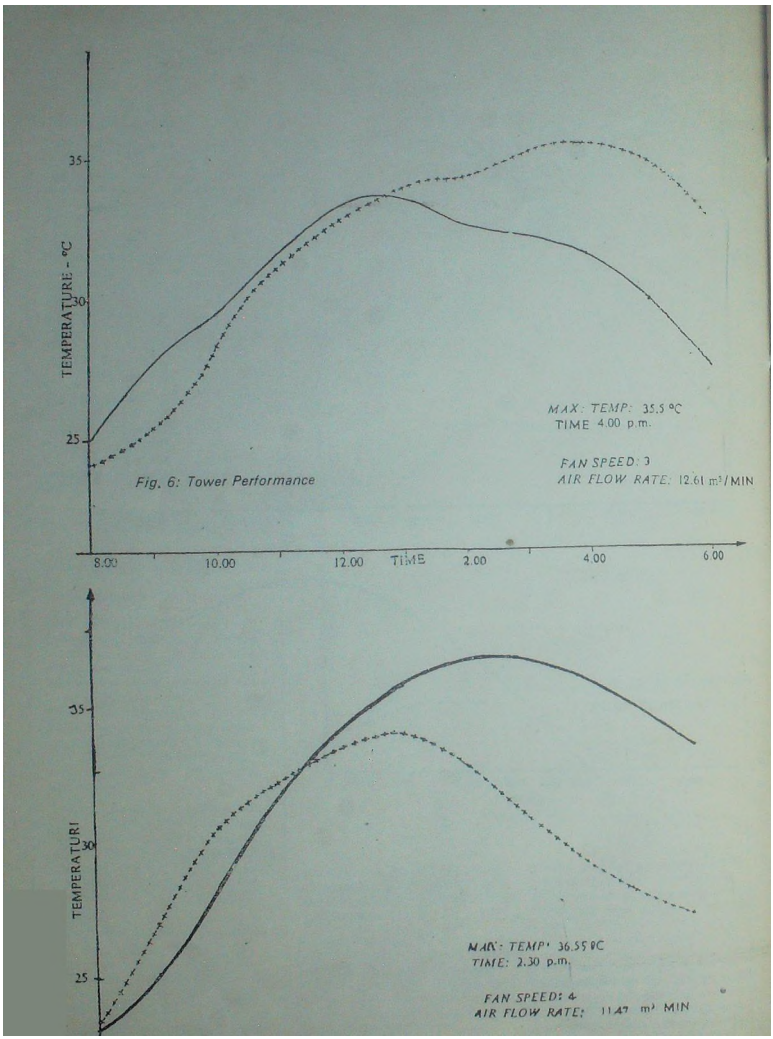


Fig. 6: Tower Performance

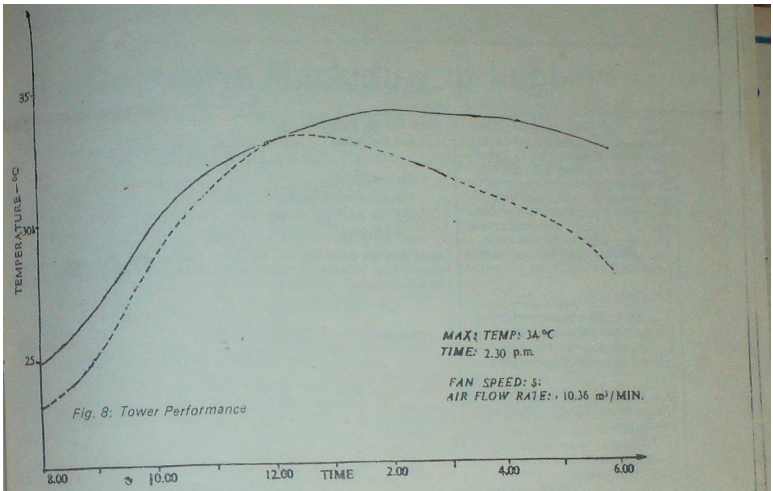


Fig. 8: Tower Performance

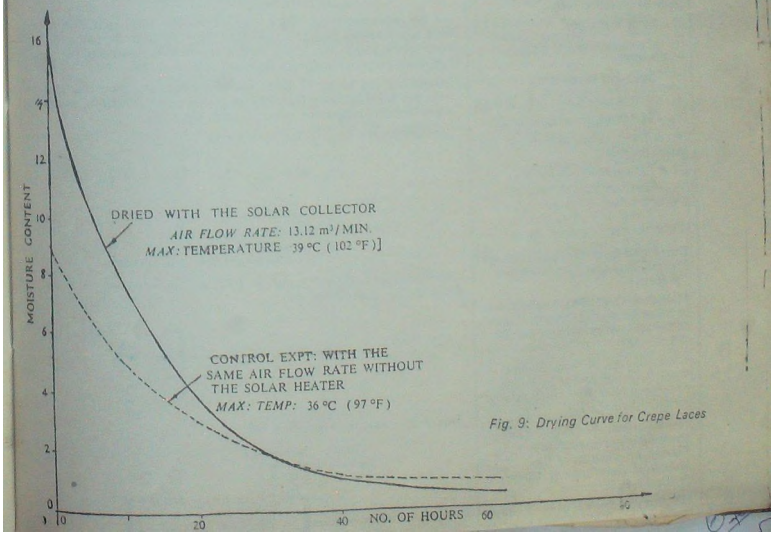


Fig. 9: Drying Curve for Crepe Laces

losses will take place by radiation from the absorber plate to the cover plate and by a combination of radiation and convection from the cover plate to the atmosphere. Heat loss will also take place from the fluid to the cover plate, by convection. Heat is gained by the fluid from the absorber plate by convection processes.

Notation

h_1 = Convection heat transfer coefficient from fluid to the glass.

h_2 = Convection heat transfer coefficient from absorber plate to fluid.

h_r = Radiative heat transfer coefficient from absorber plate to cover glass.

U_t = Combined convection and radiation coefficient from cover glass to atmosphere.

U_b = Heat loss coefficient from rear of absorber plate.

S = Total insolation

q_u = Heat gain by the fluid in element

T_a = Ambient temperature

T_c = Temperature of cover glass

T_f = Temperature of fluid at x

$T_{f,o}$ = Temperature of plate at the collector exit

T_p = Temperature of plate

$T_{i,o}$ = Temperature of fluid at collector inlet.

References

Duffie and Beckman. Solar Energy Thermal Process. Van Ntosrand Company.

Matherell, C. (1978). Application of Solar Energy to Drying Rubber *M.R.P.R.A. Development* No. 67 (13-10-78).

Tharmalingam, R. and Goonatilake, R. Development in drying of crepe rubber from solar energy (unpublished work)

Tharmalingam, R. (1980). Solar powered crepe drying tower. *Karmantha, Journal of the Industrial Development Board,* Sri Lanka 8, 9.

From Energy Balance,

For the cover

$$(U_t U_b)(T_a - T_c) + h_r (T_p - T_c) + h_1 (T_f - T_c) = 0$$

For the fluid

$$h_1 (T_c - T_f) + h_2 (T_p - T_f) = q_u$$

For the absorber plate

$$S + h_2 (T_f - T_p) + h_r (T_c - T_p) = 0$$

Note that the back loss is added to the cover loss coefficient to atmosphere, as otherwise the equations would become too unwieldy. By manipulating, we obtain,

$$q_u = F^1 S + U_o (T_f - Ta)$$

Where; $F_1 = \dfrac{1}{1 \times \dfrac{h_r (U_t + U_b)}{(h_r h_1) + h_2 (U_t + U_b) + (h_2 h_r) + (h_1 h_2)}}$

$$U_o = \frac{U_t}{1 + \dfrac{U_t (h_2 + h_r)}{(h_1 h_2) + (h_1 h_r) + (h_2 h_r)}}$$

Or; $q_u = F^1 [S + U_t (T_1 - T_a)]$ .....

