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Cover: Shri PJ Thomas with Shri SM Krishna, Minister of State for Industries and Smt. Ram Dulari Sinha, Minister of State for Commerce during a discussion at the National Seminar on Rubber.

THE RUBBER BOARD

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RUBBER BOARD BULLETIN

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THE QUARTER

There is a wrong notion among many that the Rubber Board has been established only to promote rubber cultivation in India. There is also a widespread feeling among those associated with the rubber industry that Board is interested in rubber cultivation only. Whatever be the feeling, it is a fact that both the Rubber Board and the Rubber Industry have wider perspectives and their areas of activities have been very much enlarged in recent times. The National Seminar in Delhi is the culmination of the much outspoken ambition that the integrated development of the Rubber Industry in India could be possible only with the active assistance and intimate involvement of all the segments concerned. Shri P J Thomas, Chairman, Rubber Board is the architect and exponent of this novel idea. It is his earnest desire that different sections should relinquish their conflicting positions and strive hard to achieve the common objective of the welfare of all the rubber interests in the country. The outcome of the deliberations of the national seminar is also a pointer in this direction.

A TECHNIQUE TO PREVENT UPROOTING OF RUBBER PLANTS

Picture showing how roots have emerged from sunken portion of the trunk.

Uprooting of rubber trees, raised in wind-prone areas, is a regular annual feature resulting in huge losses to rubber growers. Attempts to prop such trees with the help of supports have not proved effective.

Uprooting is attributed largely to inadequacy of anchorage support from tap roots and laterals during cyclonic storms. This defect is expected to be effectively rectified, if more lateral roots could be generated additionally from the main stem of the plant by planting the seedlings deep enough to keep 12-15 cms of the main stem under the soil. The initial results of a trial, laid out at the Central Experiment Station of the Rubber Research Institute of India at Chethakkal near Ranni, has partially testified this hypothesis.

The 350 budded stumps of clone GT-I used for planting in this trial, were budgrafted at a height of 15-20 cms from the ground level, against the conventional system of budgrafting seedlings at a height of 3-4 cms from the ground level. Green buddings were found to be superior to brown budding in this case. When the budded stumps so budgrafted were planted in the field, they were kept sufficiently deep in the pits so as to keep the bud patch only 3-4 cms above the ground level thereby allowing 12-15 cms of the main trunk of the stump down below the soil. This technique was adopted to enable generation of additional lateral roots from the sunken portion of the trunk, above the collar and ensure better anchorage for the plants. As expected there was profuse rooting from that part of the trunk kept below the soil. The stumps so planted had produced about 3 times the number of laterals than those planted in conventional planting.

Additional laterals were found not only to ensure better anchorage but also to enhance the rate of absorption of nutrients and water from soil resulting in better girthing of plants. They attained a girth of 28-35 cms in 3 years as against 15-22 cms girth usually attained by plants planted in the conventional style resulting in proportionate reduction in immaturity. Though the trial area was located in a wind prone belt, not even a single plant was found uprooted, obviously due to the better anchorage provided by the additional roots. The plants are still under observation.

Root formation in the sunken portion of the plant trunk above the collar region could probably be accelerated if some root inducing plant hormones like SERADIX is applied in that portion before the stumps are planted to the field.

Detailed studies on the complex aspects of these issues are proposed to be studied in detail by laying out larger trials during 1984-85, at the Central Experiment Station.

N Raghunathan Nair
Sr. Superintendent
Central Experiment Station
Chethakkal.

Union Minister for Finance Shri Pranab Kumar Mukherjee and the Chief Minister of Kerala Shri K Karunakaran being received by the Chairman, Rubber Board Shri PJ Thomas at the National Seminar on Rubber.

THE NATIONAL SEMINAR ON RUBBER

The National Seminar on Rubber organised by the Rubber Board in New Delhi on 10th September 1983 proved to be an assembly of consuming, producing and trading interests. About 400 delegates from different parts of India listened to the deliberations of the assembly which marked the beginning of the process of integrated development of the rubber industry in India. The rubber producers from South and North-East, a large number of rubber goods manufacturers, manufacturers of synthetic rubber, rubber reclaimers, rubber traders, machinery people, formulaters of rubber chemicals, rubber goods exporters, decision makers from the Ministry of Commerce, Ministry of Industry and DGTD, representatives from prospective rubber producers like the north eastern states, Rubber Board Members and Officers, Members of Parliament and Ministers attended the Seminar. The national forum, first of its kind ever held in India has set a common stage for the integrated development of the rubber industry in India. As visualised by Shri PJ Thomas, the seminar promoted mutual acquaintance between the varied interests and identified the hurdles encountered by them.

PROMOTION OF SMALL-SCALE INDUSTRIES

New venture of the Rubber Board.

The Rubber Board which has so far been concentrating on natural rubber production in India is launching a new endeavour to promote small-scale and largely home based industries. To implement the programme, a "training and demonstration centre for products" was inaugurated by the Chief Minister Shri K Karunakaran on 8th October 1983 at the Rubber Research Institute of India. The new centre offers a 10-day course to batches of 10 trainees each in the manufacture of bands, elastic thread, adhesives and surgical and industrial gloves. The course would fully equip them with theoretical and working knowledge to run units independently. They would also get the benefit of follow-up extension services.

In his speech Shri PJ Thomas, Chairman, Rubber Board said the main aim was that eventually the small rubber growers in Kerala, numbering about 2.4 lakhs should be able to get the benefit of value addition which would stand them in good stead in the event of rubber prices falling for one reason or another.

It was deplorable that Kerala which produced 92 per cent of the natural rubber in the whole country was consuming less than 10 per cent, while small rubber based industries flourished in states like Punjab, Haryana, Uttar Pradesh, Gujarat, Maharashtra and West Bengal. This, despite the State having hordes of educated unemployed youths and key resources such as power and water. Small units in the northern states were producing a variety of 35,000 items based on rubber.

Mr. Thomas stressed that the start was deliberately being made in a small way to ensure success and perfection. The four selected products had been fully researched both in regard to technology and manchinery and marketability. The same basic technology was used for all of them and latex rather than dry rubber was the raw material. The know-how and equipment were simple enough for units to be successfully run by small growers using their own produce and employing family labour. Later on the centre would expand the training facilities to cover moulded items.

Financial Assistance

He said financial assistance could be obtained at low interest from the Khadi Board since rubber based units had now been included in the category of village industries. The trainees would be picked largely from among rubber growers, plantation workers and their dependants and the educated unemployed.

The returns, as worked out in the detailed project reports, are most attractive. For a total capital investment of between Rs. 1.25 and 1.5 lakhs, including land and building, a net annual profit of Rs. 25,000 is expected. What is significant is that the profit has been calculated after setting apart as much as Rs. 50,000 towards labour charges which could well be saved if family members themselves do the work. Special efforts have been made to reduce costs at every stage so that units using the recommended technology and machinery can expect to operate far more profitably than existing ones. In the case of rubber bands, for example, three dippings would be enough instead of the normal seven.

Perfect quality

Mr. Thomas said perfect quality could be achieved in the manufacture of the four products. If some rubber band units ran into trouble, it was not for want of demand but because of the poor quality of the product. Again, consumers in need of really good elastic, had to depend on imports because the rubber threads used for indigenously manufactured elastic were not adequately heat-resistant.

He was really having his eye on the export market, Mr. Thomas said. Units promoted through the new programme should be in a position to produce high quality goods which could be sold abroad. He pointed out that a subsidy of Rs. 4.5 a kg of rubber used was available for exported goods.

The Chief Minister who inaugurated the "training and demonstration centre" promised all the help from Government of Kerala. He also congratulated the Rubber Board, for its efforts in sponsoring such a training programme which would bring up the living conditions of small rubber growers. Shri PK Narayanan, Public Relations Officer welcomed the gathering.

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PUBLIC SECTOR PLANTATIONS: THE CONSTRAINTS

NK GOPALAKRISHNAN

Shri NK Gopalakrishnan, General Manager, Plantation Corporation of Kerala Ltd explains how Public Sector has emerged in the national scene and how it functions later on with the country's hard-earned investments. Public sector is also not free from the malaise of management. The functions have to be assessed in the light of the objectives and aims with which they were established.

The Public Sector has been under fire for quite some time now, eventhough during the last 35 years it has grown and emerged as a catalytic force in the national economy. Critics have enough statistics to show that these 'white-elephants' eat away the country's hard-earned investments. Out of 187 public sector enterprises in the Central Sector, 97 are making huge losses at present. In the first nine months of 1982-83, sixty of these units have lost Rs. 650 crores and that too inspite of protected markets and administered pricing policies in many areas. It is true that by and large while the private sector prospered, majority of public sector enterprises continue to be in the red. It has to be admitted that the returns that the public sector projects in India are yielding do not commensurate with the massive investment made in these projects.

The plantation industry, the latest addition in the fist of public sector enterprises is also not free from the malaise of management. An attempt is made here to examine the constraints encountered by the public sector enterprises in general and plantation industry, in particular.

Whether the public sector enterprises have fulfilled the expectations of their protagonists, have to be assessed in the light of the objectives and aims with which they were established and encouraged.

Why Public Sector?

In a developing country like India, the State has to play a crucial role in the process of socio-economic development. This inevitably leads to the participation of the state in management, regulation and control of important sectors of economy. The expansion of the public sector in India was rapid. In 1951, there were only 5 public sector enterprises with an investment of Rs. 29 crores, whereas in 1978 the number rose to 153 with an investment of Rs. 12,851 crores and in 1981-82, 187 public sector enterprises in the Central Sector with an investment of Rs. 21,863 crores.

In India, there are three different categories of public sector enterprises.

1. Administrative Departments like Railways, Telephones, post and Telegraph etc. at the Central level and Electricity, Transport, Irrigation etc, at the State level. These are basically meant to provide public utilities and are not run on commercial considerations.

2. Enterprises that are run by various Government departments such as Food Corporation of India, LIC, STC. etc.

3. Joint stock Companies which are generally wholly owned by the Government.

Thus the public sector plays different roles depending upon the objectives of the economic policy of the State. The encouragement of the public sector is highly necessary to achieve the goal of establishing the socialistic pattern of society. The public sector serves to remove certain basic deficiencies in the economic structure and reduces the scope of accumulation of wealth and large incomes of private monopolies. Though the primary objectives of the pubulic sector enterprises are not considerations of profits in the commercial sense, there has been a shift in the outlook from the fifth five year plan period and it has been stated in the fifth plan document that 'these are not charitable institutions and must earn a fair return on investment incurred on them. Eventhough many legitimate reasons like huge capital investment with long gestation period, pricing policy based on "No profit No loss" principle, etc. can be attributed generally for the low rate of return, there are many more constraints in the public sector plantation industry.

Public Sector Plantations

The plantation industry in India was started by the early part of 19th century. Indigo was the first crop to start on a plantation basis. Owners of these plantations were mainly English and Dutchmen. By the middle of 19th century a number of tea estates were also started under plantation

sector in Assam and South India. Later, coffee, cardamom and rubber were also started to be grown on plantation basis.

The first rubber estate in India was started in 1902 by M/s. J.A. Hurter, K. E. Nicoll and G. Nicali Thomson at Thottakad near Alwaye.

In the initial years plantation industry was started by foreigners mainly English people. East India Company encouraged plantation industry by helping the planters to secure extensive areas free of cost or at very little lease rate. This enabled the growth of extensive estates of various crops like tea, coffee, rubber, cardamom etc.

Though the ownership was started by partnership, later on it was converted into private limited companies engaging not only in the production of various crops but trading and export of their products.

The main concern of these companies was making maximum profits. Major portion of these profits were repatriated to their own countries in foreign exchange which caused considerable drain on our foreign exchange reserve.

They have not paid much attention for the welfare of workers and other employees. After India became independent, Companies were reluctant to develop their estates further or do replanting in time which resulted in the deterioration of existing plantations. Their only concern was to extract maximum profit even at the cost of existing plantations and labour.

In 1959 Government of Kerala took a bold decision to enter in the plantation industry directly, and started its own plantation department of Agriculture. By 1962 a public limited Company "The Plantation Corporation of Kerala Ltd" was established with the objective of cultivating, developing and carrying on the business of planting of rubber and other plantation crops and for creating maximum employment opportunities. Earning of profit and faster socio economic growth of the State are also envisaged. The Corporation was registered as a Company on 12.11.1962 and started functioning on 1.2.63 with an authorised share capital of Rs. 750 lakhs.

Now plantation Corporation owns 7 rubber estates of 7179 hectares, and 3 estates of cashew with an area of 6000 hectares. Plantation Corporation of Kerala Ltd. became a model for starting many state owned plantation Corporation in different states like Tamil Nadu, Karnataka, Andhra Pradesh, Orissa, Tripura and Assam.

Realising the success of this Corporation in terms of the profit it has made, employment opportunities created and the socio-economic changes brought about Government of Kerala has started two more planting companies viz., The Rehabilitation plantations Ltd. and State Farming Corporation.

The Constraints

The public sector in general, is an area of greatest managerial malaise and the constraints encountered by them as a class are more or less the same though with minor variations depending on the nature of business. However the most conspicuous constraints that could be identified with public Sector Plantation industry are as follows:

Lack of Professionalism

Plantation Industry is one,where specialisation counts most for management success. You cannot expect to make a person an Estate Manager overnight.It requires years of hard work and dedicated service for the rightman with aptitude for the profession, to make a successful manager. The Estate Manager, who is staying inside the plantations acts under great stress and strain. His decisions are crucial and have a direct bearing on industrial relations, on production and productivity. A man with sound professional knowledge alone can make sensible decisions. No doubt, such people are few and therefore costly too.

Unfortunately in the public sector plantations, people for these positions including that of the "Chief Executives" are posted without any screening. In most cases the chief executives are drawn from "civil servics" on deputation basis for a tenure of two to three years. They, being non specialists in plantation management, will take at least half this time to get an indepth knowledge of the industry. Further being on short term deputation they normally will have little involvement in long-range planning, growth and change which are the measures of performance of Chief Executives. Unless appointments are made, based on professional and commercial qualifications, the expected efficiency level cannot be achieved.

Frequent Shifting of Chief Executives

The continuity in management is an essential element which contributes to the success of management. The Plantations, generally take 5-7 years to come into production. The huge investment coupled with this long gestation period make it sensible to keep a man on the job at least for this much of minimum period to make him accountable for his performance. In Public Sector this seldom happens. Managers, including the Chief Exective are changed frequently within two to three years. There are funny instances where managers were posted to or shifted from plantations forcibly as a punitive measure. How can you ever imagine a manager to work sincerely under such situations?

Low Remuneration to Managers

Plantation Managers in the private sector are a well paid lot who enjoy liberal and enviable perks. The tough way of life, the professional expertise which they posses and seclusion of estate life etc. will no doubt make them deserve it. However their counterparts in the public sector are governed more or less by the Governmental or similar salary structure. The too obvious disparity in the annual earnings of comparable position in the private and public sector plantat-

ions is certainly demotivating and reflects upon the efficiency of public sector to a considerable extent, though the behaviourists may argue that motivation aimed at the satisfaction of basic needs is no longer necessary. But it is. Basic needs are always present to keep people at their job, regardless of the pressure of higher needs in the Herzberg's need heirarchy.

The Hidden side of the Public Sector

Last but least important is the constraint of social responsibility which the public sector plantations are faced with.

Beginning in the 1950's the public mood shifted towards social concerns and this mood was reflected in the extensive social demands, made on the public sector institutions. Social responsibility, implies to private sector as well. However public sector enterprises become most concerned with social as well as economic outputs and with the total effect of these institutional action on society.

The public sector plantations are expected to move faster towards greater social responsibility and they do. It is however, not a free ride or a matter of simple good will. The costs are there and they take large amounts of economic resources. Over enthusiasm geared by political leadership to invest huge sums of money on labour welfare etc. is not uncommon.

This is probably the hidden side of public sector plantation industry which is conveniently forgotten when their economic efficiency is evaluated- □

FOR RESILIENT POLICY IN RUBBER

PRODUCTION OF NATURAL rubber in India in 1982-83 rose to a record of 165,850 tonnes, compared with 135,300 tonnes in 1978-79. But this increase has not been sufficient to produce a bounce for the industries using rubber such as the automobile and cycle tyre and tube makers. Actual consumption in the last financial year was nearly 200,000 tonnes. The prediction of higher production in 1983-84 has been invalidated by the setback in Kerala caused by a widespread drought. India produces around 30,000 tonnes of synthetic rubber against a demand for more than 50,000 tonnes. The synthetic rubber industry has not been growing in the past few years. The Government's decision to import 30,000 tonnes of natural rubber (through the State Trading Corporation) in 1983-84 was made before the effects of the drought became known. The price has shot up to more than Rs. 18,000 a tonne and the Kerala planters' lobby has, as usual, been opposing imports. The user industries may be driven to the wall if the shortage persists and there is a strong case for more imports this year for maintaining supplies as well as for a reasonable buffer stock to meet at least three months' needs.