Where $U_L = \dfrac{(U_t + U_b)}{1 \times \dfrac{(U_t + U_b) b_2}{(h_1 h_2) + (h_1 h_r) + (h_r h_2)}}$

i. e. the equation is now in a form where the total heat gain by the fluid is controlled by a factor F^1 ($0 < F < 1$), called the collector efficiency factor and a heat loss coefficient which is related to the temperature difference between the fluid and ambient air.

Essentially, the factor F^1 arises because heat loss takes place not only from the fluid but also from the absorber plate, which is usually at a significantly higher temperature than the fluid.

Considering the fluid in the element δx

$$q_u = mC_p \frac{dT_f}{d_x} \delta_x = F^1 [S - U_l \cdot (T_f - T_a)] W. \delta_x,$$

where

m = mass flow rate
w = width of the collector
C_p = specific heat of air
v = collector air flow per unit area

Therefore solving the first order differential equation and applying boundry conditions; we get:

$T_i = T_a$ at $X = 0$

$$\Delta T = (T_{f,o} - T_a) = \frac{S}{U_L} \left[1 - e^{-F^1 U_l / PC_p V} \right]$$

Since $\dfrac{m}{WL} = PV$

Therefore, collector efficiency, is:

$$\eta = \frac{m C_p (T_{f,o} - T_i)}{SW_L}$$

$$PC_p V \left[1 - e^{- F^1 U_L / PC_p V} \right]$$

Co-Operative Marketing in Rubber

P. K. George

o not feel that I have much to
y on rubber bands except brief-
you about marketing of rubber
co-operative style and also to
praise you what we can do
the overall context as a mark-
ing organisation. Therefore this
per is not being presented to
u as a scholastic study paper.
is will confine to the origin,
owth and future plans of the
deration. This will only be a
tailed analysis of the marke-
ng scope of rubber and rubber
oducts under the Cooperative
stem, which is facing the chal-
nge from independent traders
the field.

he Kerala State Cooperative
ubber Marketing Federation
td. popularly known as Rubber
ark has become the single lar-
est supplier of natural rubber
India selling approximately
1,000 M.tonnes per annum.
his commendable position in
he rubber market has enabled
he Rubbermark to safeguard
he growers without going to
distress sales during the peak
production season, as we were
ble to control the price fluctu-
tions to a very great extent.

The idea of marketing rubber
through Co-operatives was
mooted by the Rubber Board
in 1960s when the production of
natural rubber in the country
was less than 50,000 tonnes.
During this period, rubber indu-
stry had not grown enough to
assure a steady demand for
rubber. This led wide fluctua-
tions in price of natural rubber
and consequent exploitation by
middle men creating number of
marketing chains. There were
minimum 3 to 4 agencies bet-
ween the producer and the
consumer of natural rubber.
Rubber being a seasonal crop,
the exploitation was acute and
intolerable during the peak prod-
uction season and this led to
rural indebtedness among the
small rubber growers. In the
initial stage, there were only a
handful of societies in this field
and in 1970, when there were
more than 30 primary rubber
marketing societies in the State,
an apex body of these societies
was formed.

The apex Federation started its
live participation in rubber busin-
ess from 1972 onwards. The
necessity of applying the latest
marketing technique in rubber
is called for because of the
seasonal variation in production
as well as grades from month
to month compared to steady
and planned requirement by major
consumers viz. Tyre companies.

Organisational set up.

There are 33 primary rubber
marketing cooperative societies
affiliated as members of the
Federation and the total individual
members of all these societies
are more than 50,000 growers.
These growers sell their produce
to the societies and the societies,
after grading the rubber, will
give a premium for grade rubber.
Rubber thus collected will be
entrusted with the Federation
for selling to terminal points and
to the consuming industry. Since
there is no exploitation by middle-
men or other agencies, the
societies will fetch the highest
price possible for their produce.
The profit generated by the Fede-
ration is divided among the mem-
ber societies and the societies
will give a share of this to their
grower members. Besides profit
sharing, primary societies help
their members by distributing
the agricultural inputs and other
requirements supplied by the
Federation under various schemes.
Plant portection operation is
also undertaken by the Federa-
tion on nominal charges. Educat-
ing the growers on making grade
rubber, maturing in time and
imparting knowledge on scien-
tific management in small holding
etc. are also undertaken by the
Federation at different levels
among the societies and memb-
ers.

All of you are a ware that Rubber
Board and the Federation have
been solely responsible for
ensuring a remunerative price
to scrap rubber, which was being
sold at throw away price by
small growers who were at the
mercy of unscrupulous scrap colle-
ctors. Establishment of 6 crumb
rubber factories created aware-
ness among all growers about
the worth of the scrap and this
has enabled them to feel that
their small holdings is an econo-
mically viable venture.

Apart from the main activities,
viz. rubber procurement, sales,
processing of crumb rubber, dist-
ribution of fertilisers and other
agricultural inputs, aerial spray-
ing etc., Rubbermark also adopts
latest marketing techniques to
meet the challenges from more
than 3000 dealers and other
intermediaries. Rubbermark also
undertakes sales promotion acti-
vities and advertisements. Rubb-
ermark has a net-work of seven
sales branches in New Delhi,
Bombay, Calcutta, Faridabad,
Ghaziabad, Jalandher and Ahme-
dabad and 6 purchase depots
in Trivandrum, Vithura, Punalur,
Arakunnam, Nilambur and Iritty.

As the Federation of small scale
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price is the incentive for increas-
ing productivity. As a respon-
sible Cooperative organisation,

losses will take place by radiation from the absorber plate to the cover plate and by a combination of radiation and convection from the cover plate to the atmosphere. Heat loss will also take place from the fluid to the cover plate, by convection. Heat is gained by the fluid from the absorber plate by convection processes.

Notation

h_1 = Convection heat transfer coefficient from fluid to the glass.

h_2 = Convection heat transfer coefficient from absorber plate to fluid.

h_r = Radiative heat transfer coefficient from absorber plate to cover glass.

U_t = Combined convection and radiation coefficient from cover glass to atmosphere.

U_b = Heat loss coefficient from rear of absorber plate.

S = Total insolation

q_u = Heat gain by the fluid in element

T_a = Ambient temperature

T_c = Temperature of cover glass

T_f = Temperature of fluid at x

$T_{f,o}$ = Temperature of plate at the collector exit

T_p = Temperature of plate

$T_{i,o}$ = Temperature of fluid at collector inlet.

References

Duffie and Beckman. Solar Energy Thermal Process. Van Ntosrand Company.

Matherell, C. (1978). Application of Solar Energy to Drying Rubber *M.R.P.R.A. Development* No. 67 (13-10-78).

Tharmalingam, R. and Goonatilake, R. Development in drying of crepe rubber from solar energy (unpublished work)

Tharmalingam, R. (1980). Solar powered crepe drying tower. *Karmantha, Journal of the Industrial Development Board,* Sri Lanka 8, 9.

From Energy Balance,

For the cover

$$(U_t U_b)(T_a - T_c) + h_r (T_p - T_c) + h_1 (T_f - T_c) = 0$$

For the fluid

$$h_1 (T_c - T_f) + h_2 (T_p - T_f) = q_u$$

For the absorber plate

$$S + h_2 (T_f - T_p) + h_r (T_c - T_p) = 0$$

Note that the back loss is added to the cover loss coefficient to atmosphere, as otherwise the equations would beccme too unwieldy. By manipulating, we obtain,

$$q_u = F^1 S + U_o (T_f - Ta)$$

Where; $$F_i = \frac{1}{h_r (U_t + U_b) \times (h_r h_1) + h_2 (U_t + U_b) + (h_2 h_r) + (h_1 h_2)}$$

$$U_o = \frac{U_t}{U_t (h_2 + h_r) \times (h_1 h_2) + (h_1 h_r) + (h_2 h_r)}$$

Or; $$q_u = F^1 [S + U_t (T_t - T_a)] \ldots\ldots\ldots\ldots\ldots\ldots$$

Where $$U_L = \frac{(U_t + U_b)}{(U_t + U_b) b_2 \times (h_1 h_2) + (h_1 h_r) + (h_r h_2)}$$

i.e. the equation is now in a form where the total heat gain by the fluid is controlled by a factor F^1 ($0 < F < 1$), called the collector efficiency factor and a heat loss coefficient which is related to the temperature difference between the fluid and ambient air.

Essentially, the factor F^1 arises because heat loss takes place not only from the fluid but also from the absorber plate, which is usually at a significantly higher temperature than the fluid.

Considering the fluid in the element δx

$$q_u = mC_p \frac{dT_f}{d_x} \delta_x = F^1 [S - U_l \cdot (T_f - T_a)] \, W. \, \delta_x$$

where

m = mass flow rate
w = width of the collector
C_p = specific heat of air
v = collector air flow per unit area

Therefore solving the first order differential equation and applying boundry conditions; we get:

$$T_i = T_a \text{ at } X = 0$$

$$\triangle T = (T_{f.o} - T_a) = \frac{S}{U_L} \left[1 - e^{-F^1 U_1 / PC_p V} \right]$$

Since $$\frac{m}{WL} = PV$$

Therefore, collector efficiency, is:

$$\eta = \frac{m C_p (T_{f.o} - T_i)}{SW_L}$$

$$PC_p V \left[\quad - F^1 U_L / PC_p V \right]$$

Rubb. Board bull. 21, No. 4 - 1986

Co-Operative Marketing in Rubber

P. K. George

I do not feel that I have much to say on rubber bands except briefing you about marketing of rubber in co-operative style and also to appraise you what we can do in the overall context as a marketing organisation. Therefore this paper is not being presented to you as a scholastic study paper. This will confine to the origin, growth and future plans of the Federation. This will only be a detailed analysis of the marketing scope of rubber and rubber products under the Cooperative system, which is facing the challenge from independent traders in the field.

The Kerala State Cooperative Rubber Marketing Federation Ltd. popularly known as Rubber Mark has become the single largest supplier of natural rubber in India selling approximately 21,000 M.tonnes per annum. This commendable position in the rubber market has enabled the Rubbermark to safeguard the growers without going to distress sales during the peak production season, as we were able to control the price fluctuations to a very great extent.

The idea of marketing rubber through Co-operatives was mooted by the Rubber Board in 1960s when the production of natural rubber in the country was less than 50,000 tonnes. During this period, rubber industry had not grown enough to assure a steady demand for rubber. This led wide fluctuations in price of natural rubber and consequent exploitation by middle men creating number of marketing chains. There were minimum 3 to 4 agencies between the producer and the consumer of natural rubber. Rubber being a seasonal crop, the exploitation was acute and intolerable during the peak production season and this led to rural indebtedness among the small rubber growers. In the initial stage, there were only a handful of societies in this field and in 1970, when there were more than 30 primary rubber marketing societies in the State, an apex body of these societies was formed.

The apex Federation started its live participation in rubber business from 1972 onwards. The necessity of applying the latest marketing technique in rubber is called for because of the seasonal variation in production as well as grades from month to month compared to steady and planned requirement by major consumers viz. Tyre companies.

Organisational set up.

There are 33 primary rubber marketing cooperative societies affiliated as members of the Federation and the total individual members of all these societies are more than 50,000 growers. These growers sell their produce to the societies and the societies, after grading the rubber, will give a premium for grade rubber. Rubber thus collected will be entrusted with the Federation for selling to terminal points and to the consuming industry. Since there is no exploitation by middlemen or other agencies, the societies will fetch the highest price possible for their produce. The profit generated by the Federation is divided among the member societies and the societies will give a share of this to their grower members. Besides profit sharing, primary societies help their members by distributing the agricultural inputs and other requirements supplied by the Federation under various schemes. Plant portection operation is also undertaken by the Federation on nominal charges. Educating the growers on making grade rubber, maturing in time and imparting knowledge on scientific management in small holding etc. are also undertaken by the Federation at different levels among the societies and members.

All of you are a ware that Rubber Board and the Federation have been solely responsible for ensuring a remunerative price to scrap rubber, which was being sold at throw away price by small growers who were at the mercy of unscrupulous scrap collectors. Establishment of 6 crumb rubber factories created awareness among all growers about the worth of the scrap and this has enabled them to feel that their small holdings is an economically viable venture.

Apart from the main activities, viz. rubber procurement, sales, processing of crumb rubber, distribution of fertilisers and other agricultural inputs, aerial spraying etc., Rubbermark also adopts latest marketing techniques to meet the challenges from more than 3000 dealers and other intermediaries. Rubbermark also undertakes sales promotion activities and advertisements. Rubbermark has a net-work of seven sales branches in New Delhi, Bombay, Calcutta, Faridabad, Ghaziabad, Jalandher and Ahmedabad and 6 purchase depots in Trivandrum, Vithura, Punalur, Arakunnam, Nilambur and Iritty.

As the Federation of small scale rubber cultivators, Rubbermark has a vital role to play in the field of rubber marketing. Its primary aim is to ensure that the samllscale cultivators get a remunerative price for their produce. We firmly believe that a remunerative price is the incentive for increasing productivity. As a responsible Cooperative organisation,

Federation has to safeguard the interests of the consumer as well. It is our aim to see that the consumer gets quality raw rubber at a reasonable price. All our policies are aimed at achieving these twin objectives. We also aim at transforming ourselves into a live-wire commercial organisation known for its reliability and accountability.

I should also point out the various limitations under which we fnuction. The very nature of our set up-a Cooperative apex body-entails certain constraints. The Federation is controlled by a Board of Directors and there are Committees and sub-committees for controlling our functioning. The lack of professionalism among the decision makers often result in major mishaps. Though this is a cooperative body, essentially it is a commercial organisation, competing with 3000 and odd rubber dealers spread throughout the country. As you know rubber prices are quite sensitive to market conditions. In a highly fluctuating market if correct decisions are not taken in time, then it means nothing but peril. The Chief Executive should have enough powers to take decisions in such a situation. But the preponderance of Committees hinder a smooth functioning. As a Govt. body, we have to abide by the laws and there can be no evasion of taxes and duties. In other words, we just cannot indulge in No. 2 business. As you all know, No.2 business is flourishing in rubber trade, especially so in rubber band market. The consumer would naturally prefer to get rubber bands without bills but how can a Government Agency like ours oblige them? We should not close our eyes to such real life situations. However one should admit that similar limitations. are there in every type of business. The onlyway out is to develop a thoroughly pragmatic, business like approach. The success of a cooperative set up depends on that. Rubbermark has plans to diversify into product lines from Rubber band to Tyres.

The paper presented at the workshop on Rubber Band Manufacturers held at the Rubber Research Institute of India- Kottayam 686 009 on 11th August 1986. The author is the Marketing Manager, Kerala State Co-operative Rubber Marketing Federation.

A MAJOR COCOA PRODUCER TURNS TO OIL PALM

Cocoa production in Ghana, one of the leading producers for decades, has been declining steadily in recent years. The oil palm is rapidly taking over from cocoa as the most popular cash crop among farmers. Cocoa is Ghana's main export crop at present.

Production of palm oil shot up to 42,000 tonnes in 1985 after three years of low output and exceeded the national requirement of 39,000 tonnes. The production in 1982 was just 13,000 tonnes.