Kerala accounts for more than 90 per cent of the domestic production, most of it from small holdings. Rubber is one of the plantation crops in which there has been considerable expansion, from 70,000 hectares to about 300,000 hectares, over the past three decades. Natural rubber has a gestation period of seven years and a recent plantation programme will start yielding results in another two years. New areas are being brought under rubber cultivation in Assam, the Andamans, Tripura,Manipur and Nagaland. In view of the rapid expansion in Kerala, imports had fallen to a trickle in 1970 and stopped in 1974. A redoubled effort is needed to keep internal production slighty ahead of needs. This can be achieved through the expansion of cultivated areas as well as the introduction of new varieties with higher yields. Until such self-sufficiency is achieved, the Government should adopt a resilient import policy that should cater to the requirement of industry and the people rather than to the vested interests of those who want the commodity to be in short supply.

(HINDU)

On her arrival at the Rubber Research Institute of India, Smt. Ram Dulari Sinha was received by Shri PJ Thomas, Chairman Rubber Board, Shri BK Nair, M. P., Shri George Joseph Mundackal M. P., Shri Joseph Monipally and Senior Officers of the Rubber Board.

A PRIDE OF PLACE FOR RUBBER AMONG PLANTATION CROPS

Welcoming Smt. Ram Dulari Sinha, Union Minister of State for Commerce, Shri PJ Thomas, Chairman, Rubber Board presented the problems and prospects of the Rubber Plantation Industry in India. Analysing the growth and development of the industry Shri PJ Thomas highlights all salient aspects of the development of the industry. He appealed to the Minister that the Rubber Board should be given the status and rank it deserves. Full text of his speech is reproduced below:

I consider this an auspicious occasion, for our distinguished guest Smt. Ram Dulari Sinha, Hon'ble Union Minister could make it convenient to spend a few hours of her precious time with us here, acquainting herself with the problems and prospects of the rubber plantation industry and the activities of the Rubber Board and Rubber Research Institute of India. Madam, we feel honoured at the gesture of yours, which is clearly indicative of your genuine concern for the welfare of the various segments of the rubber industry. Let me at the outset record the deep sense of my appreciation and gratitude to you on behalf of everybody present here. I hope you will continue to inspire and guide us in our pursuit and search for a stable and self reliant rubber industry in the country.

Pride of place

Though a newcomer among plantation crops in the country, rubber occupies a pride of place in the national economy. From a humble beginning in 1902, the area under rubber in India as on date has spread upto 2.9 lakh hectares producing 1.66 lakh Metric Tonnes of natural rubber, while the annual requirement of the rubber goods manufacturing sector is around 1.95 M. T. of natural rubber. The annual rate of increase in demand in the consuming sector was over 6.8% except during 1982-83 when the growth rates were 8.5% and 3.8% respectively.

The projected production of natural rubber for 1983-84 is estimated around 1,70,000 Tonnes while the consumption is expected to be of the order of 2,03,000 MT. Taking into account the carry over from the previous year and the stock to be maintained within the country, the likely deficit could be put within the range of 30,000-40,000 M.T. Of course, these estimates would need periodical review.

Development Schemes

The Rubber Plantation Development Scheme of the Rubber Board, launched in 1980-81, with a view to attaining self sufficiency in natural rubber within the shortest possible time, provides subsidy and long term loans at reduced rate of interest to all those who come forward to new plant or replant rubber using high yielding strains. An area of about 60,000 hectares is expected to be planted under the scheme during the sixth plan period. Till 1978, the Board used to subsidise only replanting. The subsidy paid under this scheme since its inception in 1957 is over Rs. 19 crores for rehabilitating an area of 53,000 hectares, out of which 35,000 hectares have come into production.

As a result of the massive and organised efforts of the Rubber Board to rejuvenate the rubber plantation industry through rehabilitation and popularisation of modern techniques of production, in less than 3 decades, the average per hectare production of natural rubber in the country has risen to 830 kg from 300 kg.

Rubber tops all crops in production according to the Ministry of Agriculture, Government of India. The average growth rate for rubber during 1940-50 to 1981-82 was 8.89% as against 5.95% for wheat, 5.17% for coffee 2.53% for tea and 2.59% for all crops.

No doubt, the prevalence of a remunerative price fairly throughout, coupled with a well laid out rural market net work also had wielded its own influence in making these gains possible.

Small holder's crop

Natural rubber has come to stay as a small holder's crop in India. Under the Rubber Act-holding upto '20' hectares are small and those above 20 are estates. Taking into account the unregistered small holdings also, it could be seen that the number of small holders is as large as 2,30,000 while the number of estates above 20 hectares are as few as 460. These small holdings constitute 75% of the area and 70% of the total production of rubber.

Therefore better productivity from existing holdings, as well as investment in new plantings could be anticipated only if long term prosperity of this enterprise is ensured, both as remunerative and stable.

It is in this context that I had endeavoured to instil a sense of awareness among the different interests of the industry, particularly the producers and consumers of rubber, that in the unique situation obtaining in India the producing and consuming sectors are inseparable and mutually interdependant. India is the one and only country in the World which has a strong rubber goods manufacturing industry capable of consuming more than the domestic production of natural rubber. The rubber goods industry also has an edge over its counterparts in other countries in that it is assured of raw rubber within the country itself. The deficit, whatever, is being made good by imports.

Prices of raw rubber have always been a live issue of debate. I am trying my best now, to bring round these two interests across a table and agree on a price formula which would be remunerative to the producer and affordable to the consumer. It is gratifying to note that everybody concerned have reconciled to the point that a stable price is an essential pre-requisite for the integrated development of the rubber industry in this country.

Import of rubber

While agreeing that imports to bridge the actual gap between demand and supply is essential as a short term strategy to prop the industries, I do not hesitate to reveal my apprehension about the illogical way the imports are planned. Past experience shows that imports some times arrive at periods of peak production causing steep decline of domestic rubber prices to unremunerative levels. For want of adequate arrivals in lean months prices tend to go up. The quantity traded in lean months being low, the beneficiaries of the high price are also few. I know that such wide fluctuations would be detrimental both to the producers and consumers.

Rubber imports are at present handled by the STC, strictly as a commercial operation and not as a price support or market stabilisation measure. Though the Rubber Act clearly stipulates that it shall be lawful for the Board to import rubber with the previous approval of the Union Government, the Board has not been able to do this for want of appropriate authorisation. Rubber prices could be effectively brougt under control eliminating violent fluctuations, if the Board, which is seized of the rubber situation better than any other agency in the country, is entrusted with this task.

Besides, the profit realised from the sale of imported rubber would have gone to the Pool Fund for rehabilitation of small holdings, if import operations were executed by the Rubber Board. Since the STC is handling it the rubber small holders are deprived of their rightful share due to them from the sale of such rubber.

Much of the discrepancies now experienced in timing, quantity, quality, allocation etc. in rubber imports could be very effectively offset if the job is entrusted to the Rubber Board which is a better judge of the needs of the producer and consumer.

I would request you madam, to give serious thought to this proposal and decide the issue on merits, as otherwise the rubber producers would continue to be allergic even to the very mention of rubber imports.

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Import of rubber

While agreeing that imports to bridge the actual gap between demand and supply is essential as a short term strategy to prop the industries, I do not hesitate to reveal my apprehension about the illogical way the imports are planned. Past experience shows that imports some times arrive at periods of peak production causing steep decline of domestic rubber prices to unremunerative levels. For want of adequate arrivals in lean months prices tend to go up. The quantity traded in lean months being low, the beneficiaries of the high price are also few. I know that such wide fluctuations would be detrimental both to the producers and consumers.

Rubber imports are at present handled by the STC, strictly as a commercial operation and not as a price support or market stabilisation measure. Though the Rubber Act clearly stipulates that it shall be lawful for the Board to import rubber with the previous approval of the Union Government, the Board has not been able to do this for want of appropriate authorisation. Rubber prices could be effectively brougt under control eliminating violent fluctuations, if the Board, which is seized of the rubber situation better than any other agency in the country, is entrusted with this task.

Besides, the profit realised from the sale of imported rubber would have gone to the Pool Fund for rehabilitation of small holdings, if import operations were executed by the Rubber Board. Since the STC is handling it the rubber small holders are deprived of their rightful share due to them from the sale of such rubber.

Much of the discrepancies now experienced in timing, quantity, quality, allocation etc. in rubber imports could be very effectively offset if the job is entrusted to the Rubber Board which is a better judge of the needs of the producer and consumer.

I would request you madam, to give serious thought to this proposal and decide the issue on merits, as otherwise the rubber producers would continue to be allergic even to the very mention of rubber imports.

Board's efforts

As already mentioned vigorous efforts are afoot to maximise rubber production through intensive and extensive cultivation. We have crossed traditional frontiers and gone out to the North Eastern States in a big way for undertaking rubber cultivation. Tripura has taken the lead in introducing rubber followed by Assam, Meghalaya, Mizoram, Nagaland and Arunachal Pradesh. Goa, Maharashtra and Orissa are fast falling in line.

From 1985 an annual output of 15,000 MT of natural rubber is expected to come additionally every year from the high yielding trees planted under the Rubber Plantation Development Scheme. At that rate by 1990 the domestic production of natural rubber is likely to be around 3 lakh Tonnes. If this pace is maintained self sufficiency may become a not-too-distant reality in India.

At present synthetic rubber plays only a complimentary role to natural rubber, effectively making good the deficit. But of late, we happened to know of a move to establish a new synthetic rubber plant in Maharashtra by one of the multinationals, with an installed annual capacity of 1 lakh tonnes. This is being thought of at a time when there are already two SR plants within the country which have not been able to attain their full capacity for want of demand of the product. Therefore the proposal for a new SR unit at this stage would be totally unjustifiable.

Any move of this type will certainly dishearten the rubber producers resulting in neglecting their plantations and depressing production and productivity, because arrival of more synthetic rubber posing a threat and competition to natural rubber would be detrimental to their century old efforts. The fears in the minds of the producers may be set at rest by discouraging the attempts to establish new SR units. I would also request you to ensure that SR in India always continues to maintain its position as a complimentary material to NR and not a competitor. Unless this is done it would degenerate this industry which has so far withstood the test of time.

Though the Rubber Board is said to be an autonomous body, it has only very limited powers, often reducing it to the level of an ordinary department under Ministry of Commerce. In the case of a vital and strategic raw material like natural rubber, unless the agency entrusted with the task of its promotion has a free hand in decision making and implementation of development programmes consistent with the emerging needs, performance can never be commensurate with the requirements.

Status to be upgraded

Rubber Board should be given the status and rank it deserves. Rated by its contributions, the Rubber Board should be accorded a place far higher than other Commodity Boards in the level of administrative heirarchy. Contrary to this, recently even the status of the Chairman has been lowered from the rank of a Joint Secretary to that of a Deputy Secretary. It does not matter as to who presides at the helm, but the position accorded should have some relation to the tasks assigned.

The status of senior officers in the Board also leaves much to be desired. I am proud that measured by any standard, the Rubber Board has easily the most competent team of officers at top, middle and lower level. Not only they are paid low, but also many of them stagnating for yeras now.

Employees of the Rubber Board have been agitating for Bonus for quite a few years now. Several assurances have been given to them in this regard in the past. But I would say that nothing has been done so far, though employees in other departments of Government have been extended this favour. I would appeal to you madam to redress this long standing grievance of our staff by notifying the employees as eligible for Bonus.

Conclusion

Though the Rubber Board and Rubber Research Institute of India are members of several international bodies of R & D. most of our scientists do not get opportunities to interact with their counterparts, as they are not permitted to go out and do so. The Rubber Plantation Industry in India, I may draw your attention, is one of the best organised in the World. The RRII has been chosen as a centre for excellence by many research institutes in and out of India for training personnel in certain selected disciplines.

Madam, I have been briefly touching only some of the relevant aspects concerning the rubber industry in the country. For want of time I am not attempting at the elaboration of minor issues.

I would fervently appeal to you to bestow your personal attention to the points raised and seek your good offices for expeditious resolution of these vital issues.

Once again, I record the deep sense of my gratitude and respects to you madam for having taken the pain to visit this Institute which is located in the southern extremity of our country.

Thank you.

STABILISATION OF RUBBER PRICES REMUNERATIVE TO THE RUBBER PRODUCER AND AFFORDABLE TO THE MANUFACTURER

PJ THOMAS

The participants of the National Seminar on Rubber held on 10th September 1983 at the 'G' room in Vigyan Bhavan had the rare opportunity of listening to a galaxy of personalities drawn from various interests of rubber industry especially the rubber plantation as well as rubber goods manufacturing sectors The colourful function so carefully organised to uphold the much outspoken view of the Rubber Board that the producer and manufacturer are the two sides of the same coin emanated too much enthusiasm and enriched the vistas of hopes and aspirations of many a people connected with the rubber plantation industry in India. In his address of welcome delivered there, Shri PJ Thomas, Chairman, Rubber Board, has expressed that the mutual dependence and inseparable nature of the producing and consuming factions need much more intimate appreciation. Following is the full text of his speech:-

I am indeed overwhelmed when I rise before you to offer my greetings of felicitations and welcome. This day will be remembered as a landmark in the history of the rubber industry in this country, because today we are initiating the process of integrated development of the rubber industry in India with the active assistance and intimate involvement of all the segments concerned.

The response to our call for a get together of this nature has been exceedingly exciting, as could be seen from the profile of the participants assembled here from all over the country–we have rubber producers who have taken the pains to reach here from the farther south and the north-east, a large number of rubber goods manufacturers coming from all over, manufacturers of synthetic rubber, rubber reclaimers, rubber traders, machinery people, formulators of rubber chemicals, rubber goods exporters, decision makers in the Government, from the Ministry of Commerce, Ministry of Industry, DGTD and STC, representatives from prospective rubber producers like the North Eastern States, Rubber Board members and officers, public sector companies etc. It is too hard to name everybody because it is so enormous. But I am glad that everyone in the country who has something to do with rubber is present or represented here.

Maiden attempt

May be, organisation of a national forum of this type has not been attempted in the past. How-

Board's efforts

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The response to our call for a get together of this nature has been exceedingly exciting, as could be seen from the profile of the participants assembled here from all over the country-we have rubber producers who have taken the pains to reach here from the farther south and the north-east, a large number of rubber goods manufacturers coming from all over, manufacturers of synthetic rubber, rubber reclaimers, rubber traders, machinery people, formulators of rubber chemicals, rubber goods exporters, decision makers in the Government, from the Ministry of Commerce, Ministry of Industry, DGTD and STC, representatives from prospective rubber producers like the North Eastern States. Rubber Board members and officers, public sector companies etc. It is too hard to name everybody because it is so enormous. But I am glad that everyone in the country who has something to do with rubber is present or represented here.

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ever, it is only in the fitness of things that a common stage is set for different people with identical interests to meet, get to know each other and enable mutual appreciation of views. The rubber industry in India despite its diverse complexities, has been able to achieve a rate of growth better than the national average. An added advantage of the Indian rubber industry is that it has both a producing and a consuming sector, fairly well matched. India is perhaps one of the very few rubber producing countries in the world which has an industrial capacity capable of consuming more than the domestic output of rubber. Besides natural rubber, India produces synthetic rubber and reclaimed rubber which supplement and offset the deficit felt for natural rubber.

The rubber producing industry enjoys the assured favour of a ready market for its product while the rubber goods manufacturing industry can rest relaxed on account of the domestic availability of rubber, of course, not to the fullest extent they need.

Though there has been tremendous expansion in extent and output of natural rubber in the country, selfsufficiency for this material appears to be still far. The projected production for 1983-84 is 170,000 tonnes against the estimated demand of 203,000 tonnes. The deficit, as in the past, will be met by imports.

The erratic nature of rubber supply and demand coupled with violent fluctuations in prices is causing a lot of disquiet both to the consumers and the producers. Prices tend to rise when supply position weakens and fall when arrivals improve resulting in imbalances and instability. The respective sections which get hit alternately react sharply even accusing each other at times. My specific reference is to the rubber producers and rubber goods manufacturers. These two sections cannot afford to operate in isolation. One sector produces something which the other sector needs in abundance. Trends of recession in one sector is sure to cast their shadows on the other.

Inseparable nature

The mutual dependence and inseparable nature of the producing and consuming factions need much more intimate appreciation. I have spared no opportunities to reiterate my considered view that the producer and consumer are just like two sides of the same coin. We have tried to conceptualise this thesis in a more concrete form in the badges you wear.

Gentlemen, please look to your badges. On one side you can observe the logo of a rubber tapper trying to extract the precious latex from the rubber tree, which represents the producer, while on the reverse we have projected the wheel of industry to depict the rubber goods manufacturing sector.

Once we reconcile to this position, I believe that the stage is set for the 'integrated development of the rubber industry.' The inspiration for accepting this concept as the theme of this seminar was largely derived from the essential precondition that balanced growth is possible only if the diverse interests within this industry are tamed and groomed to reach this ultimate goal.

The first step in this direction would be to promote mutual acquaintance between the varied interests, identify the hurdles experienced in their operations and dovetail the stages of transition. The next stage is fostering cordiality and goodwill between these interests and ensure smooth transaction of business.

It is only through a get together of this nature that result-oriented courses to rectify the flaws could be devised. This is precisely what is anticipated to be achieved at this seminar.

Foremost issue

To me the first and foremost issue that needs immediate attention of all concerned is the stabilisation of raw rubber prices at rates remunerative to the producer and affordable to the manufacturer-a price which should not be subjected to violent fluctuations. No doubt, this is an essential pre-requisite. The idea is to converge the price at a central point with leverage to swing vertically, only within a limited range mutually agreeable to both the grower and the consumer, the lower limit being kept remunerative to the producer and the upper edge being affordable to the manufacturer. Once a consensus on this "price band system" is arrived at, fool proof arrangements should be organised to import rubber when the price tends to cross the upper limit and stockpile when it slides down below the lower edge. Therefore import and buffer stock coupled with timely release from either of the two could be employed as the gadget to bring about stability. In fact, a good lot of informal parleys have already been held between varied interests to arrive at an agreeable price formula. These consultations have helped to iron out differences of opinion and soften the hardliners. I fully appreciate the spirit of understanding and sense of cordiality that have emerged out of these dialogues. An amicable solution is imminent and I hope that the day is not far off when every one concerned agree on a price formula. The Union Ministries of Commerce and Industry could initiate mediation in this direction. The Government of Kerala, under the dynamic stewardship of my leader Shri. K. Karunakaran, could also actively associate with the attempts of these Ministries to achieve the desired objective.

As regards supply rubber, as often mentioned earlier, the country is largely relying on indigenous production of natural rubber, synthetic rubber, and reclaimed rubber, besides the natural and special purpose synthetic rubbers imported to bridge the gap between supply and demand. The market network now available for delivering supplies to the manufacturing industry is fairly well laid out and performing satisfactorily.

Streamlining necessary

But the schedules for imports of natural rubber and its subsequent release to the actual users leave much to be desired and need a good lot of streamlining. The Statistics & Import/Export Committee of the Board, where the producers and consumers have adequate representation, periodically reviews the supply position of rubber and make appropriate recommendations to the Government as to how the imports are to be planned. Though it is repeatedly reiterated that imports should be timed in such a way as to effect release during lean months, past experiences show that imports invariably arrive at peak production periods causing steep fall in domestic prices. In lean months for want of adequate stocks within the country and due to the late arrivals of imports, rubber prices tend to rise above the levels affordable to the users. In effect what happens is that the prices tend to swing within a wider bracket disheartening both the producers and the consumers in turn. As a result so much of avoidable noise, chaos and confusion are created.

Therefore, it is imperative that the rubber supply position should be attuned to the needs of the consumers and made fool proof.

Rubber imports are now handled by the State Trading Corporation. The Rubber Board, which is supposed to be the agency to compute the deficit/surplus position of rubber in consultation with the concerned interests, virtually has no involvement in import operations thereby reducing it to an advisory body. The difficulty right now experienced by rubber goods makers in procuring raw rubber is caused on account of irrational handling of imports and the erratic supply. I strongly feel that more than the quantum of rubber imported annually, it is the timing that matters.

The only solution to this already grave problems would be that either the STC should reorient its operations on a need based manner strictly in accordance with the advice of the competent body, or the Board should be entrusted with the task of import. Section 8A of the Rubber Act clearly provides for this. This suggestion may not be misconstrued as an overenthusiasm on the part of the Board to take over rubber imports. The Board is interested only in ensuring uninterrupted supply of raw rubber to the consumers, whoever operates it.

Rubber import

If the Board is allowed to handle imports, the profit from the sale of imported rubber would have accrued to the Pool Fund, which in turn could be ploughed back for rehabilitation of small holdings vide provisions in Section 9B of the Rubber Act. Since the STC is handling the job now, the smallholders are naturally deprived of their rightful share realised from the sale of such rubber. The efforts to stabilise prices, streamline imports and stockpiling for buffer stocks would prove futile if they are executed in isolation. It should be conceived as a package deal, as otherwise the whole exercise would turn out to be counter-productive. Alongside, we should reckon with the fact that both the rubber producing and goods making sectors are proliferated by vulnerable sections. Predominance of less resourceful groups within these sections warrant the need for a fair deal to them.

The rubber small holder who accounts for 75% of the area and over 70% of the production of natural rubber dwells in huts in remote villages within his farm. He is cut away from all comforts amenities of civilized living. He carries on his enterprise against heavy odds like agro - climatic disfavours, mounting costs of inputs and other factors of production. He tries to subsist on the day's income from his tiny rubber garden subjecting himself to all sorts of exploitation.

The fate of the small scale rubber goods manufacturer is also not different. He has no access to new technology, he lacks sophisticated means of production, he does not have adequate resources and infrastructure and is harassed by the custodians of law. He gets on to business under great strains.

Integrated development of the Rubber Industry will remain an unfulfilled dream if the miserable lot of these two weaker sections is not ameliorated and their long term prospects and welfare ensured.

India's position

Hopefully, this seminar can deliberate on the pros and cons of these vital issues and arrive at certain definite inferences.

India is the 4th largest producer of natural rubber in the world. We have enormous potential in this country to bring more area under rubber cultivation. Ambitious plans are afoot to achieve this objective and in the next two decades propagation of rubber cultivation has to be taken up on a massive scale.

Another relevant point to which I want to draw your attention is that we should condition our minds to reconcile to the position that expansion of capacities for Synthetic Rubber and Reclaimed Rubber should be contemplated in such a fashion as to continue their supplementary role to natural rubber. They should never be made to pose competition to a versatile resource like natural rubber.

As regards synthetic rubber, even the full capacity available right now within the country is not being made use of. This being the case, how can we justify the proposals for new synthetic rubber units? Any more of this type would wean away the enthusiasm of rubber producers, who will harbour inhibitions about the long term prospects of their vocation. Experiences show that such suspicions in the minds of the producers of any possible glut, would result in the neglect of plantations. During the period 1971-77 when the goods manufacturing industry had faced a prolonged recession, the rubber producers were compelled to sell their produce even below the

floor price. Disheartened at this stage of affairs the producers neglected their holdings, which is being reflected in the poor rate of growth in rubber production experienced now.

Natural rubber, as all of you are aware, is a renewable resource of nature. Thousands of small people, who live below the poverty line, find a bread winner in this crop. Let us not try to do away with this versatile gift of nature by replacing it with synthetic polymers made out of expensive and exhaustible feed stock.

Ideal tree

It is gratifying to note that natural rubber has now been exempted from Forest Conservation Act (1980) thereby removing an unnecessary impediment against afforestation of denuded forests with rubber. Rubber is an ideal tree for afforestation and extensive suitable areas are available in many States. Unless Forest Departments in each State come forward to accord a special deal to natural rubber, it will be difficult to go ahead with development of rubber plantations in new areas. Besides, reforestation with rubber would help to preserve mother earth against disintegration, prevent shifting cultivation and bring back ecological equilibrium, upset by merciless destruction of forests. I may also add that for the rehabilitation and economic upgradation of the millions of tribals in underdeveloped areas, natural rubber planting would yield a viable solution.

The States in the NE sector hold out great promise for large scale expansion of rubber cultivation and the Board intends to field for them separate establishments with the concurrence of the Union Government.

I would suggest that an Informal Consultative Forum with adequate representation for the varied interests of the rubber industry and the concerned Ministries be constituted at this seminar so that vital issues concerning integrated development of the rubber industry could be discussed as frequently as needed. It would be advantageous to have national seminars of this type at least once in two years in different centres in the country as a regular feature, so that a sense of belonging could be nurtured. Representative organisations of producers and consumers could think about this and have it done under their auspices.

Also, I would suggest that whenever crisis situations arise let us sit together and sort out the issues than running directly to the media with handouts. This course would help us to foster a sense of co-existence and get away from the fallacies of dissonance.

I was trying to dwell upon some of the points which I felt relevant. Quite a good lot of presentations are going to be made here in this seminar, which will throw more light on the various facets of the rubber industry.

Sorry for digressing a little from the task assigned to me. My pleasant duty this morning is to welcome our distinguished guests and delegates who have taken the pains to be here to contribute to the success of this national meet.

It is indeed very kind of our beloved national leader and the Union Finance Minister Pranabji to have consented to declare open this prestigious national seminar on rubber. He is well versed with the problems and prospects of rubber more so as he was at the helm of affairs of the Commerce Ministry for quite some time. Pranabji had visited the Rubber Board and the Rubber Research Institute of India in 1980 and had spent a day there during the Silver Jubilee Celebrations of the Research Institute. He had visited us on later occasions also.

It will be embarrassing for me to tell you of the contributions of this great national leader to our economy as they are well known like an open book.

Great relief

His recent gesture in exempting excise duty on natural rubber has rendered great relief to the rubber industry. It bears ample testimony to his keenness in the welfare of this industry. I hope he will sympathetically consider and favourably dispose off our pending submission for removing Income tax burden on Replanting Subsidy extended to rubber planters.

On behalf of the Rubber Board and everybody present here I welcome you Sir most heartily, and respectfully pray that we continue to have your patronage, guidance, goodwill and blessings for all our efforts.

I am delighted to convey to you my dear friends, the keen interest being evinced by my leader Sri. K. Karunakaran in the welfare of the rubber industry. His association with this industry is almost as old as his public life. It will be relevant and appropriate to recall in this context that Sri. Karunakaran started his political career as a Trade Union worker, organising rubber plantation labour in Kerala. He has been a champion of labour productivity. He has never made secret of his thinking, that labour force, as an essential factor of production should be conscious of its duties and responsibilities to the society as much as it is about their rights and privileges. Most of you are aware that Sri. Karunakaran was a member of the Rubber Board for about 2 decades and was its Vice-Chairman for one term.

He is constantly in touch with the Rubber Board and has always taken the stand that everybody concerned should endeavour for a balanced growth of the rubber industry. My friends in the manufacturing industry are well aware of his commitment. The very fact that he has earmarked so much of his precious time to be here with us, to preside over this seminar shows his deep concern for the affairs of this industry. I am given to understand that to make his presence possible here he had to cancel a series of prefixed engagements.

On behalf of everybody here and on my own behalf I extend my respectful regards to you Sir, and welcome you most affectionately- we seek your continued patronage and guidance.

Galaxy of personalities

We have with us today a galaxy of colourful personalities to offer us their good wishes. They are Mr. George John, Vice-President of the United Planters Association of Southern India, Mr. O. P. Jalan, the young and dynamic President of the All India Rubber Industries Association, Rev. Fr. (Dr) Victor Z. Nariveli, Chief Editor of the Malayalam newspaper Deepika–popularly identified as the rubber newspaper of Kerala-Sri. M. M. Jacob, Member of the Rajya Sabha and a rubber small grower himself who is so much identified with rubber, Shri. B. B. Sangtani, a former member of the Board and doyen of the S. S. Rubber Industries and Shri. Joseph Monipally, Member, Rubber Board and the General Secretary of the Indian Rubber Growers Association.

These gentlemen who have made signal contributions for the promotion of the rubber industry need no introduction, I guess.

Immediately after the inaugural, two important sessions, one in the fore-noon and the other in the afternoon, are planned. The first session on "Rubber Production and related aspects" is being presided over by Shri. P. K. Kaul, Secretary to Finance, Government of India. We have included 4 papers in this session relating to natural rubber, Synthetic Rubber, Reclaimed Rubber and Raw Rubber Trade. These presentations are being made by very competent persons.

The session in the afternoon on "Rubber Goods Manufacture and allied interests" is being presided over by Shri. D. V. Kapur, Secretary to Ministry of Industries. The six papers scheduled in this session are also being presented by experts in the respective fields.

We have earmarked sufficient times in both the sessions for participation from the floor.

The valedictory session is being attended to by two dignitaries in Government-The Union Minister of State for Commerce Mrs. Ram Dulari Sinha and the Union Minister of State for Industries Shri. S. M. Krishna. I need not introduce these personalities to you.

The difficult task of summing up the deliberations is being entrusted to my good friend Shri. Madhav Capoor, Member, Rubber Board.

The Valedictory session is being followed by the projection of a colour film on Rubber produced by the Malaysian Rubber Bureau.

The Rubber Exhibition on 'Rubber In Every Day Life' arranged in the Vigyan Bhavan Foyer may be of interest to you. Kindly make it convenient to see the exhibits.

I welcome you all to this august assembly once again.

Now I welcome all the participants who have taken so much trouble to go over to Delhi to attend this seminar as delegates.

Before I conclude, I would request everyone assembled here that this seminar has been conceived as a result-oriented venture. When we disperse today we should rededicate ourselves to the cause of 'Integrated Development of Rubber Industry in India' and ensure that through our activities the rubber industry attains the pride of place in our economy it deserves.

Lastly, I may submit that we have tried our best to make the base of representation to this seminar as wide as possible. Still by oversight lapses are likely, but not many, in any case. Also we had to turn down many last-minute requests for participation for want of accommodation.

I apologise for all such shortfalls and beg of you to bear with me, for these lapses are not intentional.

Thank you very much. □

RUBBER IMPORTS TO END IN 6 YEARS

BOMBAY, AUGUST 1-In the next six years the country will cease to be an importer of natural rubber. At the current fast pace of new plantation growth and replantation. India will produce more than 3 lakh tonnes of rubber by 1990.

Since 1979, the rubber board has launched an integrated programme for development of rubber plantations by extending financial, technical and input assistance. In the past 4 years 63,000 hectares have been covered under the programme. The units planted in 1979 will commence production in 1985.

The rubber board chairman, Mr. P. J. Thomas, expects an additional 15,000 tonnes of rubber production annually to take the total to the 3 lakh tonne point by the end of the decade. Ably supplemented by the domestic production of synthetic rubber and reclaimed rubber, he believes that this will meet the needs of the rubber goods industry. He was addressing gathering or rubber goods producers who met under the auspices of the All India Rubber Industries Association here.

In this context, he said that the move to set up a new synthetic unit in Maharashtra was uncalled for. The capacity available now with the manufacturers were not fully utilised. It is understood that the output of the sole synthetic rubber producer. Synthetic and Chemicals Ltd., was only 13,000 tonnes last year against its capacity of 30,000 tonnes. This being the case how could we justify the proposal for a new factory, the rubber board chairman asked.

Any move of this type was sure to dishearten the rubber producers who would naturally feel panicky about the long term prospects. Experience showed that any suspicion in the minds of the producers about any possible glut in the rubber market could really do damage resulting in the neglect of plantations he warned.

(Business Standard)

Rubb Board bull. 19, No. 1

TRIAL RUBBER PLANTATION IN MAHARASHTRA

TR Chandrasekhar,
Assist. Botanist, Trial Rubber Plantation
Dapchari, Maharashtra.

The consumption of natural rubber in India has been increasing consistently during the last few years. The production in the year 1982-83 was 165,850 metric tonnes while the consumption was 195,545 metric tonnes, the shortage being met by import of natural rubber involving foreign exchange. The demand for rubber in the country is increasing year after year thereby widening the existing gap between demand, and supply. In order to meet the ever growing demand, every effort is being made by the Rubber Board to increase the production both by maximising the output from the existing holdings and also by introducing rubber to new areas. The non-availability of land for further expansion being the limitations in the traditional rubber growing tracts it has become a necessity to explore new areas for rubber cultivation. As a sequel to this, in 1981, the Rubber Board with the help of the State Government of Maharashtra, has initiated a Trial Rubber Plantation Project in Konkan at Dapchari. (Altitude: 58 metres, MSL). The Trial Rubber Plantation is about 145 kms away towards north of Bombay in the Thane Dist., on the Bombay-Ahmedabad National Highway. The Government of Maharashtra has handed over an area of 50 hectares to the Rubber Board under the Konkan area Development scheme.

A Field plant with overhead shade

12 Months old field plant

The Konkan area, stretching from north to South is between 15° and 20° north latitude, comprising a narrow strip of land on the western ghats of Maharashtra. The area is distributed in four districts namely Sindhudurg, Ratnagiri, Raigad and Thana. Indiscriminate felling of the forest cover and shifting cultivation practised by the local people has completely denuded the area. The topography of the land and the erratic rainfall, associated with prolonged drought periods, have rendered the area unsuitable for cultivating annual agricultural crops leaving vast area unutilised.

The area receives an average annual rainfall of about 2500mm restricted to about 4 to 6 Months from June to October, the number of rainy days being 65 to 98 days (1977 to 1982). The prolonged drought period of about 6 to 8 months is a problem for raising perennial crops like rubber. With the exploitation of perennial sources of water supply from dams, streams, etc., and also with the adoption of special irrigation techniques coupled with a package of other cultivation practices it is possible to overcome the problem. In the case of perennial tree crops it is likely that the problem of

1982 Seedlings (9 months old)

drought will be less severe when the canopy closes. Further, rubber cultivation with leguminous ground cover will considerably improve the physiochemical properties of the soil which in turn will help to conserve soil moisture.

Since rubber cultivation is labour intensive it can provide gainful employment to the local people particularly Adivasis who could thus be induced to abandon shifting cultivation so harmful to the agricultural potentiality of the area. The price of rubber in the nearby market is invariably higher than that prevailing in the traditional areas. Timber which would become available at the time of replanting would also fetch a very high price because of its high local demand for fuel and for making packing cases.

The project initiated in 1981 by the Rubber Board aims at the following:

1. To find out whether rubber can be cultivated in the region,
2. To study the yield performance
3. To work out the economics of cultivation and
4. To evolve a suitable planting material and cultivation practices for the region.