This dramatic increase has been attributed to various factors. According to the Executive Secretary of the Ghana Oil Palm Development Association (GOPDA), Mr. B. K. Otoo, the market price of 96,000 cedis (Rs. 13,500) a tonne is one key factor that has encouraged many Ghanaians to take to oil palm plantation.

Mr. Otoo says the oil palm industry has even lured many farmers to shift from cocoa. Though the producer price offered by the Government for cocoa beans was increased in April this year from 56,000 cedis to 85,000 cedis, this has not made cocoa farming lucrative enough.

The move to boost palm oil production itself started in 1983 with the setting up of an oil palm rehabilitation committee under the former Agriculture Secretary, Mr. I. K. Adjei.Maafo, to oversee the maintenance of neglected State oil palm plantations. This committee managed to reclaim from the bush all State plantations that had been neglected.

In the same year, Ghana faced a severe drought, followed by a national disaster of bush fires which destroyed most cocoa farms. Subsequntly, the farmers did not heed the Government's call to replant eocoa

'Many of them took note of the high palm oil prices on the market and plunged straight into oil palm cultivation, 'Mr. Otoo says. Like hybrid cocoa, some types of oil palm mature in only three years. Another important factor was the Government ban on the import of palm oil from Benin.

The year 1983 also witnessed severe shortages of soap. To meet the demand, many entrepreneurs moved into soap production. Since palm oil is an important ingredient in soap making, many of these entrepreneurs started their own oil palm plantations to beat down production costs.

The soap situation also forced the Government to impress on Lever Brothers Ghana Limited—leading producer in the country—to support oil palm production. Consequently, more farmers took to oil palm cultivation to meet the company's demand.

The foreign financed Twifo Oil Palm Plantation and the Kwae Oil Palm Plantation have also contributed to the increase in production. The Ghana Oil Palm Development Corporations, which controls the two plantations, has initiated a new scheme to boost palm oil production.

The Twifo Plantation, for example, has doubled its capacity, by processing 30,000 tonnes of fresh fruits. It has also decided to increase the number of small holders to 300. The small holders are contracted and given use of land, seedlings and technical advice.

Tim Chigodo
from Harare

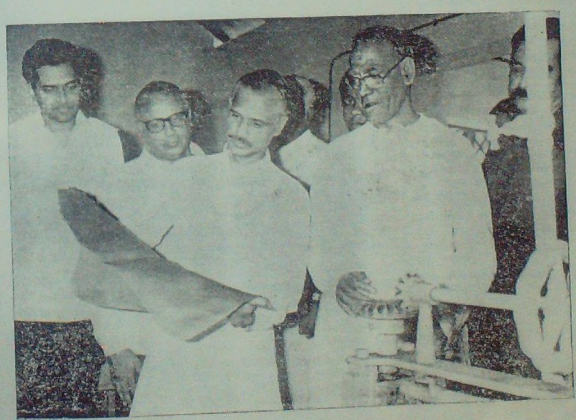
THE VISIT OF THE MEMBERS OF PARLIAMENT CONSULTATIVE COMMITTEE

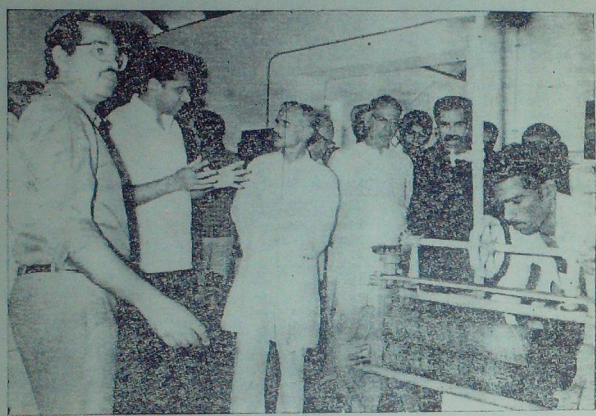
Five members of the Parliament Consultative Committee for the Union Ministry of Commerce, who were on a study tour to South India, to familiarise with the problems of the plantation crops including Rubber, Cardamom, Spices and Tea, assured the rubber producers of Kerala at a meeting held at Kottayam that they would convey to the Government the severe hardships caused to the rubber growers due to the fall in rubber prices. They were convinced, the MPs said, that untimely release of imported rubber to the domestic market and the unexpected excess probuction brought in during the lean months had been the reasons for the glut in rubber market.

The meeting convened by the Rubber Board to enlighten the members of the Consultative Committee on the pressing issues of the rubber industry, was attended to by representatives of rubber producers, rubber dealers, latex processors, rubber plantation labour and Rubber Board officials. The members lent a very patient hearing to the various demands raised by the respective interests and promised that they will do their best to sort out the issues.

The members visited the RRII and went round the various Research Divisions. They expressed appreciation and satisfaction at the progress made by the Rubber Board in modernising the rubber plantations in the country. The members also complimented the Board for achieving commendable heights in increasing production and productivity in rubber.

The members of the Consultative Committee





included Prof. P. J. Kurian, Sri. George Joseph Mundackal, Sri. Thomas Kuthiravattom, Dr. Chandrasekhar Thripathy, and Sri. Chandra Kishore Pathak. A group of senior officials of the Rubber Board headed by Sri. P. C. Cyriac, Chairman accompanied the team in their tour of the rubber plantation areas. The members also visited Cardamom plantations in the high-ranges on 23rd September. After touring through the plantation areas in Malabar region on 24th they proceeded to Nilgiris to visit pepper and tea plantations there.

AWARD FOR K M PHILIP

The Hancock Gold Medal for 1986 of the plastics & Rubber Institute (U.K) has been awarded to Mr K. M Philip, Whole Time Director, MRF Ltd. and a former President of the All India Rubber Industries Association. The Hancock Gold Medal Award is made on the basis of nominations received and evaluated for outstanding contributions to the progress of the Rubber Industry.

In selecting Mr Philip for the 1986 Hancock Gold Medal, the Institute has recognised the major contributions made by him since Independence in developing the Indian Rubber Industry. India has become the fourth largest producer and consumer of Natural Rubber and the industry products are exported worldwide, including the sophisticated markets of U. S and Europe.

Mr K. M. Philip has been associated with the development of many rubber and rubber related Industries, and in providing an overall direction to the growth of the Industry as a Member, Rubber Board, President, All India Rubber Industries Association, Chairman, Indian Rubber Manufacturers Research Association (jointly funded by Industry & Government), Council Member, Plastics & Rubber Institute (Indian Section). He recently chaired the Development Panel (VIIth plan period) for the Non-tyre Sector of the Rubber Industry.

Mr. K. M. Philip has been associated as whole Time Director, MRF Ltd., since its inception, Chairman, M M Rubber Co. Ltd., as well as Chairman for a number of other leading Public Limited Companies including India Coffee & Tea Distributing Co Ltd., Integrated Finance Co. Ltd., DEN Connectors Ltd., Meheshwari Proteins Ltd., etc.

Rubb. Board bull. 21, No.

The Genesis of Rubber Plantation Industry in India

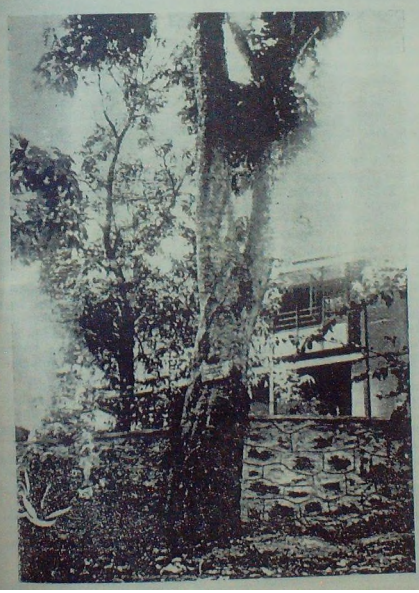
P. John Joseph

Until the end of 19th century rubber cultivation in India has been little more than experimental. In North Eastern India rubber was extracted from Ficus elastica (Rambong tree) for many centuries and used for lining receptacles and making torches. In the South, trials had been made with Ceara rubber (Manihot glaziovii) and Panama rubber (Castilloa elastica) but these varieties were found to be commercially insignificant. It was Thomas Hancock who in the 'Gardner's Chronicle' of 1834 first called attention to the possibility of cultivating rubber in India and other eastern possessions of the British empire.