The Rubber Research Institute of India after taking over the land at Dapchari has established a seedling nursery with about 4,000 seedlings and a budwood nursery of 16 clones in the year 1981 itself. The growth of plants was satisfactory and is comparable to the plants of the conventional areas. The seedlings after sixteen months have grown to a height of 2 to 4.5 metres with girth ranging from 3.5 to 11 cms. The additional expenditures involved were for watering and shading. A clone trial with twelve clones has already been laid out in 1982 using polybag plants. The growth of plants is satisfactory. The plants have attained an average height of 2 metres in twelve months and also they have developed 6 to 12 whorls of leaves. The plants in the seedling nursery established in 1982 are also growing well. New Experiments both under irrigation and non-irrigation facilities are being taken up on a phased programme.

The preliminary experience shows that it is possible to grow rubber in the Konkan area. This could be achieved by providing shade in the initial years of planting and irrigation during the drought period. Since rubber is a perennial crop it requires a few more years to know the growth and yield performance. It would be premature to conclude anything positively at this stage because the Konkan belong to a non-traditional area, the crop would be exposed to new agroecological situations. The special techniques needed for raising the crop in the area are to be worked out and the commercial feasibility is to be

(continued on page 20)

Five months old polybag plants

RUBBER INDUSTRY HOLDS GREAT PROMISE

—CHIEF MINISTER

Shri K Karunakaran, Hon'ble Chief Minister of Kerala in his presidential address at the National Seminar on Rubber described the rubber industry as one which holds out great promise in respect of generation of employment. Thousands of people find a livelihood in this industry. It could therefore be considered as a mass-based industry. The Chief Minister said that various sectors within the industry could not behave in isolation. An integrated approach should solve the present problems he continued. A remunerative price assumes great significance. Referring to imports Shri Karunakaran said that it should aim only as an operation to ensure uninterrupted supply to the industry. The rubber goods industry has a bright future in India added the Chief Minister. Full text of his speech is reproduced below:-

My dear Pranabji, Shri. Thomas, Chairman, Rubber Board, and friends.

I am delighted to be present here and to associate myself with this prestigious national Seminar on Rubber, which is organised by the Rubber Board with the active involvement of all the interests of the Rubber Industry. I was particularly impressed with the theme of this national Seminar i. e. towards "Integrated Development of the Rubber Industry", which sets the trend and direction for the course of action to be pursued in future.

The strategic significance of rubber is inter-related with the progress and prosperity of developing nations. The rate of off-take of rubber is looked upon as an index of modernisation. Per capita consumption of rubber in India is said to be one of the lowest in the world. Here, I learn, that 3 persons put together consume only 1 kg. of rubber in a year while the per capita annual consumption in developed countries like United States of America is as

high as 15 kg. As the style of living of our people both in the urban and rural areas gets more and more sophisticated consumption of rubber also would pick up proportionately, resulting in greater need for this material in the years to come.

Judged by any standard rubber production in India has been growing steadily over the past three decades outpacing all other agricultural commodities, though it could not measure up fully to the needs of the rubber goods industry.

Compliments to the Rubber Board

I would hasten to compliment the Rubber Board and pay my tributes for the excellent work done by this institution in promoting production and productivity of rubber in the country to such big heights. I feel elated as I have had ample opportunities to be associated with the Board in several capacities. I gratefully acknowledge the fact that the Rubber Board still remembers me as a good friend and involves me in all their activities of development.

As an enterprise which holds out great promise in respect of generation of employment the rubber industry, both the producing and consuming sectors, has great relevance to Indian economy. Hundreds and thousands of people find a livelihood in this industry. Therefore, it could be taken as a mass-based industry. Any recession or set-back in any sphere of this industry will cast its adverse impact on the people and our economy at large. Viewed in this context the type of dialogue envisaged to be initiated at this seminar is indeed commendable. I fully concur with the sentiments expressed by the Chairman, Rubber Board in his opening remarks that the various sectors within the industry cannot afford to behave in isolation. What is needed is a joint, unified and integrated approach wherein all the interests should be ensured of a fair deal.

I offer the good offices of the Government of Kerala for arriving at a consensus on all outstanding issues. As the State which produces more than 90% of the rubber in this country, we are concerned in the welfare and development of the rubber goods industry as much as we are committed for the protection of the rubber producers. The producing and consuming industries should prosper and flourish equally and enrich the economy of this country. Let us work together hand in hand to reach this laudable goal.

Lion share of the Rubber Plantations and Rubber goods production in the country abound in small scale operators. They are no longer large enterprises. Of course, I am not underscoring the importance of the organised sector or proprietory units.

Industrial relations

These industries are engaging sizable number of people in their units especially the working class. Labour as an essential component of production needs sympathetic consideration. Much of the disquiet and unrest now experienced are due to inadequate handling of industrial relations. A contented work force is inevitable for ensuring higher standards of production.

A sizable section of the working class are covered by the industrial and plantation labour Acts. But those units which stay outside the purview of these legislations on account of their small size also employ equally large number of workers who are denied many of the social security benefits allowed to their counterparts in the large sector.

These people also must be accorded a fair deal. Otherwise the economic viability and potential productivity of these units where they work will be adversely affected, because of the erosion of creative efficiency of the discontented worker.

I am aware of certain steps initiated by the Rubber Board to extend social security benefits to the plantation workers who are not covered under the Plantation Labour Act. This is an example worth emulating, because to win the confidence of the workers and instil the spirit of dedication and loyalty it is imperative to nurture a sense of security.

A remunerative price

The rubber producers in our country are a highly innovative breed of people. They are eager to acquire and adopt the most appropriate technology for upgrading productivity. Traditional rubber areas in our country are not strtictly very congenial agro-climatically. Prolonged monsoons and droughts are factors that impede the realisation of optimum yields from rubber. But still they have done well compared to their counterparts in other rubber producing countries, despite heavy odds. The largest single factor that used to inspire them, was the fairly lucrative nature of this vocation. If they are to maintain the standards they have built up over the years, it is necessary that they should have faith and confidence in the long term prospects of this crop. The issue of a remunerative price for rubber assumes significance in this context. By remunerative I do not mean an unrealistic or unreasonable price. Viewed as an economic activity rubber cultivation should appear to be a paying proposition. But there is one aspect that has to be clearly understood and sympathetically appreciated. The increase in rubber prices is nothing unique or universal. It is only a part of the general increase in the price of all agricultural commodities, whether cash crops or otherwise. In large terms I should even point out that it is part of a global phenomenon. I am stressing this point to dispel the totally incorrect notion that has gained currency in certain quarters that rubber producers are having wind fall profits, totally out of proportion to the general price increase and inconsistent with the need for keeping the cost of manufactured goods competitive. To put it differently the spurt in rubber prices is perfectly natural and legitimate against the overall spiralling of the cost of all goods and services. It is not a phenomenon to be looked upon with suspicion or

concern. If this fact is accepted, I am sure that the rubber producers in our country will rise to the occasion and take up the challenge of catering to the full needs of the rubber goods industry either through intensive or cultivation techniques.

Need based import

There has been sufficient reason for the rubber producers to be panicky in the past. That is why they are allergic to the very mention of imports. I have no dispute about the fact that the country is short of rubber at present. Imports to the extent to fill up the gap between demand and domestic availability are justified. But imports should not be for the sake of imports alone or to push own domestic prices but it should be aimed only as an operation to ensure uninterrupted supply to the industry during periods of real shortage.

I do subscribe fully to the apprehension of the Chairman, Rubber Board and to endorse his concern about the apparently irrational manner in which rubber imports are handled now. Arrival of imports and release to the consumers should be timed in such a way that it does not cause violent fluctuation in the domestic market.

I wish the Government of India set right the present systems and see that import operations are employed as a tool only to maintain stability in supply, prices and market. For healthy growth of the industrial sector also stability is essential.

Bright future

I am one who strongly believes that rubber goods industry has a bright future in this country. Rubber will put to more and more new uses by virtue of its all-purpose nature. When we think of new rubber-based industries, it would be worthwhile to consider the locational advantage of Kerala. I would utilise this opportunity to make a special plea to my friends from leading industrial houses of the Rubber Industry to go over to Kerala and avail of the ideal climate that awaits them for establishing new industries. Kerala is endowed with natural resources including rubber. It is obvious that the heavy cost of transportation of raw material to the factory site would be minimal if the manufacturing centres are located in Kerala. Another significant advantage would be the savings on taxes. I assure you everything within the command of my Government for such ventures. I trust that this request would engage your earnest consideration.

I would like to mention here two specific commitments my Government have given to prospective entrepreneurs. The first is that for the initial five years the lower power tariff that prevailed before the recent revision will be available to them. The second is that for the first five years it will be ensured that there is no stoppage of work hindering productivity.

Modi-an example

Another area where the Industrial Houses of the rubber industry could move in is assisting rural development activities in regions with concentration for rubber small holdings. I am aware of the pioneering work being done by M/s. Modi in this direction in one of the villages in Kerala, where they disseminate new technology, among small holders through field extension service. Big industries should engage in such activities to fulfil their obligations to the society. This would supplement the efforts of Government agencies already involved in rural reconstruction.

The ultimate objective of "Integrated development of the rubber industry" could be achieved only if the various components within the rubber industry foster mutual trust and confidence. I am given to understand that this Seminar is being convened primarily to create an awareness among the different interests on the extent and nature of their inter-dependence.

I hasten to congratulate the organisers for the efforts put in to set a common forum of this type for effective interaction. Once again I assure you the goodwill and patronage of my Government for all your endeavours.

Jai Hind! □

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established. For attempting large scale planting it is also essential that all agronomic requirements of the crop in the area have to be established on scientific footing. However, experiments are being envisaged to evolve cheaper methods of irrigation and shading so that rubber cultivation in the area becomes an economical proposition. Once a suitable clone is identfiied for the Konkan region, no doubt, the region can substantialy contribute towards overcoming the shortage of natural rubber in the country. □

THE WEEPING WOOD

The latex that flowed out
from a rubber tree
in Vigyan Bhavan attracted
the attention of
many visitors who
assembled there to see
the exhibition
arranged in connection with
the National Seminar
on Rubber held in
New Delhi
on 10th Sept. 1983.
Surprisingly enough a few
visitors asked:-

"Is it true that the
milky liquid called latex
comes out! from a tree?"

To them, it was a
surprise. It is still more
interesting
to learn that quite a
number of people
are there in the North
who have not seen
a rubber tree in their life.

Natural rubber has bounced through extreme vicissitudes during its history of nearly five centuries. A brief recapitulation of the course of events might be relevant here.

* Christopher Columbus who from the modern world first discovered rubber in the wild tropical forests of Amazon valley towards the close of the 15th century considered such a fascinating material as to befit presentation to the Queen of Spain. Since then, close to three centuries had to pass before it had to find use as the humble eraser' or "rubber" in England and France.

* Mass production of internal combustion engines and pneumatic tyres from the close of 19th century threw up the demand for rubber so high that extensive plantations had to be raised in tropical Asia and Africa in order to feed the markets.

* The boom, however, was too good to last long. The Great Economic Depression of 1930s sent the rubber producers abegging before buyers. Then came the Second World War and the industrial world got ready to gobble up any amounts of rubber which by then had become one of the most important strategic raw material. But the war itself severely curtailed its production and movement. The crisis made commercial production of the synthetic substitutes a reality.

* For a quarter century after the hostilities, natural rubber had to compete hard with the synthetics for even a humble existence. In this process of struggle, it neverthless went on gaining in productive efficiency and price competitiveness though at the same time losing ground in market share.

* The petroleum crisis which started manifesting itself from 1973 is again bringing about a change in fortunes. Synthetic rubber which mainly depends on petrochemical feedstocks is finding it hard to hold its grips owing to enormous escalations in costs. Prospects for any dramatic recovery are none too bright since the known sources of raw materials are fast getting

The paper presented by Shri P Mukundan Menon, Rubber Production Commissioner at the National Seminar on Rubber gives an account of the developments that have taken place in regard to natural rubber and goes on to analyse the strengths and weaknesses of rubber plantation industry in India. An assessment of the demand potential for the next 25 years that is upto 2010 A. D, is then attempted. Based on these, the challenges that have to be met in attaining the goal of self sufficiency are identified and discussed. The delegates attending the seminar profusely complimented Shri Menon for his efforts in preparing such a paper which contains a realistic assessment of the industry. Shri Menon also answered the questions that followed.

THE NATURAL RUBBER PRODUCTION: THE CHALLENGES AHEAD

P MUKUNDAN MENON

depleted, energy for processing is getting dear, capital costs are rising to dizzying heights and pollutions resulting from industrial effluents are proving to be increasingly difficult to tackle. Natural rubber, on the other hand, draws mainly on the inexhaustible sunlight for energy. Rubber plantations bring about the much needed ecology restoration of the countryside and supply fuel wood, timber, vegetable oil, oilcake and honey as by-products.

* Natural rubber and synthetic rubber have now seemingly come to a compromise on the understanding that both will co-exist, co-operate and complement each other.

* The recent world-wide recession witnessed production and consumption of both natural and synthetic rubber suffering set backs. However, recoveries are now well in sight.

The big question facing the new found status of natural rubber is whether it can widen its production base and fully meet the future demands. On a world-wide basis, there are problems looming large. Land resources are fast dwindling, labour is getting dear and where both are available, management capabilities are missing. Should natural rubber fail to make the fast progress now expected of it, the world would hava to go ahead with increased production of synthetics, whatever be its costs and other problems.

For those of us who are concerned with natural rubber production in this country there cannot be a more appropriate time than now to take a look ahead and to prepare ourselves to meet the challenges in store. The view has essentially to be a long range one since rubber is a long term crop taking seven years to mature and a further twenty five years to yield its full quota of economic production.

Rubber Plantation Industry in India -Strengths and Weaknesses:

The course of history of natural rubber in India was more or less in line with the global developments until the Second World War. During the war, India and Sri Lanka came to be the main sources of natural rubber to the Allied Powers. Plantations in these countries were then encouraged to be intensively exploited. This and the eventual exit of the colonial government set the history of rubber plantation industry in India to take a course somewhat different from that of the rest of the world.

The achievements and shortcomings of the rubber plantation industry in India as of now can be summed up as follows:

Emergence of consuming industry

India could turn the fall-outs of economic depression of the '30s to her advantage. The existence of vast, untapped industrial potential and the availability of cheap and plentiful indigenous rubber drew local enterpreneurs as well as investors from abroad to start rubber based industries within the country. The manufacturing industry has since then registered phenomanal growth, So much so that India today ranks 11th highest among rubber consuming countries and 5th highest among natural rubber consuming countries. The country has come to produce sizeable quantities of synthetic rubber and reclaimed rubber. The unique strength of rubber producing industries in India- natural, synthetic or reclaimed is that there is a growing internal market ready to support and nurture them.

Statutory support

After the War, the rubber plantation industry was left badly worn out as a result of the Government's insistence on intensive exploitation for promotion of war efforts. Without its proper rehabilitation and continued development, the manufacturing industries could hardly be expected to survive and expand. The Government therefore, came forward to enact low to protect and support the rubber plantation industry.

The Rubber Act, 1947 came into force even before Independence. The provisions under the Act and its Rules have considerably benefitted producing and consuming industries. The price protection afforded to raw rubber until recently has been particularly helpful in creating a sense of security and well being for the plantation industry and to give it incentive for growth.

The Rubber Board set up in 1947 under the Rubber Act "to promote by such measures as it thinks fit the development of the rubber industry" has played a stellar role in providing organisational support and direction to the expansion and modernisation of the plantation industry.

Having been enabled to function systematically and with fair amount of freedom for action, the Board could readily and adequately respond to the needs of the industry. The existence of a cess fund to which collections are made by the Board itself has provided ample money for the Board to draw upon for all its activities so far.

The success achieved by the Board owes itself largely to its research and development activities undertaken on a mutually complementary fashion. Collection and compilation of statistics advisory and extension services, training, supplies and labour welfare measures have also contributed prominently to the total spectrum of Board's attainments.

Membership of the Government of India or the Board in the three most important international organisations relating to rubber, namely International Rubber Study Group (IRSG), International Rubber Research and Development Board (IRRDB) and Association of Natural Rubber Producing Countries (ANRPC) enables the country to keep in touch with the developments taking place in the rest of the world, to inter-act with workers in counter-part organisations, to work out solution to common problems and to derive significant benefits in all fields.

Geographical limitations to growth

Rubber tree flourishes and yields best in warm, equable, tropical climate. Such conditions are normally obtained at low elevations in certain regions of the world lying within 10° latitude on either side of the Equator. In India, Kanyakumari District of Tamilnadu and Nicobar Group of Islands are the only regions failing within this geographical limits. Areas lying outside this belt experience pronounced seasonal variations in climate such as excessive rainfall, extended drought, cold winter etc. which are all factors affecting growth, health and yield of rubber to varying extents depending upon the severity of the incidence of each or all. Most of the rubber growing areas in India lie in marginal and submarginal locations and suffer from high incidence of diseases entailing expensive control measures, rain interference of tapping which calls for rainguarding, loss of tapping days which reduces yield and lengthening of immaturity period which results in increase in capital investment and delayed break-even point in economic performance. Rubber plantations in India also exist mostly on slopy lands where the relative absence of easy workability and the need to have effective soil conservation measures become responsible for higher costs and reduced labour output. It should, stand to the credit of all concerned in India that despite these heavy odds rubber production is being achieved with efficiency far excelling most other countries.