Sir Dietrich Brandis in 1873 suggested that Kanara, Malabar, Travancore and the Burma coast offered the desired conditions for successful cultivation of rubber. Shortly after the pronouncement of Brandis efforts began to be made by the Govt. of India to experiment with this cultivation

First Initiative

The credit for introducing *Hevea* rubber from South America to the South East Asian Countries goes to Sir Clements Markham, Asst. Secretary of India office in London, who was responsible for introducing Cinchona trees to India in 1860. But for his valuable suggestion the *Hevea* tree grown in the thick forests of Amazon valley would have remained unknown to outside world.



In 1880 Sir Clements Markham wrote in his book 'Peruvian Bark' "In 1870 I came to the conclusion that it was necessary to do for India rubber or caoutchouc yielding trees what had already been done with such happy results of Cinchona trees. The Caoutchouc yielding trees are of of several genera and are found in the forests of India, the Eastern archipelago, Africa, Medagascar, Mexico and Nicaragua, as well as in South America. Owing to enormous demand for caoutch- the most reckless felling is going on in all trophical forests which yield the valuable product. The time has come when plantations must be formed of Caoutchouc yielding trees in order to prevent their eventual destruction and to provide for a permanent supply.

The increase in demand for India rubber is very remarkable and the enormous number of uses to which this product is now put renders the consideration of measures for its cultivation and for securing the permanency of an adequate supply.

When it is considered that every steam vessel afloat, every train and every factory on shore employing steam power must use India rubber, it is hardly possible to over rate the importance of securing a permanent supply in connection with the industry of the world".

The above proposal was accepted by the British Govt and James Collins, Curator of the Pharmaceutical Society museum was deputed to collect further infor-

mation on rubber. In1869 and 1871 James Collins published 2 papers on "India rubber its history, commerce and supply". At the request of India office he also published a report on 'the rubbers of America' with illustrations of various methods of tapping etc. in 1872. The report revealed that the best commercial variety of rubber was 'Hevea braziliensis'. A copy of the report was also sent to Dr. Joseph Hooker Director of Botanic garden at Kew, London. Dr. Joseph Hooker appreciated and welcomed the suggestion to introduce Hevea rubber to India.

Transfer of Strains From Brazil to Asian Countries

Farris was deputed in 1873 to collect rubber seeds from Brazil. In June 1873 a shipment of 2000 *Hevea* seeds procured by Farris in Brazil arrived in Kew garden, London and was immediately put for germination. 12 plants were raised from these seeds of which 6 plants were despatched to the botanic garden at Calcutta in India. But the plants perished due to unfavourable climatic conditions. After failure of first experiment, the Govt. of India decided to send further consignments to botanic gardens in Ceylon and Singapore. In 1876 Henry Wickham, an Englishman, residing in Brazil was entrusted with the job of collecting good rubber seeds from Brazil. Henry Wickham gathered 70,000 seeds of *Hevea braziliensis* and transported to Kew botanic garden in London. Out of this 2700 plants were obtained. India Office wished to supply bulk of these plants to Ceylon and 1919 plants were despatched to Ceylon in special wardian cases in August 1876, of which 90 per cent arrived in good condition. Dr. Joseph Hooker, Director of Kew botanic gardens wanted to give an additional chance to the seedlings of rubber of becoming established in the east by sending 50 plants to botanic garden at Singapore.

First Experiments in India

sted that some of the hevea plants might be put down in the sites on ghats near Nilanbur prepared for Castilloa rubber expected from Ceylon. But this suggestion was not carried out. After failure of trial in Calcutta botanical garden in 1873, the next consignment of rubber plants were received in India from Ceylon in 1878. The first man to experiment on rubber cultivation in India was F. J. Ferguson. He conducted his experiments at Plantation House in Calicut. He was a great botanist and arboriculturist who collected large quantity of exotic plants, shrubs and trees. He was a great enthusiast and planted the first rubber tree at Poonoor at the foot of the Vayithiri ghat near Thamarassery in Calicut.

In June 1879 twenty eight hevea plants received from Ceylon were planted in Nilambur near Govt. teak plantation.

First experiments failed to come out triumphantly. Many of the plants planted at Poonoor and Nilambur on land belonging to forest departments perished due to neglect. However, the whole experiment was condemned as a financial failure by Nilambur Forest officers and ultimately the experimental cultivation of rubber plants through private agency (by F. J. Ferguson) was ordered to be discontinued. The next move was made by G. Anderson who planted a few rubber plants at Shallicary Estate in 1887. A. G Nicholson planted rubber plants in Glenburn Estate as shade to coffee plants. Small scale rubber planting was also done in Glenrock Estate near Pandalur, in the same year.

First Plantation at Thattackad near Kothamangalam

In 1902 M/s. J. J. Murphy, J. A. Hunter, K. E. Nicoll and C. M. F. Ross formed themselves into the Periyar Syndicate and negotiated with govt. for land for planting rubber. 500 acres of forest area at Thattakad near Alwaye in North Travancore

J. A. Hunter, K. E. Nicoll and G. Nicoll Thomson started planting at Thattakad and the first rubber estate in South India came into existence.

In the same year rubber plantation was raised in Poonoor near Thamarassery in Calicut. 500 acres of Konny forest reserve was granted for rubber plantation in 1903 and rubber was planted in Lahai Estate.

Mundakkayam

The name 'Mundakayam' meaning 'Heron's Pool was christened by Rev. Henry Baker a missionary of C. M. S. Church in the year 1847, where he started his missionary work. At that time Mundakayam was a wild forest area.

In 1904, 400 acres of forest land was allotted to Mr. J. J. Murphy. He cleared forest land in Yendayar and planting was done using seeds and plants brought from Ceylon. He was followed by M/s. S. H. Drummond Dean in Eldarado, R. S. Imray in Mundakkayam, T. A. Richardson in Paloor and Kuppakayam, H. B. Kirk in Peruvanthanam, R. Harley in Orkaden, H. B. Hartly in Teekoy. By the end of 1910 Mundakayam was the largest rubber growing district in India. Mr. J. J. Murphy was the pioneer rubber planter whose mortal remains lie interred in Yendayar where he started the first rubber plantation. He lived in Yendayar and wished to be buried in the same soil which was a source of inspiration to planting community in the country.

Cochin

Rubber was first planted in Cochin State in 1905 when Mr. K. E. Nicoll obtained a grant of forest land at Palappilly behind the Govt. teak plantation, This was a well situated block at the foot of the hills which Chemoni river running through centre. Pudukkad forest area was also planted in 1905.

All the first plantations in Travancore Cochin and Malabar were

converted most of the difficult forest areas into beautiful plantations facing considerable hazards and handicaps. No doubt the success tells the tale of indomitable courage, initiative and great enthusiasm of European pioneers.