Expansion in area

The area under rubber in India in 1950-51 was 69,000 hectares. This has grown over four-fold to 290,000 hectares in 1982-83. The State-wise distribution of area is as follows:

States/Union Territories	Area (hectares)
Kerala	255,000
Tamilnadu	16,000
Karnataka	9,500
Tripura	4,800
Assam	1,100
Meghalaya	1,100
Andaman & Nicobar Islands	900
Goa	700
Manipur	400
Mizoram	400
Others (Maharastra, Arunachal, Nagaland, Andhra, West Bengal and Orissa)	100
	290,000

The impressive expansion in area has taken place owing to a variety of reasons important amongst which are price protection and the resulting remunerative returns obtained, agrarian reforms in Kerala which exempted rubber estates from land ceilings, disease devastation of extensive coconut plantations in parts of Kerala which prompted change-over to rubber cultivation and integrated supplies and services rendered by the Rubber Board.

The 1970s saw the tempo of newplanting sagging to dangerously low levels. The Rubber Board, therefore, started implementing ambitious schemes for promoting newplanting of rubber from 1979-80. The schemes provide for giving a package of handsome financial assistance, technical support and supplies. The response to the schemes during five years of their implementation has been exceedingly good. It is estimated that not less than 35,000 hectares has been newly brought under rubber during this period against the laid out target of 28,000 hectares.

Replanting of old and uneconomic plantations

Cosidering the duration of economic life of the rubber tree, it is necessary to have 3 per cent of the total area rehabilitated every year. As the immaturity period of the rubber tree under Indian conditions is 7 years, follows that about 20 per cent of the total area should remain in different stages of immaturity.

It is to be noted with satisfaction that out of the total area under rubber in India, the area under mature rubber has rarely exceeded 80 per cent. However, this position has been maintained more by addition of new areas than by replantation.

A scheme for subsidised replanting which is in operation from 1957 has succeeded in promoting the work on an extensive scale. During the last 26 years, it has been made possible to get replanting done in about 65,000 hectares per year. Thjs achievement has fulfilled only 60 per cent of what was actually needed for maintaining the industry in peak efficiency. The shortfall has occurred almost entirely in the small holding sector for obvious reasons.

Improvement in cultivation and production practices

Rubber plantations in India have come a long way in improving their agro-management and production practices. Manuring and spraying were relatively absent in small holdings three decades ago. With the spread of high yielding cultivars, both these are now widely practised. Demands for soil and leaf analyses based on which discriminatory fertiliser application could be adopted is rising to such high levels that the Rubber Board has proposed setting up of regional laboratories and fielding extra mobile laboratories. Tapping with rainguards is gaining wide acceptance amongst progressive small holders. It could soon get universal in the country. Use of advanced planting materials raised in polybags as a technique for reduction of immaturity period and minimising casualties is another innovation getting quick diffusion. Tapping and processing standards of small holders in India are already far superior than that of their counterparts in other countries. The healthiest trend in manifestation towards modernisation is the singular keenness evinced by rubber growers in organising and attending village level study classes and group discussions on appropriate technology.

Gains in productivity

Productivity improvement in terms of average yield per hectare per year is the indicator of the growth of internal efficiency of the industry. This has registered

a gain of 192 per cent from 284 kg in 1950-51 to 830 kg in 1982-83.

It is relevant in this regard to compare India's present yield rate with that of other major rubber producing countries. Malaysia which is in the forefront in natural rubber prdouction enjoys an average yield rate which is around 20 per cent more than that of India. For other countries, the reported figures are: Indonesia (1980)—668 kg, Thailand (1980) —435 kg, China (1982)—700 kg and Sri Lanka (1980)—716 kg.

Productivity improvement in India has been achieved through a variety of means. These may be mainly classified as use of high yielding varieties, improved cultural practices, increased plant protection and better exploitation techniques. Amongst there, use of high yielding varieties alone is reckoned to have contributed 50 to 60 per cent to the yield rise. As against unselected, low yielding seedlings which have a yield capacity of only 400 kg, improved varieties, both clones and clonal seedlings yielding 1,000 to 1,500 kg were extensively planted during 1950s and 1960s. Since then, newer clones capable of giving yields ranging from 2,000 to 3,000 kg are in popular use. Spectacular productivity rise on a sustained basis during coming years are therefore on the cards.

During 1950-51, the ratio between areas under high yielding varieties and low yielding material was 19:81. By 1982, the ratio improved to 88:12.

Increase in production

Total production of natural rubber during 1950-51 was 15800, tonnes. During 1982-83,it reached 166,000 tonnes, an increase by 10.5 times.

Structural changes in plantations

Until 1950s, rubber planted area in India was predominantly under large estates of over 20 hectares in size. Changing socio-politico-economic conditions, however, brought about a fast change in this structural pattern.By 1959-60, the total extent under small holdings of 20 hectares or less size exceeded that of large estates. Estates had reached their peak number of 654 in 1967-68. Thereafter, it has come down to the present 460.

Small holdings numbering about 230,000 account for 75 per cent of the total area is made up of small holdings of upto 2 hectares in size.

Proliferation of small holdings will have to go on inexorably. The existence of such a large proportion of tiny holdings managed by individuals who are neither fully conversant with the sophisticated techniques of modern cultivation and production of rubber nor possessing the means for giving due attention result in poor performance.But the situation actually existing is far different. In the main rubber growing districts, the majority of small holders are educated and earnest. Diffusion and adoption of technical innovations are easy and fairly fast amongst them.

About 35 per cent of the area under large estates is contributed by various State-owned undertakings. By and large, their performance is well below par. Sizeable areas under them are downright poor. As a whole, public sector plantations now act as a drag on the productive efficiency of the large estate sector.

Price of rubber

The plantation industry in India has been often branded as a high cost producer of rubber. Certainly, there is truth in this accusation in as much as the cost of production in India is to an extent higher than in Malaysia, Indonesia, Thailand and Sri Lanka. There are various sustaining reasons for this. It is relevant to mention the most important ones:

—The geographical handicaps, which have already been dealt with earlier.

—High cost of such essential inputs as fertilisers, weedicides, plant protection chemicals, coagulating acid, petroleum fuels and fuel wood.

—Low productivity of tapping labour. While in Malaysia, for instance, the daily tapping task for a worker is 500 to 600 trees, it is only 250 to 300 in India.

It is common knowledge that market prices behave reasonably when demand-supply balance is maintained. There is however, a wrong but widespread belief that spurts in prices occuring in India in situations of inadequate supply are reflective of high cost of production. There is also a similar erroneous impression that abnormally slumped prices which prevailed in South East Asian and Colombo markets during the last few years represented a fair level of world price.

Demand projection for rubber

An examination of the challenges facing NR production should begin with projection of demand on a long term basis. The period to be taken into consideration should be atleast 25 years, or say upto 2010 AD.

The demand for rubber depends on the production of various rubber goods. Product-wise consumption of new rubber (NR&SR) in India takes place on the following pattern:

Product	Share in total consumption (per cent)
Auto tyres and tubes	52
Cycle tyres and tubes	12
Retreading compounds	5
Footwear	11
Belts and hoses	6
Other products	14
	100

The consumption of new rubber during 1982-83 was 245,100 tonnes made up of 195,500 tonnes of NR, 44,700 tonnes of general purpose SR (styrene butadienel and poly butadiene) and butyl rubber and 4,900 tonnes of special purpose SR.

Various organisations have projected the future demand for rubber. According to the projections prepared by the Planning

Commission in 1980, the consumption of rubber by 1989-90 would be 405,000 tonnes consisting of 342,000 tonnes of NR, 63,000 tonnes of general purpose SR and butyl rubber. This yields an average growth rate of 7 per cent per year over the consumption in 1979-80. The National Council of Applied Economic Research (NCAER) had in 1980 conducted a detailed study on the future demand for rubber at the instance of the All India Rubber Industries Association. They have worked out the demand adopting two different methods, namely:

(1) Based on the projected production of various rubber products:

(2) Based on the projected growth of index of industrial production.

Employing the first method, the demand by 1989-90 is projected to 365,000 tonnes made up of 298,000 tonnes of NR, 67,000 tonnes of general purpose SR and butyl rubber. The second method gives a figure of 473,000 tonnes for the same year consisting of 386,000 tonnes of NR and 87,000 tonnes of general purpose SR and butyl rubber. The average annual growth rate works out to 6 per cent under the first method and 9 per cent under the second method. It is relevant to note in this context that the actual growth-rate in consumption of rubber during the last 10 year period (1973-74 to 1982-83) was only 6.0 per cent.

Both the above projections are only for the period upto 1989-90. As no dependable projections are available beyond this period, an attempt is made in this paper to project the demand upto 2010 AD.

It is widely accepted that in a country growth rates in Gross National Product (GNP) and usage of a vital industrial raw material as rubber are highly co-related in the sense that both can maintain a ratio of 1:1. However, this can be true only when growth in the various sectors of economy takes place in a fairly balanced manner. In India, during the initial years of industrial development, growth rate in rubber consumption had taken place at a pace much faster than that of GNP. The ratio between the two went on progressing towards a balance over the years. For the seven year period 1975-76 to 1981-82, the ratio between GNP growth rate and rubber cosumption growth rate worked out to 1:1.25. The targeted growth rate in GNP during the current Plan period (1980-81 to 1984-85) is 5.2 per cent year and for the next two Plan periods (1985-90 to 1994-95) it is 5.5 per cent per year. On the above basis, and taking care not to err on the high side, the average annual growth rate in rubber consumption during the period upto 1989-90 could be projected at 6 per cent and during 1990-91 to 1999-2000 at 5.5 per cent. Thereafter, a growth rate of 5 per cent could be assumed upto 2010 AD. The total consumption of natural and synthetic rubber would then work out as follows:

Period	Growth rate (per cent)	Consumption of rubber ('000 tonnes)
1985-86 to 1989-90	6.0	368
1990-91 to 1994-95	5.5	482
1995-96 to 1999-00	5.5	629
2000-01 to 2004-05	5.0	803
2005-06 to 2009-10	5.0	1025
2010-11	5.0	1077

The recent new developments in the motor vehicle production sector in India have been hailed as the first stirrings towards an "automobile revolution". Tyre manufacturers are promptly enough drawing up plans for increasing their output sizeably under due letters of intent issued by the Government. Obviously, there need not be any dispute in accepting the above projections of demand as a base.

The per capita consumption of rubber in India in 1954 was 0.07kg., or 1 kg. of rubber for 14 persons. This has steadily increased to 0.33 kg., or 1 kg. for 3 persons by 1981. The per capita consumption in all developed countries is between 6 and 14 kg. According to the Sixth Plan document, the total population in India, which in 1981 was 68.4 crores, is estimated to go up to 86.4 crores by 1996. The laid out policy is to reduce the Net Reproduction Rate for the country as a whole to 1 per cent by 1995. If the target is achieved, the population will still rise to 90 crores by 2000 AD and to 100 crores by 2010. A three-fold increase in per capita consumption of rubber, ie. from 0.33 kg. of 1981 to 1 kg. can be surely envisaged during this period of three decades. Should this materialise, the total rubber consumption by 2010 must reach the 1 million tonne mark.

There can be imponderable changes in the end uses of rubber in future. Change over from the conventional crossply to radial ply technology in the manufacture of passenger car and commercial vehicle tyres in developed countries has brought about addition 30 to 50per cent to tyre life. This can reduce the consumption of raw materials including rubber. However, the radial ply technology also involves increased use of NR in place of SR. In India, radial ply tyres have only made an appearance and that too for cars alone. There are opinions expressed that with existing conditions of roads and vehicles already on road, it will have to take quite long for a complete switch over to radial tyres for cars and commercial vehicles.

Liquid injection moulded polyurethane tyres is a newer innovation on the horizon. It cannot as yet be said whether this is going to be a success and if so what all changes in rubber consumption it can bring in its wake. Development of thermoplastic NR which is also indicated can, on the other hand, open up new exciting vistas including recovery of ground already lost to plastics. Application of rubber in new areas can also happen. Possibilities in this line

in industry, railways, roads, bridges, buildings, irrigation, agriculture etc. are endless.

If one must take a gloomy view of developments for rubber in future and reckon annual growth rate in consumption to diminish at a steady ½ per cent over every five years starting from 6 per cent in 1985-86, the total demand by 2010 will still be 9.69 lakh tonnes.

The present pattern of use of NR and SR in India is in the ratio of 80:20 as against the global pattern of 30:70. With the diversification of industries and end uses and dictated by questions of availability of NR, there can be change in NR - SR consumption pattern to 70:30 by 2010. The demand for NR would then be around 7 lakh tonnes.

The Challenges

It can be seen from the fore-going discussions that the challenges facing NR in India indeed continue to be in increasing production, improving productivity and reducing cost. The tasks involved are briefly dealt with below:

Newplanting

Assuming that national level average productivity of rubber plantations would rise from the present 830 kg. per hectare to 1500 kg. in 2010 AD, the requirement of area in production for giving an output of 7 lakh tonnes would be 4.67 lakh hectares. With the requirement of 20 per cent immature plantations in the total, the aggregate are which should be under rubber plantations by 2010 AD works out to 5.84 lakh hectares. A net addition of 2.84 lakh hectares to the existing 3.00 lakh hectares should therefore be achieved during the course of 25 years from 1985-86. This involves setting of annual average newplanting target at 11,000 hectares, i. e. 5,000 hectares more than the Sixth Plan annual target of 6,000 hectares.

Land resources required for the expansion will have to be fully met. About 25 per cent of it can be found from traditional rubber growing areas and 75 per cent from such non–traditional areas as North Eastern States, Orissa, Maharashtra, Goa etc. In non-traditional areas, a programme for identifying and demarcating suitable lands would have to be immediately undertaken jointly by the concerned State Governments and the Rubber Board.

Replanting

Plantations raised up to the year 1977-78 will outlive their 32 year economic life period by 2010 and will require systematic replanting. The average annual target over the 25 year period would have to be 9,000 hectares. This is in contrast with the average of 2,500 hectares achieved since 1957 and 4,000 hectares estimated to have been achieved during the last few years.

It is possible that 5 to 10 per cent of the existing rubber planted area will get cleared for various other purposes during the period upto 2010. This will have to be made good by newplanting additional areas.

Productivity

Achieving of increased productivity to the desired average national level of 1,500 kg. per hectare per year will be quite an uphill task, particularly so when considering that most of the new plantations will be in non-traditionl areas having submarginal agro-climatic conditions and undertaken by growers who will not be well versed in the techniques of rubber growing. However, the proposal is indeed feasible reckoning that the yield level in non-traditional areas can be brought up to an average 1,200 kg. and that of traditional areas to between 2,000 kg. and 2,500 kg. These yield levels could be achieved through use of high yielding cultivars both existing and new, a high standard of agro-management including irrigation wherever needed and optimum crop exploitation using rainguards and judicious chemical yield stimulation.

Research

The most important input required for achieving developments on the scales envisaged is widened and intensified research efforts. The main areas for research should be the following:

* Most of the non-traditional areas as well as the high elevation locations in traditional areas where planting expansion has chiefly to take place are prone to spells of pronounced drought and cold. Introduction, mother tree selection and breeding of strains which can withstand such hostile conditions and perform well need to be undertaken.

* Fropagation of newly evolved clones cannot be left to the cumbersome and time involving conventional methods. Therefore, tissue culture techniques which can stand rigorous tests for commercial adoption will have to be evolved. The effects of growing tissue cultured improved cultivars on own roots should be fully investigated and, if beneficial, made use of for efficient growth and production.

* Among field operations, weed control accounts for the maximum expenditure, the reason being that the whole work is being undertaken manually. Chemical weed control at reduced costs is a crying need for which cheap and effective weedicides which can be indigenously produced require identification.

* Irrigation is as yet not commercially practised in rubber plantations anywhere in the world. Under the Indian conditions, and more particularly in non-traditional areas, this might prove advantageous. Cheap and efficient Irrigation systems, as for instance subsoil injuction of water along with nutrients, will have to be studied and perfected.

* Expensive plant protection methods now adopted for the control of Abnormal leaf fall, Powdery mildew and Pink diseases should be dispensed with by making it possible to evolve successful materials and techniques for adopting crown budding as a universal practice.

* Fertiliser application should be only on discriminatory system

based on soil and leaf analyses. Research has to continue for progressive improvement of this system. Simultaneously, preparation of detailed maps showing soil survey aud classification should be got prepared.

* Chemical yield stimulation is now popular only with large estates. Even with them, the systems adopted are not always the most advantageous. In order to make stimulation accepted and adopted universally,suitable materials and methods have to be investigated and the best ones identified.
* Research on easy and efficient exploitation systems such as micro or puncture tapping and mechanised tapping should be carried out and thereby cost reduction made possible.
* Improved systems for collection, transport and processing of small holder rubber at large as well as small group processing centres as needed also have to be evolved.

Supplies, services and training

There is very little further scope for expansion of area in the organised large estate sector. Therefore, small holders will have to largely bear brunt of the envisaged tasks of expansion and increased production. Supplies, services and training amongst them bear crucial importance. The field organisation of the Board would have to be progressively expanded on a massive scale. Extension workers will have to be provided at the rate of one for every 1,000 hectares of small holding area. Their number will therefore have to exceed 500.

For an annual planting/replanting target of 20,000 hectares, about 1 crore of budgrafted plants reared to 1 to 1.5 metre height in polybags would be required. Other supplies and services will have to be correspondingly stepped up. Small holder Development Centres organised at the rate of one for every 200 to 500 small holdings and run by co-operative societies with the active assistance of the Rubber Board alone can satisfactorily handle the work.

Training and communication will assume great importance amongst entrepreneurs in general and in non-traditional areas in particular.

Cost reduction

The Research proposals suggested if undertaken and made to yield effective answers to the problems and if the same are got widely adopted in the field can bring down cost of production to a very great extent.

Funds

At the current prices, the capital outlay required on agricultural operations for planting/replanting 5 lakh hectars is Rs. 1,000 crores. About 50 per cent of this will have to be subsidised and 50 per cent made available as long term agricultural loans. Expenditure on administration, supplies, services, training etc. on the part of the Board would come to the equivalent of about 15 per cent of the amount shown as the total estimated outlay on subsidies. Research support could similarly cost and amount equivalent to about 5 per cent of the estimated subsidy outlay.

Loan finance will have to come jointly from NABARD and comm ercial banks. Expenditure on subsidies,Board's project services and research will have to be funded partly from rubber cess and partly through Government grants.

CONCLUSION

India has chosen well in depending mainly on NR for industrial requirements. The rubber plantation industry has responded to the situation equally well and played its assigned role with remarkable credits. This holds true in expansion of area, modernisation of plantations, improvement of productivity and increasing of output. On the price side, timely and controlled imports, or exports as the case may be, could bring about the desired stability and prevent hardships to producing and consuming industries. This should be easy to achieve since possible demand supply imbalances are always worked out by the Rubber Board with fair accuracy and well in advance.

The challenges facing NR for the future mainly centers around making adequate supplies available at reasonable costs to meet the projected steady increase in demand. The dimensions of the task are indeed such as to call for imaginative policy planning and concerted and dynamic execution. With the resources available and the level of progress already gained, there can be justifiable optimism towards attaining the goals,

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The first shipment of Chinese-made radial passenger tyres to reach the U. S. market has its roots in West Germany. The 10,284 "Warrior" brand passenger and snow tyres expected to go on sale in September or October originate from a Mainland Chinese factory that utilizes almost all the equipment and manufacturing technique of the former Metzeler Kautschuk GmbH plant in Munich, West Germany.

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(Rubber & Plastics News).

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ROLE OF SMALL SCALE RUBBER INDUSTRY

BS KAPOOR

Shri BS Kapoor, Member, Rubber Board and President, Northern India Rubber Manufacturers Federation in his paper presented at the national seminar on rubber discusses the various problems being confronted by the small scale rubber industries. About 35,000 items are manufactured from rubber. The uninterrupted availability of rubber, therefore, becomes very important in the context of the stresses and strains experienced by them. Shri BS Kapoor endorses the views of the Chairman Rubber Board that growers and consumers should come closer and recommend to Government to stabilise the rubber prices by ensuring a reasonable price range remunerative to the producers and affordable to the consumers. The national seminar is no doubt a memorable milestone so far as growers and consumers are concerned, he says.

The rubber based industry is an important segment of the total industrial set up of our country. Rubber is the most vital raw material for the production of strategic products for Electronics, Automobiles, Thermal Plants, Aeroplanes, Defence, Railways, Naval, Consumer goods and Family Planning. There are about 35,000 items being produced from rubber.

It is heartening to note that besides the large scale sector, the small scale rubber goods manufacturers have also been actively engaged in producing a large number of various rubber goods. It might come as a pleasant surprise to many, present here, that one of the small scale manufacturers has entered the automobile, Tube & Tyre Manufacturing with 100% indigenous know-how and self made equipment.

Our Government has therefore reserved some of the important rubber items for the small scale sector with full confidence based on their past performances.

The rubber industry is divided broadly into Tyre and non-Tyre sectors. The non-Tyre sector is further divided into DGTD & SSI units.

SSI Units

A large number of SSI units are located in Northern India, West Bengal and Maharashtra as proprietory concerns, private ownership firms of private limited companies. Only very recently one of the small scale units has gone public with an excellent response from the public in acquiring their equity

shares. This has set a new healthy trend in the upcoming small scale rubber industry.

The commendable achievement in exports by small scale sector is well described in the paper by Shri. R. K. Jain and Commerce Ministry is closely watching to develop that potential.

Rubber situation until 1976-77, very much matched its consumption. At this stage, the norm of buffer stock in the country was brought down from four months to three months and some 24,000 tonnes of indigenous rubber was exported out of the country. This was the period when some of the new tyre companies were about to start or increase production. The consumption of rubber therefore soon overtook the production. There came a time in 1973-79 when there was hardly any rubber available and our Government had to depute special officers to study the situation in Kerala. As a result, it was decided to import about 30,000 tonnes of duty free rubber to provide rubber to the industry.

The imports

Initially, the imported rubber was distributed at Rs. 10,000 - per tonne which was raised to Rs. 12,000/- per tonne when the second lot arrived. The indigenous rubber, at this stage was cheaper and the small scale consumers preferred to go for the same and their seeurities amounting to many lakhs of rupees were forfeited by S. T. C. for not lifting the contracted imported rubber.

The imports of rubber had to be continued. The yearly imports are given as under:

1966-67	1967-68	1968-69
23,500	9,500	8,500
1969-70	1970-71	1971-72
17,800	2,500	437

1973-78 (6 years)
NIL

1978-79	1979-80	1980-81
14,750	32,200	9,200
1981-82	1982-83	
41,200	30,000 (Sanctioned)	

After the year 1981, the local prices rose and fell in line with the prices of imported rubber as under (lot rubber):

1978-79	1979-80	1980-81
9,500	10,100	12,100
1981-82	Current	
14,300	18,000 (peak price)	

While the world rubber prices had shown very minor fluctuations, the prices in India fluctuated rather widely.

Now this erratic fluctuation of raw rubber prices is neither good for the growers nor for the consumers.

Already the local prices are showing a downward trend, as imported rubber has arrived and is being distributed. This downward trend is likely to continue.

Plastic and other industries

Further some of the small scale manufacturers have diverted their attention to plastic and other industries. More and more use of synthetic and reclaimed rubber is now being considered by small manufacturers. There is a possibility that the management of the synthetic rubber plant in private sector might change hands and the new management shall raise production from 20,00 tonnes of SBR to 40,000 tonnes. If we add to this another 30,000 tonnes of public sector production, this increase plus more and more use of the improved grades of reclaimed rubber, and in a few years time addition of the 3rd Synthetic Rubber Plant and increase of raw rubber from new and high yielding plantations, the present shortage of rubber is sure to disappear.

Recently, during a visit of the Rubber Board Chairman Shri P. J. Thomas to China, it was discovered that high yielding varieties of rubber have been successfully planted there in cooler climates. If that is so, large areas at very low prices are available for plantation of rubber in Northern India, which offers a much wider scope than in Kerala where land prices have gone up very high.

For the time being success has been achieved through the efforts of the Rubber Board in replanting and new planting of additional areas as under (in hectares)

1978-79	1979-80	1980-81
7,300	11,100	15,500
1981-82	1982-83 (Trend)	
16,000	18,000	

This makes a total of about 60,000 hectares in the last 4 years.

We can take one hectare to yield an average of 1.5 tonnes per year with high yielding varieties now available.

Thus in another 5 to 6 years time about 90,000 tonnes of additional rubber is likely to be available and thus the indigenous production might cross 2.5 lakh tonnes which will still be slightly short of consumption with 5% growth of rubber industry plus exports.

It seems that natural rubber production will remain slightly short of its consumption in the coming 5 years, unless the synthetic and reclaimed rubber can attain additional production of about 70,000 tonnes otherwise the gap will have to be met out of imports till production of natural, synthetic and reclaimed rubber comes at par with the consumption.

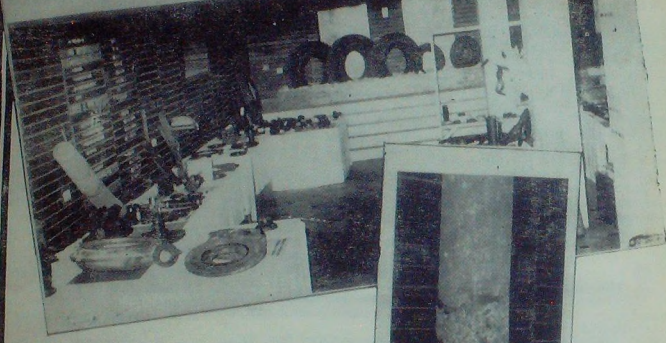
Price of raw rubber

In order to keep a steady price, the importance of having a reasonably good buffer stock of standard quality offered at a price remunerative to the growers and affordable by the manufacturers is most desirable. Also to keep the prices in line with the world prices to help exports, the import duty may be withdrawn and a more efficient system of distribution of rubber particularly, to smaller units might be introduced. The S. T. C. had started supplying imported rubber from their depots to consumers of 2 tonnes per month. This should be raised to 8 tonnes per month for those small scale manufacturers who cannot register their requirement in advance.

Raw rubber is an agriculture produce. There should be no excise, sales tax or any other tax

(continued on page 33)

RUBBER IN EVERYDAY LIFE



EXHIBITION IN DELHI

The exhibition arranged at the Foir Hall of the Vigyan Bhavan, New Delhi in connection with the National Seminar on Rubber attracted a large number of delegates. For most of them it proved to be a rare opportunity to see latex dripping out from a live rubber tree brought from the extreme South.

On one side of the Foir Hall rubber products were displayed. Almost all the sophisticated products which included balloon to giant truck tyres could be found systematically arranged there. Shri K Karunakaran, Chief Minister of Kerala also visited the pavilion.

NEWS IN PICTURES

NATIONAL SEMINAR ON RUBBER

A view of the inaugural session

RUBBER BOARD MEETING

The 100th meeting of the Rubber Board was held in Delhi on 11th September 1983.

EARTHQUAKE BEARINGS ARE AMONG PROJECTS SHOWING SUCCESS

The practical use of natural rubber bearings to protect buildings from earthquake damage is 'the most exciting application to be developed' by the Malaysian Rubber Producers' Research Association (MRPRA) since 1962 'one which may outrank all others as a contribution to the safety of mankind.' That is the view expressed by Dr. Leonard Mullins, retiring MRPRA Director of Research, in the Associations's Annual Report for 1982. Full-sized commercially manufactured natural rubber bearings to protect buildings from earthquake damage have been shown to conform to the behaviour predicted from earlier laboratory studies. Serious consideration is currently being given in California to use of this base isolation system, both in the construction of a major new civic center and to bring an existing historic building up to modern safety standards.

This project demonstrates the strength of MRPRA in its ability to apply fundamental research to practical needs. Beginning with the established use of steel-laminated natural rubber bearings in bridges and anti-vibration mountings for buildings, and applying first theoretical and then experimental research programmes, the concept was established. Collaboration with other organisations enabled more powerful techniques and more extensive technological facilities to be used. The reputation derived from over forty years of scientific achievement has enabled the results and their interpretation to be presented authoritatively to consultants and legislators to pave the way for innovation.

'SELL TIN, BUY RUBBER' STOCKPILE DEAL URGED ON U. S.

Malaysia, Indonesia and Thailand, the world's three largest tin producers, have asked the United States to consider buying their rubber for the strategic stockpile, as part of an arrangement paralleling more ordered stockpile sales of tin. The proposal is made in a draft memorandum of understanding agreed earlier this month by the three countries and put to the U. S. The memorandum's main feature is a proposal that tin sales from the U. S. stockpile should be at the rate of 3,000 tonnes this year and 3,000 tonnes in 1984. Malaysia firmly believes that U. S. sales of some 12,000 tonnes over the past two and a half years have disrupted the world market, thereby breaching an informaly understanding with Washingtton. The U. S. argues that the market is weak because of the world recession and peristent tin smuggling, saying that its stockpile, now about 140,000 tonnes has long overhung the market. Apart from directly contributing to an improved world market, an agreement with the U. S. would help the three South-East Asian countries plan their own production better. For Malaysia it would pave the way to an improvement in relations with its most important ally which have suffered because of the continuing disagreements over tin. Malaysia, is still waiting for a

U. S. response. It says the U. S. wants to build up its rubber reserves from 120,000 tonnes to about 850,000 tonnes. Previously, the U. S. has suggested a kind of tin-for-rubber barter deal but this was rejected because the three wish to sell both tin and rubber. A complicating factor for the U. S. has been the limited resources available to the General Services Agency, Additional funds would need congressional authorisation. For the producers, the latest proposal represents a frank acknowledgement that it cannot persuade the U, S. to abandon what they see as its dumping policy.

MALAYSIA EXPECTS PALM OIL AND RUBBER EARNINGS TO RISE

Malaysia expects to earn an extra 1.42 bn ringgit (£402m) from rubber and palm oil exports this year because of firmer commodity prices. In a major commodity review, Datuk Paul Leong, the Malaysian Minister of Primary Industries, said the Government expects the rubber price to average 250 Malaysian cents a kilo this year compared with 201 cents last year. Exports are expected at 1.51m tonnes this year compared with 1.378m tonnes last year. Rubber export revenue is expected at 3,775bn ringgit, a billion more than last year. For palm oil, the average price this year is now expected to be around 1,005 ringgit per tonne against 829 ringgit last year, while exports are projected at 3m tonnes compared with 2.8m tonnes in 1982. Explaining why rubber and palm oil exports are expected to go up this year, when out put is lower than that of last year's Datuk Leong said the higher prices encouraged producers to release stocks they withheld last year.

PHILLIPS CONTINUES CUTS IN SYNTHETIC RUBBER

Philips Petroleum is continuing its withdrawal from its worldwide synthetic rubber operations. Following the sale of its 50 per cent interest in the Petrochim synthetic rubber plant in April the company says it intends to terminate the manufacturing operations of its Australian chemicals subsidiary later this year. Philips Australia Chemicals Pty produces 23,000 ton/year of SBR and polybutadiene rubber and 17,000 ton/year of carbon 'black in the Sydney suburb of Kurneli. New South Wales. The closure, which will mean the loss of 148 jobs, will take place during the third quarter, Philips says the decision to close the plant was taken after negotiations had fallen through to sell the company. The potential Buyer, a southeast Asian Group, withdrew from the talks earlier this month. The Kurnell operation was established in 1963 as a joint venture between Philips Petroleum and ICI Australia. ICI withdrew from the operation in 1973.

(continued from page 29)

on this commodity. Also there should be no countervailing duty on imported rubber.

There was a move in the Rubber Board to modify the cess so that the small scale manufacturers could be exempted. That will be a step in the right direction to help the growth of small scale industry both for local and export markets.

A mile stone

I as a member of the Rubber Board, endorse 100%, the views of our worthy Chairman that growers and consumers of rubber are the two sides of the same coin. They should come closer and recommend to the Government to stabilise the rubber prices by deciding a reasonable price range remunerative to the producers and affordable by the consumers.

This seminar is no doubt, going to be a memorable mile stone for the growers and consumers of raw rubber in India and in the process the public will be saved of the inflation resulting from sudden raise of prices of 35,000 items covering tyres, v-belts, transmission belts, children's toys and finally the "nirodh."

□

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CONTENTS

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THE RUBBER BOARD
KOTTAYAM 686 001 INDIA

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V Bhaskara Pillai

Rubber Production Commissioner
P Mukundan Menon

Director of Research
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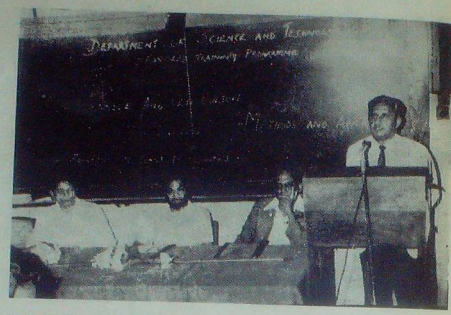
THE QUARTER

The Rubber Board has now decided to invite applications from prospective growers who intend to raise rubber cultivation by availing of the benefits of the Rubber Plantation Development Scheme during 1984. It is worthwhile in this context to analyse briefly the challenges being confronted by Natural Rubber in respect of increasing production, improving productivity and reducing cost. In his article recently published, Shri P Mukundan Menon, Rubber Production Commissioner, has made a clarion call for the expansion of rubber cultivation in non-traditional areas in North Eastern States, Orissa, Maharashtra, Goa etc. His article was published in the last issue of the Rubber Board Bulletin (Vol 19 No. 1)

Higher yields could be achieved through use of high yielding cultivars both existing and new, a high standard of argo-management including irrigation wherever needed and optimum crop exploitation using rainguards and judicious chemical yield stimulation. The cost of production also could be brought down by strictly adhering to the suggestions made by him in this regard.