First Indian Owned Plantation

Fascinated by the success of Europeans, Indians entered the plantation field. The first Indian owned plantation was Malankara Estate in Thodupuzha, opened in 1910. The prospects of the Company published in 1910 reads:

"This company has been formed with the object, at present, of planting rubber. It is now recognised by all those who possess any practical first hand knowledge of rubber planting that South India in general and Travancore in particular is specially suited for rubber cultivation. Land is available at a moderate cost in a part of the country that is ideally suitable for the purpose. Arrangements have been made for acquisition and for opening a nursery in a portion of it which has already come in to the possession of the Company. The locality selected is very healthy and accessible by water and by good cartable road. There are unrivalled facilities for obtaining a sufficient and cheap supply of labour. The intention of the Company is to open out and plant 100 acres in the coming season.' The original promoters of the Company were Rev. C. P. Philipose Kassesa, K. C. Mamman Mappillai and P. John. Other Directors of the Company were Sri. John Chandy, Sri. S. Rama Swamy Iyer, Sri. S. Parameswaran Pillai and Sri. K. V. Chacko, Sri. P. John was well experienced in the management of rubber plantations. He became one of the partners of Lahai Rubber Syndicate in 1903. He had also associated with G. H. Davey of Alleppey, formed a Syndicate and planted 700 acres of rubber in Kaliyar estate, Thodupuzha.

In view of the experience Sri. P. John had in opening Kaliyar rubber estate he was appointed as the Manager of the first Indian owned 'Malankara Rubber Estate'. At that time there was general feeling among the public that Indian owned company, which had no sufficient resources and experience of Europeans might not succeed. The promoters and the Directors of the company took this as a challenge and proved that Indian enterprise would work with equal efficiency as a foreign company.

The success of this plantation was an eye-opener as well as a source of inspiration to many Indians. They came forward with un-ending energy and enthusiasm to start rubber plantations. Thus the fertile soil, congenial climatic conditions prevailed and the great enthusiasm of the local planters contributed much towards the delopment of Rubber Plantation industry in the country.

Reference:

1. Vicki Baum—"The weeping Wood" pp 126
2. Information furnished by Royal Botanic Gardens, Kew, London vide letter dated 1st June 1984.
3. Colin Burlow 'Natural Rubber Industry'
4. Loren G. Polhamus 'Rubber'
5. Speer S. G. Upasi-1893–1953 pp 109, 214
6. Armstrong W. H. 'Probe into the early history of rubber' souvenir published in connection with All India Rubber Planters' Conference pp 40, 1966
7. 'A Short Note on the Indian Rubber Plantation Industry' published by Rubber Board on 15th May, 1947.
8. 'The Malankara Rubber and Produce Co. Ltd. 1910–1961, A Short History, pp 2
9. Ghosh H. H. 'The Realm of Rubber, pp 137–139
10. Kakku J. Thana 'Plantations in Nilgiris' A Synoptive History pp 44 & 45.
11. Drabble J. H. 'Rubber in Malaya, 1876–1922 pp 2-5

DIESEL OIL FROM PLANTS

Two plants growing wild in Rajasthan can be a source of fuel for trucks according to scientists in New Delhi who have extracted diesel oil from the thick fluid (latex) oozing out of their stem.

The plants, "*Euphorbia nerrifulia*" and "*Euphorbia roylena*," nicknamed "Petrocorps", have been extensively studied by Dr S Bhatia and his colleagues at the Indian Institute of Petroleum (IIP) for their energy potential. Mr Bhatia said that diesel oil has been "cracked" from the latex and also from the dried biomass of the plants. The latex leaves a heavy residue, he said.

The experiments have been conducted on laboratory scale in a one litre vessel and the results are promising, Mr Bhatia said. Another petrocrop being studied at IIP is 'Jojoba' a native of Mexico. Its seeds when crushed give a brownish oil that can be straight away used as a lubricant, Mr Bhatia said.

A WORKSHOP FOR RUBBER BAND MANUFACTURERS

The rubber bands manufactured from rubber latex, have multifarious uses in the day to-day life of Man. Of the 50,000 items manufactured out of rubber, the rubber band is probably one which is subjected to numerous unavoidable uses. Two and a half decades ago the threads were used for the purposes for which the rubber bands are now used. By the passage of time they have been totally replaced by this new product. With the increase in uses of rubber bands, more marketing problems cropped up. The new entrepreneures who with their comparatively less investment on machinery and technical know how, experience difficulties even at the initial stages with regard to marketing. The workshop held at the Rubber Research Institute of India went into the details of the problems and discussed various aspects of of the manufacturing of rubber bands. The workshop was organised by the Technical Consultancy Division of the Department of Rubber Processing.

Prospect

Shri C. M. George, Head of the Department of Rubber Processing in the Rubber Board stated that the rubber based industry has enough flexibility to take on diversification of products without much difficulty. A rubber band unit could be easily converted into one producing finger tips, gloves, baloons, latex adhesives etc. There is good internal market for rubber bands, but numerous towns in India still lie outside the pale of its influence. It has also a replacement market in the sense that the band is replacing in many applications of cotton thread and jute hessian in packing and binding. Ladies have started using the band in dressing their hair. Rubber band also has very good export market. Malaysia exports about 5,000 tonnes of rubber band every year. Singapore is another major exporter of this commodity, he added.

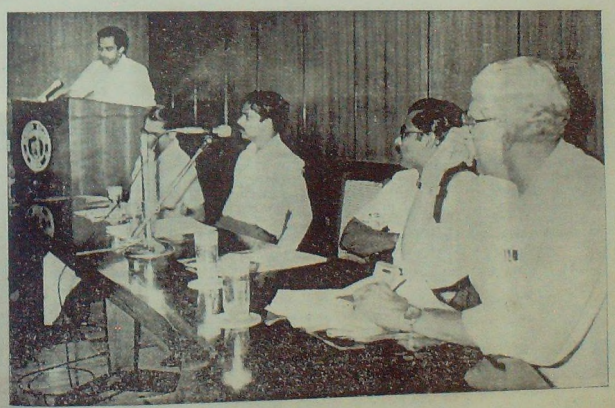
The position of cottage industry

According to Shri P. C. Cyriac, Chairman of the Rubber Board, Kerala produces 92% of the natural rubber in the country but consumes only about 14% of it. Manufacture of rubber goods in the small sector offers potential for rural employment. Rubber based industries if started on a wider scale, would ease the acute unemployment situation in the State. When raw rubber is made into value added finished goods, the income generated goes to help other sectors also to prosper. The per capita consumption of rubber in India is the lowest in the world. It is only about 0.4 kg here while the consumption in developed countries is as high as 10 kg. This points to the vast scope for labour intensive rubber goods production in the country, As one-sixth of the world population live in India and every human being use some kind or other rubber goods in his daily life, the prospects for developing rubber industry in India is immense. There are several items which can be made in the cottage sector using rubber latex produced in small rubber estates. The Rubber Board will help this sector by offering training facilities and technical assistance. Most of the rubber goods of daily use can be made by the cottage industry. He made a welcome announcement that the possibility of exempting rubber units in the cottage industry from payment of rubber cess would be examined.

Bureaucracy lukewarm

Shri P C Cherian, Managing Partner of Padinjarekara Industries in his felicitation address stated that the State Government should take full advantage of the good potential for development of rubber based industry. It is regrettable that the Kerala type of bureaucracy is not suited to industrial development. While their interest in industrialisation is lukewarm, the officials in the neighbouring State of Tamil Nadu aggressively go about giving encouragement in starting new ventures, offering all assistance and facilities. His experience has been that even the Common Facility Centres in Kerala are not serious about assisting the setting up of new factories or solving the production problems of small units.

Shri Jiji Thompson, Managing Director of the Kerala State Co-operative Rubber Marketing Federation also felt that lack of enthusiasm in the Government machinery stand in the way of industrial development in the State. He spoke of an advertisement in a newspaper published from Bombay, announcing that top officials of Gujarat Government would be camping in Bombay on certain days to solve the problems of Bombay based Gujarati industrialists. Similar intimate involvement by the officials in Kerala in industrial development would bring in a world of difference here. Many people in Kerala appeared to him not so keen about starting producing units. They show enthusiasm to make quick money rather than put in hard work to set up and successfully run a factory. People with resources unfortunately fight shy of starting industries in Kerala, mainly since they are not properly motivated. He stated that the Kerala State Co-operative Rubber Marketing Federation will not confine its activities to trading in



aw rubber but enter into the ield of rubber goods manufacture n the near future. The Fede- ation would also come forward o function as a marketing hannel for rubber products made n the small scale sector, he dded.

hri George Joseph, General Manager of the District Industries entre, Kottayam noticed an nhealthy trend among many ntrepreneurs to discontinue peration of the producing units fter 5 years of starting and set p sister concerns, obviously to ontinuously take advantage of he sales tax exemption, excise uty concession etc available r the first five years. He advised he industrialists to prosper by roducing good quality materials nd remaining competitive in he market, instead of trying to tagnate under the umbrella of oncessions and incentives.

Unhealthy trade practices

r. E V Thomas, Head of the echnical Consultancy Division ointed out that though there is emand for rubber goods in the ountry. Industrialists in Kerala re finding marketing prpblems in he absence of any regular sales rrangement. The middlemen who control the market purchase rubber bands without bills and a situation has emerged wherein the rubber band offered with sale bills has no market. This can be put to an end only with suitable buying arrangements, eliminating the unscrupulous intermediaries. He wanted the Rubber Marketing Federation to conduct a market survey and function as the marketing link for the rubber goods produced in the small scale sector in the State.

Technical Session

In the technical session that followed, three papers were presented. In his paper on co-operative marketing in rubber, Shri K P George. Marketing Manager of the Kerala State Co-operative Rubber Marketing Federation explained the activities of the Federation and expressed its readiness to market rubber products from the small scale sector.

In the second paper on evaluation of the rubber band industry in Kerala, Shri K K Thomas, Proprietor of the Maruthy Rubber Industries surveyed the development of rubber band industry from its inception in 1960. Many units have come up during the last decade, but an equal number has fizzled out on account of unhealthy competition.

The third paper on the marketing problems of rubber band units in Kerala was presented by Dr. Therian Gorge, Market Research Officer In the Rubber Board. He examined the growth and problem of rubber band units in the States. There has been a mushroom growth of small scale rubber producing units, mainly propelled by the easy availability of raw materials, among whom rubber band making units occupy an important position. They are tiny units, each consuming from 5 to 10 tonnes of rubber a year. Several units manufacture finger tips, household gloves and adhesive along with rubber bands. Many of them face a multitude of problems arising from the existing market situation. The average cost of production of rubber band is about Rs. 26/- per kg, while the average sales realisation comes to about Rs. 30/- per kg However, the middlemen realise a sale price of Rs. 40/- per kg at the major consuming centres.

Federation to market rubber goods

In the discussions that followed, almost all spoke about the need for finding a regular outlet for the produce. Evidently the producers had sizeable unsold stocks with them. Usually during the monsoon months there is no band production, mainly owing to the difficulty in getting field latex. The middlemen therefore purchase and keep in stock sizeable quantities to fend for the hard days. This year the picture was different with the weather. The monsoon got delayed by about two months, helping rubber tapping to go on without interruption. There was no shortage in the availability of field latex and production in the factories went on as usual. However, since the buyers had already stocked enough quantity, the bands produced during June and July had no outlet.

The Kerala State Co-operative Rubber Marketing Federation was suggested as the suitabls agency to market the rubber band. Its Managing Director agreed to take up the job, if the entire rubber band production could be routed through him. In a situation where widespread underhand dealings are galore, he thought that the market can be improved and disciplind only through blocking the bands going to the illicit trade channels and making the goods flow through the normal routes. The Federation may explore the possibility of exports, as the export operation could be successful only if done under an organised agency. As a measure of assisting production of goods for export, the Government of India has enhanced the subsidy for natural rubber used in production of such goods to Rs. 6 per kg from 1st April, 1986. If exports are contemplated, the producing units could take advantage of this. Once the Federation comes into the picture, it can take up the job of providing the chemicals, acid, titanium dioxide etc to the producers and solve the present situation of their erratic supply.

Technical problems

Disposal of latex serum ie. the effluent water, was another point under consideration. An industrialist explained his experience of using the serum as a source of fertilizer in the paddy field. Since there is ammonia in the serum, it could contain elements of nitrogenous fertilizers. Dr. EV Thomas suggested that as ammonia is the main pollutant, it could be stirred away, for which a mechanical stirrer may be employed. There would be only about 2 to 3 drums of serum in a couple of days' operation. If a septik tank is made, it can collect the serum of about 3 weeks' duration. The effluent coming out of the tank will be harmless.

Deterioration in storage of compounded latex was another problem examined. Dr. EV Thomas explained that normally the compounded latex deteriorates only if the percentage of zinc oxide is low. For a barrel of latex 0.2 to 0.3 kg zinc oxide may be needed. If thickening of latex during rainy season and in prolonged storage is the problem, it could be solved by adding 0.05% potassium hydroxide on volume of the latex.

Availability of field latex at regular intervals was another problem. The Chairman, Rubber Board promised that if rubber band units come forward to produce preserved latex, licences could be issued to them liberally. If they want to set up testing

facilities in their factories, or for that matter by any rubber factory in the small scale sector, the Board will render all the technical assistance. They can also avail of the subsidy at the rate of Rs. 25,000 from the State Government. If anyone plans to instal the effluent treatment plant, the Rubber Board would provide the necessary drawings and technical assistance, the Board's chief announced.

The workshop was an eye-opener to the grave problems in under utilisation of internal resources. Kerala is the only State in the Indian Union profusely enriched with raw material resources that offer vast scope for development of rubber industry in the small sector. In spite of the necessity to transport natural rubber all the way from the southern most State meeting long distance transportation costs, the economy of Punjab, West Bengal and Maharashtra get effective support from rubber based industries. We have to appreciate that industries have flourished in other States because the Governments have ensured congenial conditions for their growth. En block socialisation is also not desirable as it is not possible for any Government to set up all the production processes in the public sector. A wise Government encourages people to start them and help them produce goods and services without interruption, of course keeping apart the core industries to the public sector. The message of the workshop was very clear— if we do not learn from past mistakes of our lethargy, other States will continue to prosper by making finished goods out of raw materials obtained from us and keep Kerala a captive market for their finished goods. □

GUAYULE CULTIVATION PROGRAMME IN LIMBO

The Defence Department's guayule commercialization project at Sacaton, Ariz., is on hold while the US Department of Agriculture negotiates to take over the project's administration. The move will mean a reduction in the role the Gila River Indian Community will play in the project, which also has dropped its director. William P. Miller - the Bureau of Indian Affairs official who directed the programme since the Gila River Indian Community won the defense contract in 1982 is now out of the picture. The current shakeup at Sacaton apparently was begun by the election of a new tribal governor at the Gila River Indian Community, according to sources close to the project. The governor and his administration worried that the interest on the $20 million government loan given the Indian community for the Sacaton project was too great a financial burden for the tribe to bear. The tribal administration was amenable to a suggestion that the agreement with the Defense Department be changed to a procurement contract, in which the Indian community would deliver a minimum of 56 tons of guayule rubber. The contract now in effect includes research and development and all other phases of the project. In the new arrangement, Firestone, which is subcontracted to design and build a guayule processing plant, would negotiate its own contract with the Defense Department. Sources say that the Agriculture and Defense departments have just begun negotiations with Firestone to design and build a guayule processing plant, with an annual capacity of 150 tons, by 1990. When those talks are completed, negotiations with the Gila River community will begin.