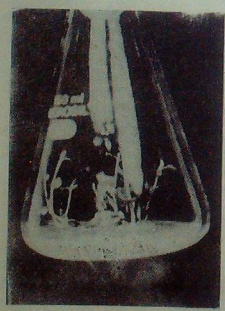
PLANT TISSUE AND CELL CULTURE TRAINING WORKSHOP



Welcome Speech by Prof. A. R. Metha

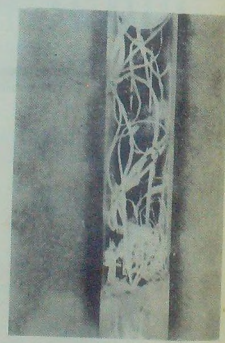
Prof. B.C. Parekh, Vice Chancellor of the M. S. University Baroda. Dr.Jagannathan of the National Chemical Laboratory Pune and Dr. V.V. Modi, Dean of the faculty of science M.S. University Baroda are also seen on the dais.

A training workshop on "Plant Tissue and Cell Culture-methods and applications" was held at the Botany Department of the M. S. University Baroda from November 10 to 24, 1983. The programme was sponsored by the National Biotechnology Board, Department of Science and Technology, Government of India.



The inaugural function was presided over by Prof. B. C. Parekh Vice Chancellor of the M. S. University Baroda. The key note address was delivered by Dr. Jagannathan of the National Chemical Laboratory Pune. Prof. Atul Metha Head of the Botany Department, M. S. University Baroda and the Programme Director of the training workshop extended a hearty welcome to Prof. B. C. Parekh, Dr. V Jagannathan and the participating scientists. He said that the objective of the programme is to train young plant scientists to employ the latest cell and protoplast culture techniques for achieving higher productivity of crops yielding food, fuel, fibre and rubber.

Twenty two scientists from national research laboratories agricultural and other Universities from all over India participated in the programme. The programme consisted of lectures and laboratory of Baroda, Delhi, Jawaharlal Nehru University and the Bhabha Atomic Energy Commission took classes in the programme.



Mrs. P. Sobhana of the Plant Physiology/ Exploitation Division of the Rubber Research Institute of India attended the programme. □

PROSPECTS FOR NATURAL RUBBER

At "The Planters' Conference 1983" organised by the Rubber Research institute of Malaysia at Kuala Lumpur from 17th to 19th October 1983—twenty two papers were presented covering the following themes:

* Prospects for increased Natural Rubber Production
* Managemet Strategies for the Natural Rubber Industry.
* Exploitation
* Agronomic Practices and
* Processing and Effluent Utilisation.

There was also a panel discussion on the theme 'Towards Mechanisation in the Natural Rubber Industry.'

Increasing Rubber Production

Three papers were presented at this session.

With inflation,the cost of rubber production is increasing. In order to make the natural rubber industry competitive,it will be necessary to increase productivity of the planting materials which is a major component affecting cost of production. Rubber breeding to produce higher yielding cultivars was based on the small population of seedlings collected by Wickham in 1896 from Brazil. Thus to begin with, the genetic base of Hevea was very narrow and later, breeding work with these materials resulted in further erosion of the genetic variability. The success of rubber breeding during the past five decades is remarkable despite the small genetic population introduced by Wickham. A five-fold increase in yield has been achieved over a short span of time. It is generally believed that further dramatic yield increase will not be expected from the existing Wickham germplasm. In view of this, there was the need to widen the genetic base. The paper by Ong Seng Huat and his colleagues from RRIM described the events which led to the 1981 IRRDB expedition to systematically collect wild Hevea materials from their origin in South America. Their paper described the achievements, observations of various plants' characteristics of the new genotypes and utilisation of those materials in the breeding programmes. The new germplasm collection displayed considerable genetic variability which should create a greater impact on tha breeding programmes in producing higher yielding Hevea cultivars with desirable characteristics in the future. Some are very vigorous while others are tolerant to certain leaf diseases. Dwarf characteristics are also observed on a few plants. In addition, morphological variations in leaf colour, shape, size and number, petiolar and leaflet orientation were noted.

The papers from overseas gave an account of rubber development in Brazil and China.Both countries have mounted ambitious plans to increase their rubber acreage and productivity.

Jose Cezario Menezes de Barros and his colleagues traced the development and present state of rubber cultivation in Brazil. In 1967, Rubber Authority (SUDHEVEA) was created to coordinate and supervise the implementation of the economic policy of rubber in Brazil. The plan was to make Brazil self-sufficient in natural rubber SUDHEVEA was assisted by EMBRAPA which was responsible for research.EMBRATOR/EMETER provided the technical assistance and the banks managed the credit finance. The major constraint in the development of new rubber plantations was the inadequate supply of suitable planting materials. On a similar theme, Hang and Zheng dealt with rubber cultivation in China. They outlined the natural conditions prevailing in China's rubber growing regions between 18° and 24° North of the Equator which emphasises the main obstacles for China to succeed in largescale cultivation of rubber. Two other problems faced are typhoon and cold climate. By breeding and selection of adaptable clones and suitable agronomic practices, they have been successful in growing rubber in the hostile environments for Hevea prevalent in China. Area under rubber is 453,000 hectares and production in 1982 was over 150,000 tonnes. Thus, China ranks fourth in terms of rubber area and fifth in terms of rubber production in the world.

Management Strategies:

Three papers were presented on Management Strategies for the Natural Rubber Industry. Yahil of Rubber Industry Small holders' Development Authority outlined the various projects and programmes adopted by RISDA for smallholder development. Specific programmes consistent with the small-holder's needs have been created which cover the period before replanting, after replanting, during the immature phase and during maturity. In particular 'Project TRIDELTA' a system devised by RISDA as an "in-house extension management system" to define small-holder needs and increase extension effectiveness in the transfer of technology to the rubber smallholder sector has been highlighted.

Arifin and James Nayagam from RRIM detailed an alternative approach to land development known as the 'Incentive Wage Concept' formulated by the Rubber Research Institute of Malaysia. Under this concept, participants are not granted land ownership rights but are assured of long-term employment with a reasonable income. The eight year experiment (1975-1982) shows that the project is economically viable as a self financing unit. Their study analysing the production cost indicates that it is possible to introduce estate pattern of management into organised small holdings and arrive at a similar level of production and efficiency compared to that of commercial estates. The income generated by production work of the participants'families compares

favourable with earnings of rural people like FELDA settler families and estate tapper families. The finance of the scheme is managed by the sponsoring authority and large amounts of the development loans can be recovered from the participants when the rubber prices are high.

The paper by Montgomerie of RRIM emphasises the importance of the Plantation Manager's role in times of economic stress and the need for the estate to have adequate rapport and cooperation with the labour force for the mutual benefit of all concerned. He has mentioned the measures whereby output may be increased and expenditure reduced during periods of low rubber prices.

Exploitation

It is significant that seven papers dealt with exploitation, a term used to include tapping and stimulation of rubber. If the cost is to be reduced and labour productivity increased, suitable exploitation systems for the various cultivars planted will have to be developed and employed. Sivakumaran, Ismail Hashim and Pakianathan of RRIM presented results on factors influencing stimulation responses and methods to obtain sustained yield responses incorporating tapping and stimulation rests of young rubber. Based on their results, stimulation could be practised from commencement of tapping in conjuction with low labour input or periodic tapping system.

Papers by Tan and Chan of RRIM and Chiah of Pinang Tunggal Estate as well as that by Chan Zainal Abidin and Chua of Highland Research Unit discussed the results obtained with stimulation and low frequency tapping systems on young rubber. Tan et al, mentioned that although there was saving in tapping cost with low intensity tapping system, it was insufficient to compensate for the loss of crop when compared to 1/2Sd/2 without stimulation. Chan et al, reported better results with PR 107 than GT 1 with reduced tapping frequency system and stimulation. Both papers reported no deleterious effects with stimulation of young rubber and Chan et al, recommended stimulation from commencement of tapping with 1/2S d/3 for two to four years.

Yahaya Hashim from Kumpulan Ladang—Ladang Terengganu and Sakhibun, Ismail and Abraham from RRIM presented interesting results on tapping systems for East Coast rubber. Tapping is discontinued for two months during the monsoon in November and December and stimulation suspended for two months during wintering months of February to March. Their results after five years of experimentation on RRIM 600 from commencement of tapping are convincing. It is profitable and feasible to tap young rubber on 1/4 cut and daily periodic system with stimulation for ten months in a year. Results obtained from this method of exploitation are good and comparable to those obtained from similar cultivar of the same age in the West Coast states where tapping is continuous throughout the year.

Exploitation procedures to be followed throughout the economic life of the rubber tree have been given by Abraham and Ismail Hashim. Their recommendations cover an exploitation period of between 25 and 30 years for modern cultivars for the following situations:

* where there is no tapper shortage
* where tapper shortage is experienced and
* for individual smallholders.

These recommendations are for general use by the industry which can adapt them according to the prevailing situations in their area. They also mentioned the possibility of opening trees of certain clones earlier by puncture tapping of trees with 36 cm (15″) girth or more. Thus, it may be possible to tap trees after three years of planting. This favourable result has been confirmed by L. H. Hunt at the Goodyear Plantations in Sumatra. His results are with trees with smaller girth of 30 cm. Both papers report that when the micro tapping system is converted to conventional tapping system on reaching a girth of 46 cm, higher yields are obtained initially and the trees suffered no deleterious effects. Now it is up to the industry to confirm these observations.

Agronomic Practices

Five papers were presented on Agronomic Practices. Wan Mohamed and Hamidy outlined the performance of Dorset-horn crossbred sheep under rubber. The crossbreds appear to be promising and may be used for integrating animal farming with plantation agriculture. Han and Maclean of Eastern Plantations Agency (Tahore) Sdn.BLd., dealt with the new spraying technique for weed control using ultra-low volume (ULV) They report encouraging results in terms of cost and effectiveness. Saving of 30-40%, is obtained for strip and circle spraying in both rubber and oil palm areas. Labour productivity was also considerably improved and efficiency was increased four times when using the new spraying equipment. Leong and Yoon and RRIM presented results which showed that prunning low and controlling the prunning resulted in better crown and trunk characteristics. Low and controlled prunning gave higher yield than normal pruning. Two papers outlined recent development in manuring practices. Sivanadyan mentioned that it was possible to withhold manuring atleast during the initial four years of tapping especially during periods of economic stress in well maintained areas during the immature phase. Pushparajah,Chan and Sivanadyan of RRIM offered general guidelines to assist fertiliser recommendations which would result in lower cost and better growth and yield of the tree. Their experiments showed that manuring of mature trees was primarily dependant on the level of application of fertilisers and agronomic practices during the immature phase.

Processing

On processing, an improved method of skim rubber recovery by a centrifugal process whereby

(continued on page 31)

Rubb Board bull. 19, No. 2

PROSPECTS OF AUTOMOTIVE TYRE MANUFACTURE IN INDIA

RP SINGHANIA

India is fortunate to be one of the few countries in the world to have a fully developed domestic tyre industry capable of manufacturing tyres comparable to the best in the world. Its vital importance to India's economy, growth, defence and development cannot be over-emphasized. The author also discusses certain factors adversely affecting the growth of the Tyre Industry in India. He is of the view that the prospects of the tyre industry are directly linked with the prospects of the economy of the country. Now the country is on the verge of a major automobile revolution. The paper was presented at the National Seminar on Rubber in New Delhi. The author is the Chairman, Automotive Tyre Manufacturers' Association and Managing Director, JK Industries Ltd.

I wish to touch briefly on the Indian Automotive Tyre Industry, its contribut on to the Indian economy, faictors affecting its growth, some of the problems faced by it and the future of Indian automotive tyre industry.

The wheel was one of man's greatest invention of all time. One cannot imagine a world without wheels! The pneumatic tyre which adds comfort and safety and speed to the moving wheel, is a wonder of human engineering. It is seldom realised what a sophisticated product the modern pneumatic tyre is. Several hundred million dollars are being spent globally on its research and development every year. It is a matter of pride that Indian tyre industry has kept pace with the most advanced technological developments in the world by making radial tyres of latest technology, for Indian cars. Soon, India will make radial tyres for a variety of vehicles including trucks and buses.

The Automotive Tyre Industry

The Indian automotive tyre industry has come a long way since its inception more than six decades ago. It was in 1936 that the first tyre factory was established in India. To-day there are 12 large tyre manufacturing companies and several units in the medium and small scale sectors making a variety of tyres for almost every type of vehicle in India from bicycle to supersonic aircrafts. Industry makes over 400 varieties of sizes and types of tyres ranging from the 2 kilo scooter tyre to the 200 kilo earthmover tyre.

India is fortunate to be one of the few countries in the world to have a fully developed domestic tyre industry capable of manufacturing tyres comparable to the best in the world. Its vital importance to India's economy, growth, defence and development cannot be overemphasized. Let me give you some interesting facts:

The tyre industry, which is in the core sector, having a yearly turnover of Rs. 1500 crores, contributes nearly Rs. 750 crores per annum to the national exchequer by way of excise duty, customs duty, sales-tax etc. In fact, it is the second highest contributor of excise duty amongst manufactured goods.

It gives direct employment to over 35,000 people and indirectly supports the livelihood of several lakhs more in associated industries. A study by National Council for Applied Economic Research (NCAER) has shown that on an average every truck and bus plying on our roads generates employment for 11 and 17 people respectively. On this basis, with the current population of around 6 lakhs trucks and 2 lakhs buses in the country, the total number of people employed by this sector would be around 100 lakhs.

Tyre industry is highly consumer-service oriented. In order to give effective customer service the tyre companies are maintaining their own offices and sales outlets in as many as 45 towns. Further, the distribution of tyres to every nook and corner of the country is ensured through a network of over 5,000 independent tyre dealers. The industry has unique product guarantee system by which, in the event of any complaint, the customer is given a pro-rata adjustment for the product without reference to the time and place or mode of purchase,

Indian tyres are exported to the most developed countries in the world in face of stiff competition. It is expected that in the year 1983-84 the export of tyres would be of the order of Rs. 25 crores.

The tyre industry accounts for more than half the consumption of natural rubber produced in India. As such the fortunes of a large number of rubber growers employing hundreds of thousands of plantation workers are linked with that of the tyre industry.

Factors affecting Tyre Industry's growth

I would now like to touch upon

a few factors affecting the growth of the tyre industry. Even though the overall growth of the industry in the past has been satisfactory, there are certain factors adversely affecting its growth to-day. The main factors are :-

Excise duty and other taxes

It is significant to mention that tyre is a very heavily taxed commodity. The impact of various Excise duties, Custom duties and Sales-tax on the inputs as-well-as on finished products amounts to nearly 120% of the actual tax-excluded price of a tyre. The Excise duty alone, on this essential product, is as high as 66% advaloram. This heavy tax incidence has a cascading effect on the price of the tyre. To illustrate the point, to recover every Re. 1 increase in the cost of a tyre, the selling price has to be increased by Rs. 1.80 on account of duties and taxes.

Indigenous raw materials

Even though India produces bulk of our raw-material requirements, the prices at which they are made available to the industry, are far higher than the international prices. This is true for practically all raw materials such as Rubber, Nylon Tyre Cord, Carbon Black, Rubber Chemicals etc. The Natural Rubber is the most important raw material in tyre contributing 50 % or more to the weight of a tyre. The domestic price of Natural Rubber is nearly double the international price. It is ironic that even 25 miles away across our shores, in Sri Lanka, Natural Rubber is available at nearly half of our domestic price.

As is known, the tyre industry is a very competitive one. It may be interesting to learn that the industry is presently selling its products at 1981 price levels. It is surprising that while the prices of various raw materials and inputs keep on increasing unabated, any price increase in tyres is being frowned upon and not being allowed in the normal course. It must be appreciated that no industry can bear high cost of increases without a corresponding increase in the selling prices of its products to ensure a viable working.

The widening deficit between domestic production and consumption of rubber is a matter of great concern. It is essential that adequate quantities of Natural Rubber are imported, at the right time, to meet this shortfall. China has made tremendous progress in growing rubber and I believe they are already the fifth largest producers of rubber in the world. I hope, the efforts made by the Indian Rubber Board to increase the domestic production of rubber by enlarging the acreage and application of new methods and technology will soon meet with success. I am confident that this will not only enhance the quality of rubber grown in India but will also substantially increase the total production and hopefully, the country will have surplus rubber available for exports.

The high cost of money

The tyre manufacturing is a highly capital intensive and a low return industry having long gestation periods. To put up a modern tyre plant to-day with an annual capacity of one million tyres will cost around Rs. 120 crores. The working capital requirements are also high, due to the very nature of distribution network required, to sell its goods, and service its customers. All these factors result in a tremendous interest burden thereby squeezing margins further.

Need for development of roads

The building and maintenance of an adequate roadways system is an absolute must for the development of a country's economy. Unfortunately, this area has not received its due importance. Less than 22% of the total revenue collected from the road transport sector has only been spent on development and maintenance of roads. This is woefully inadequate and unless corrected, Indian roads will continue to be in the deplorable condition they are to-day. Bad roads cause unnecessary wear and tear, vehicle breakdowns and accidents resulting in enormous national loss. If India is to achieve rapid economic growth our roadways system must be improved. I may suggest, that at least 60% of the total revenue collected from this sector must be invested on maintenance and development of a good road network. This investment will bring rich dividends in many ways apart from generating employment for lakhs of people.

Road transport needs urgent relief

Nearly 80% of the truck operators in the country are single truck owners. The viability of commercial vehicle operation has been steadily decreasing over the years and it is feared it will soon reach a point of no return on investment. The impact of taxes on the cost of operating a vehicle is prohibitive. The tax component accounts for 25% of fuel cost and 66% of new tyre replacement cost. In addition, there is over 60% tax incidence on the capital cost of commercial vehicles. Is there any justification to tax the vitally important road transport sector at a level, even higher than that is levied on some articles of luxury consumption? It is a fallacy to think that the railways should be protected at the cost of road transport or vice versa. Both these modes of transportation have their respective roles and in fact are complementary.