US RESEARCHERS DEVELOP HIGH-YIELD GUAYULE BY CLONING

A new aid to plant breeders developing high-yield varieties of guayule, which could render the plant commercially viable, has been developed by scientists at the University of California, Irvine. Using tissue culture clone techniques, it has been possible to reproduce large numbers of plants which are genetically identical to an original proved high-yield plant, so overcoming the problem of breeding true varieties of guayule, which is basically an outcrossing species. David N. Radin, a plant cell geneticist at Irvine who developed the technique with National Science Foundation funding, reports that one good plant can produce enough clones to allow field testing on a large scale, under typical agricultural conditions. A difficulty in the research programme has been that guayule does not reveal important traits such as drought resistance and rubber yield until plants are mature, and it has thus been necessary to base the cloning technique specifically on tissue from older plants.

BRAZILIAN SBR PLANT

Brazilian synthetic rubber producer Petroflex Industriae Comercio S. A. plans to start up a 20,000-metric ton-capacity SBR plant. Petroflex intends to open a new unit at Triunfo, Rio Grande do Sul, where it already operates an SBR plant with the same capacity. Because of the expansion, SBR exports by Brazil are expected to rise 25 percent. Brazilian SBR capacity today totals about 300,000 tons, most produced by Petroflex. The company, which is owned by the state, operates a 200,000-ton plant in Duque de Caixas, Rio de Janeiro. Companhia Pernambucana de Borracha Syntetica owns an 80,000 ton plant at Recife, and sells mostly to the domestic market. SBR exports by Brazil totaled about 45,000 tons in 1985 with most going to Latin American countries, particularly Venezuela and Columbia. Approximately 10% of that total is a also shipped to the US and about 20% goes to Europe.

NOCIL PLANS SBR PLANT

The Indian petrochemical firm National Organic Chemical Industries Ltd is to invest Rs 13,000m ($1, 100m) in a massive modernisation and expansion project that will include installation of 67,000 tonnes annual capacity for styrene butadiene rubber. The Bombay-based firm, which is one-third owned by Shell Petroleum Co Ltd, said the project at the Thane plant (near Bombay) also will involve a major expansion of ethylene capacity an installation of lines for production of polypropylene (100,000 tpa), styrene (104,000 tpa), polystyrene (50,000 tpa) and polybutenes (15,000 tpa). The Royal Dutch/Shell Group said it will make a "substantial" financial contribution towards the project, which still requires Indian government approval.

MONSANTO IN RUBBER INVESTMENTS

Monsanto Chemical has announced plans to expand capacity for its Santoprene thermoplastic rubber and Geolast thermoplastic elastomers through the construction of new plants in Brazil and Japan. A plant is being set up at Yokkaichi City in Japan by its Joint venture with Mitsubishi Chemical, Mitsubishi Monsanto Chemical. Another at Sao Jose Dos Campos in Brazil, will be built by Monsanto Chemical Co. Both facilities are scheduled to be completed by mid 1987 and will bring to five the number of plants producing Santoprene and Geolast. Existing plants are located in Akron in Ohio, Pensacola in Florida, and Newport in the UK. The new plants will bring Monsanto's Santoprene and Geolast capacity to 45,000 ton/year. Each new plant will manufacture the full line of Santoprene and Geolast grades. The former represents a new class of thermoplastic rubber designed to replace thermoset rubbers in many applications. Geolast is an oil-resistant elastomer which offers the benefits of nitrile rubber performance without the difficulties of design and processing.

TIPS TO BOOST RUBBER PRODUCTION

* High yielding planting materials
* Lush green cover crops
* Judicious manuring
* Systematic after-care
* Effective Plant Protection
* Correct Tapping Methods
* Appropriate Processing operations

proper blending of these techniques would ensure BUMPER RUBBER YIELDS.

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THE QUARTER

The horizon for rubber wood has widened. It is now used for various purposes. Till recently, it was enjoying the status of fire wood only. The transition, though sudden, brought out new dimensions into its use and presentability. Many attractive pieces of furniture are fabricated from rubber wood in other countries. Once subjected to chemical treatment, the wood could very well be utilised for prefabricated trusses of buildings. The economic research wing of the Rubber Board, in the course of its studies on the uses of rubber wood, has revealed that the small scale industries sector in Kerala engaged in wood based industries, depends mostly on rubber wood. Rubber wood plays a dominant role in plywood and other industries. The widespread application of LPG and other means for cooking fuel is reported to have brought down the consumption of fire wood.

If new areas are identified for the uses of rubber wood, its value in commercial application will rise high.

Engineering With Rubber: Black Art or High Tech?

With increasing sophistication in engineering systems, greater demands are being placed on component design and reliability. Creativity in design must be supported by accurate knowledge of material properties and by precise manufacturing techniques. This is as true for rubber engineering components as for those made from any other material.

Rubber is now well established with many successful applications in all branches of engineering. In civil engineering, elastomeric bearings for buildings and bridges were pioneered in the 1950s and are now the preferred design solution in many parts of the world. U. S. and international standards have helped consolidate this position. Several detailed case histories demonstrate the ability of natural rubber to retain specified physical properties, especially stiffness, for up to 40 years. Confidence in longevity is important if engineers are to use elastomers routinely in critical designs. Recently, offshore engineers have developed novel and critical components for oil platforms in hostile North Sea conditions, which have explored new design limits for rubber, functioning under loads of several thousand tons or strains of several hundred percent. In these cases particularly, awareness is growing that a rubber component is an integral part of design and cannot be treated as an unknown black mass squeezed in at the last moment.

It is vital that innovative engineering designs are supported by precise manufacturing processes; all too often this is the weak link in convincing engineers to use rubber components. The standard here is largely set by the aerospace industry. Leading rubber manufacturers in the U.S have achieved stiffness tolerances of five to eight percent, albeit at a price. Accurate characterisation of raw rubber and ingredients followed by precisely monitored weighing, mixing and molding operations could establish this as the norm and may even improve on it. Engineers are-rightly-not impressed by a material with stiffnesses varying by 20 percent or more, and this can lead to a general reluctance to use rubber for new designs. Automakers are now calling for improved characterisation of improved performance while moving toward lighter cars with increased plastics content. Novel spring designs exploiting rubber's unique properties could substantially increase rubber usage in automotive suspension systems.

The future for elastomeric components in engineering is perhaps brighter than for any other segment of the rubber industry.

If the rubber industry can finally shake off its "Black Art" image among engineers then the foundations will be laid for substantial growth in engineering design with rubber. Components can now be designed and manufactured with different stiffnesses in different directions, responding differently at different frequencies and amplitudes. But, having no internal moving parts and perform ing to close tolerances: this is "High Technology" indeed.

(Andrew Stevenson, Head of Engineering Research, Malaysian Rubber Producer's Research Assn, Hertford, England)

Courtesy:- Elastomerics

RUBBER PLANTATION DEVELOPMENT SCHEME PHASE II

Applications for financial assistance for replanting/newplanting of rubber during 1986 under the Rubber Plantation Development Scheme are invited by the Rubber Board subject to final approval of the scheme by the Government of India.

Growers owning a total rubber area of upto 5 hectares including any area proposed for newplanting under this scheme in traditional rubber growing areas, namely Kerala, Kanyakumari District of Tamil Nadu and Dakshina Kannada and Coorg districts of Karnataka and all categories of rubber growers in non-traditional areas such as North Eastern States, Goa, Maharashtra, Orissa and Andaman Nicobar Islands etc will be eligible for assistance under this scheme.

Applications for assistance should be submitted in the prescribed form. The forms and leaflets containing details of the scheme are available free of cost from all the Regional offices and Field Offices of the Board.

The applications duly filled up should reach the concerned Regional Offices on or before 30th August 1986.