The Road transport industry's strategic importance to our national defence, industrial and agricultural production and in moving men and materials has not been fully recognised. I may point out that it is only by means of road transport that essential and consumer goods would be most economically transported to the interiors of our country which will ensure upliftment of our masses and fulfil the task of rural development. I can hardly think of any other industry which so perfectly fulfils our socio-economic requirements of employment generation, rural development, national integration and carrying goods and people, in fact – literally keeping the wheels of economy moving.

The future is bright

The tyre industry's prospects are directly linked with the prospects of the general economy of the country, the automobile industry, the development of roads and the road transport sector. Despite the temporary recessionary phase we are passing through, I am confidently optimistic about the prospects of India's economy in the next decade. The Indian economy is poised for growth.

The country is on the verge of a major automobile revolution. Almost all the vehicle manufacturers in India have ambitious expansion plans and substantial capacity build up is taking place in trucks, light trucks, passenger cars and 2-wheeler categories. New plants are being set up in collaboration with internationally known companies to make more advanced models of vehicles. It is expected that in the next 5 years, truck production will go up by 50%, light truck by 100%, passenger car by 125%, and 2-wheeler by 100%. All this augurs well for the tyre industry.

As our industrial and agricultural production grows higher year by year and with the rise in population, the need for more and more vehicles to move people and goods will also increase. The tyre industry is fully geared to meet this growing demand.

Conclusion

In my capacity as Chairman of the Automotive Tyre Manufacturer's Association, I will be failing in my duty, if in conclusion, I do not once again refer to the mutually dependent relationship between rubber producers and the tyre industry. Natural rubber, as you know, is our basic raw material. Availability of rubber both in quantity and quality at an acceptable price is a prime necessity for the health of the tyre industry. I hope, this seminar on 'Integrated development of the Rubber Industry' will go a long way in achieving our common objectives.

□

ARMSTRONG CLAIMS TRUMP CARD IN EPDM GAME

Armstrong Rubber Co. announces plans for a 22.2 percent hike in EPDM production capacity, while Uniroyal quietly suspends an estimated $40 million EPDM capacity expansion. How can two companies perceive a market so differently? Part of the answer might be this: Armstrong knows something about EPDM that no one else does. Armstrong's recently announced expansion of its EPDM capacity at Addis, La., is based on the belief that demand for the SR will grow rapidly in the future. On that point, EPDM producers—including Uniroyal—are in agreement.

But according to the president of Armstrong subsidiary Copolymer Rubber & Chemical Corp., the expected increase in EPDM use—pegged by the industry at about 3.9 percent annually—will come only partly because of EPDM's use in the hot single—ply rubber roofing membrane market.

Copolymer's Sherman O. Lyon disclosed the firm has "some proprietary information" and a "long-term secrecy agreement" concerning EPDM that helped convince the company to boost its capacity for making that rubber. That's all Lyon will say about that proprietary information. Meanwhile, a Uniroyal spokesman said the expansion of Royalene EPDM production capacity at its Geismar, La., facility won't begin until market conditions improve. A Uniroyal spokesman said sales so far in 1983 have been up and the firm expects EPDM to continue its "modest recovery," but no plans have been made to put the expansion back on a schedule. The International Institute of Synthetic Rubber Producers put Uniroyal's nameplate capacity at 44,000 metric tons. Du Pont is listed by the IISRP as the largest North American EPDM producers with a nameplate capacity of 77,000 tons annually. Exxon Chemical Americas is second with 62,000 tons per year, Uniroyal is third, Copolymer Rubber fourth with 32,500 tons in 1983 and 40,800 tons after the expansion in 1984 and Polysar Gulf Cost is fifth with 25,000 tons.

The IISRP's latest forecasts predict EP/EPDM will be the biggest gainer in the synthetic rubber field during the next 10 years. In north America, which currently has a nameplate production capacity of 240,500 tons per year, EP/EPDM's 3.9 percent annual growth rate compares with specialty rubbers' expected average annual growth in demand of 3.4 percent per year. Much of that growth may be the result of the roofing market, currently the fastest growing area for EPDM. Another potential area for increased EPDM usage lies with the fate of butadiene supplies. Experts that follow the ethylene-butadiene production situation have indicated EPDM would grab some markets now held by SBR and nitrile if a predicted butadiene shortage comes to pass.

(Rubber & Plastics News)

RUBBER GOODS EXPORT

RAJ KUMAR JAIN

Today the Indian Rubber Industry is manufacturing about 35000 items from tiny washer to heavy truck tyres. Exports of rubber goods have touched an all time high of Rs.50 crores. The present indications are that there is a large overseas market for the rubber goods made in India.

The author is of the view that the large edifice of the manufacturing industry now created has somehow to be protected in order to serve the masses of India as also to make a dent into the competitive world market. It is here that the producing and cosuming sectors have to survive and co-exist. The paper also discusses in brief the efforts made in India for promotion of exports of rubber goods, constraints experienced in export, the vast potential that is in store for expansion of exports and the encouragement needed for enterpreneurs. The author is the immediate past Chairman, Chemicals & Allied Products Export Promotion Council.

Rubber Industry in India has come of age thanks to the rubber producers, technologists, makers of raw materials, machinery and equipment, who have all contributed to the growth of this vital and strategic Industry which is second only to the steel industry. To-day the Indian Rubber Industry is manufacturing a large variety of items numbering about 35,000; right from a tiny washer to aircraft and other heavy tyres. The industry possesses a sound and advanced technological base.

The quality products made by the Indian Rubber goods Manufacturers are now seen in various world markets. The exporters of rubber products can be placed under three categories viz. : (I) Misc. rubber manufactured products; (II) footwear; and (III) automobile tyres & tubes.

Of late the small scale industry has also entered into export field in a big way and has the proud privilege of bagging numerous export awards and national awards on this score. Leave aside the underdeveloped countries, even the developed countries and sophisticated markets like West Europe, U. K., Australia and North America are also buying Indian made rubber goods in large quantities. In the 60's nobody could imagine that India would be shipping container loads of rubber products to highly developed and mechanised markets of West Germany, U. K., and America. The credit must squarely go to the entrepreneurs in India for this great achievement. The following figures will clearly indicate the trend and growth of exports during the last two decades:

Performance in 1979-80

Export performance to various countries of the World, on the basis of Continents can be summarised as under:

The list of items that the Industry has successfully exported includes:

Misc. rubber manufactured products

1. Rubber transmission & Conveyor belting.

Items	1964-65	1976-77	1979-80	1981-82	1982-83
	Value in Lakhs Rs.				
Rubber Manufactured Products	50.90	529.80	895.60	2620.00	3600.00
Footwear	121.40	345.50	267.40	410.00	340.00
Automobile Tyres & Tubes	221.40	1848.20	1120.00	1000.00	1070.00

Country	Mic Rubber Products	Footwear	Automobile tyres&tubes	Total
	(Rs Lakhs)			
East Asia	133.27	43.90	108.35	285.52
West Asia	291.42	3.66	212.65	502.73
North Africa	39.08	—	12.88	51.96
Rest of Africa	108.58	10.75	98.81	218.14
East Europe	29.74	—	231.90	261.64
West Europe	145.22	165.92	88.08	399.22
North America	115.63	39.81	343.54	499.08
Latin and other American countries	1.88	—	—	1.88
Australia	30.77	3.34	23.78	57.89

2. Rubber 'V' belts.
3. Cycle tyres & tubes.
4. Rubber hoses.
5. Rubber condoms.
6. Surgical and scientific rubber goods.
7. Rubber hot water bottles.
8. Mackintosh rubber sheets.
9. Rubber rings & washers.
10. Reclaimed rubber.
11. Rubber gloves.
12. Rubber teats.
13. Auto rubber parts.
14. Engine mountings.
15. Rubber foot mats.
16. Rubber cots & aprons for textile machines.
17. Rubber closures & stoppers.
18. Rubber erazers.
19. Foam rubber mattresses.
20. Rubber elastic tape.
21. Rubber insertion sheets.
22. Rubber solution.
23. Micro rubber sheets.
24. Rubber bands.

Footwear

1. Rubber & canvas footwear.
2. Gum boots.
3. Rubber soles & heels.
4. Rubber chappals & slippers.

Automobile tyres & tubes

1. Auto tyres.
2. Auto tubes & flaps.

Problems

But export is a very uphill task. It is all the more difficult to the sophisticated markets. International standards have to be complied with. Many impediments are created by the importing countries as protectionist measures. The delivery schedules have to be strictly adhered to, inspite of the fact that our shipping arrangements are poor and freights are higher than those of our competitors. No overseas buyer likes to write a letter and then wait indefinitely for a response from the suppliers as it is both time consuming and costly. Business to-day is conducted on telex and telephones. But the Indian telecommunication system has failed us. Other competing nations have an edge over us and we are considered far less reliable on this account. Manufactured goods have to be piled up far in advance to circumvent unscheduled production loss due to failure of power, other infrastructure and labour unrest as also to meet the delivery schedules resulting in high costs. The dear money policy of the Government is also proving a great hurdle. The payment of Duty Draw Back,Cash Compensatory Supports (CCS) and the rubber subsidy takes unduly long time entailing heavy drills and reigours. The exports have to pass through these exactitudes and constraints.Nevertheless,the Nation can legitimately take pride on account of the herculean efforts of the exporting community despite all the constraints.

World market

Of late a serious price war has raged in the World market. Hitherto we have been fighting with the traditional manufacturers in the west since we had cheaper and plenty of basic inputs viz.,raw rubber,coal and power as also low wage structure. The situation has now changed for the worse. It has become a buyers market. Protectionism has come to play its part.The large rubber producing countries like Malaysia, Singapore and Sri Lanka have established rubber industries of their own on a sound footing and are continuously building up further capacities. They have the advantage of getting rubber quite cheap for their rubber products manufacturing activities. Whereas the Malaysian manufacters are getting raw rubber @ Rs. 6/- per kg and Sri Lanka manufacturers get it at Rs. 4.50 per kg. as compared to Rs. 18/- per kg. prevailing in India. China has also entered the markets in a big way. Taiwan and Korea have already cretead havoc in the export field. In their quest for earning foreign exchange,USSR too has jumped into the fray, offering their products at ridiculously low prices.

Russia over the last couple of years has been buying rubber goods, particularly V-belts, hoses and auto tyres, in increasingly large quantities from India. Inspite of the fact that our prices were higher than the world market and these were increasing day by day because of the spurt in the Indian rubber prices. Russians continued to pay us higher prices due to political situation and bilateral trade conditions. They have now suddently shut their doors on us for reasons best known to them and we are now facing difficulties to unload the piled up stocks, in other world markets, because we are outpriced.

Price to be remunerative

Rubber is the major constituent in any rubber product. Phenominal increase in the cost of raw rubber in India has rendered our products uncompetitive in the international market. The manufacturing industry has outgrown the rubber production. The Government have failed to meet with the shortages by timely imports, resulting in unprecedent price hikes in the indigenous market. The prices of rubber have been raised by growers sky high, unmindful of the fact that it will result in big inflation all around the country and that our exports will be adversely affected.

It is agreed that price of raw rubber should be remunerative in order to sustain the plantation; but unjudicious and unilateral increase in price would virtually result in killing the manufacturing industry which lays the golden egg. Let us think of the day when the manufacturing industry will not be able to sell its high priced goods in the market because of the strong and developing consumer resistance. We all are aware of the net result of the price resistance in the sector of auto tyres. The manufacturers had to roll back their prices to 1981 level. If this happens with regard to other rubber goods also, the manufacturing industry will have to down their shutters and the growers will find it difficult to sell their produce. The producers will not, in any case be able to export the raw rubber to the international market on remunerative price because of the lower prices outside.

The Economists are fully aware of the result of the price hike in the crude and other petroleum products resorted to by OPEC countries in their lust to achieve quick money power. All the consumer nations have either found

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RUBBER GOODS EXPORT

RAJ KUMAR JAIN

Today the Indian Rubber Industry is manufacturing about 35000 items from tiny washer to heavy truck tyres. Exports of rubber goods have touched an all time high of Rs.50 crores. The present indications are that there is a large overseas market for the rubber goods made in India.

The author is of the view that the large edifice of the manufacturing industry now created has somehow to be protected in order to serve the masses of India as also to make a dent into the competitive world market. It is here that the producing and cosuming sectors have to survive and co-exist. The paper also discusses in brief the efforts made in India for promotion of exports of rubber goods, constraints experienced in export, the vast potential that is in store for expansion of exports and the encouragement needed for enterpreneurs. The author is the immediate past Chairman, Chemicals & Allied Products Export Promotion Council.

Rubber Industry in India has come of age thanks to the rubber producers, technologists, makers of raw materials, machinery and equipment, who have all contributed to the growth of this vital and strategic Industry which is second only to the steel industry. To-day the Indian Rubber Industry is manufacturing a large variety of items numbering about 35,000; right from a tiny washer to aircraft and other heavy tyres. The industry possesses a sound and advanced technological base.

The quality products made by the Indian Rubber goods Manufacturers are now seen in various world markets. The exporters of rubber products can be placed under three categories viz. : (1) Misc. rubber manufactured products; (II) footwear; and (III) automobile tyres & tubes.

Of late the small scale industry has also entered into export field in a big way and has the proud privilege of bagging numerous export awards and national awards on this score. Leave aside the underdeveloped countries, even the developed countries and sophisticated markets like West Europe, U. K., Australia and North America are also buying Indian made rubber goods in large quantities. In the 60's nobody could imagine that India would be shipping container loads of rubber products to highly developed and mechanised markets of West Germany, U. K., and America. The credit must squarely go to the entrepreneurs in India for this great achievement. The following figures will clearly indicate the trend and growth of exports during the last two decades:

Performance in 1979-80

Export performance to various countries of the World, on the basis of Continents can be summarised as under:

The list of items that the Industry has successfully exported includes:

Misc. rubber manufactured products

1. Rubber transmission & Conveyor belting.

Items	1964-65	1976-77	1979-80	1981-82	1982-83
	Value in Lakhs Rs.				
Rubber Manufactured Products	50.90	529.80	895.60	2620.00	3600.00
Footwear	121.40	345.50	267.40	410.00	340.00
Automobile Tyres & Tubes	221.40	1848.20	1120.00	1000.00	1070.00

Country	Mic Rubber Products	Footwear	Automobile tyres&tubes	Total
	(Rs Lakhs)			
East Asia	133.27	43.90	108.35	285.52
West Asia	291.42	3.66	212.65	502.73
North Africa	39.08	—	12.88	51.96
Rest of Africa	108.58	10.75	98.81	218.14
East Europe	29.74	—	231.90	261.64
West Europe	145.22	165.92	88.08	399.22
North America	115.63	39.81	343.54	499.08
Latin and other American countries	1.88	—	—	1.88
Australia	30.77	3.34	23.78	57.89

2. Rubber 'V' belts.
3. Cycle tyres & tubes.
4. Rubber hoses.
5. Rubber condoms.
6. Surgical and scientific rubber goods.
7. Rubber hot water bottles.
8. Mackintosh rubber sheets.
9. Rubber rings & washers.
10. Reclaimed rubber.
11. Rubber gloves.
12. Rubber teats.
13. Auto rubber parts.
14. Engine mountings.
15. Rubber foot mats.
16. Rubber cots & aprons for textile machines.
17. Rubber closures & stoppers.
18. Rubber erazers.
19. Foam rubber mattresses.
20. Rubber elastic tape.
21. Rubber insertion sheets.
22. Rubber solution.
23. Micro rubber sheets.
24. Rubber bands.

Footwear

1. Rubber & canvas footwear.
2. Gum boots.
3. Rubber soles & heels.
4. Rubber chappals & slippers.

Automobile tyres & tubes

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It is agreed that price of raw rubber should be remunerative in order to sustain the plantation; but unjudicious and unilateral increase in price would virtually result in killing the manufacturing industry which lays the golden egg. Let us think of the day when the manufacturing industry will not be able to sell its high priced goods in the market because of the strong and developing consumer resistance. We all are aware of the net result of the price resistance in the sector of auto tyres. The manufacturers had to roll back their prices to 1981 level. If this happens with regard to other rubber goods also, the manufacturing industry will have to down their shutters and the growers will find it difficult to sell their produce. The producers will not, in any case be able to export the raw rubber to the international market on remunerative price because of the lower prices outside.

The Economists are fully aware of the result of the price hike in the crude and other petroleum products resorted to by OPEC countries in their lust to achieve quick money power. All the consumer nations have either found

out new sources of supply or alternative means of energy. The prices have now crumbled down. Veterans of the industry also know that the total world rubber consumption is of the order of 123 lakh tonnes, out of which natural rubber is only 38 lakh tonnes. If the developed countries can switch over to synthetic rubber in that much quantity, the day is not far off when the manufacturing industry in India will also be obliged to think in those very terms.

Principle of co-existance

Very often the consuming industry fails to understand that if the prices of Rs. 4.50 and Rs. 6/- per kg. are considered remunerative in Sri Lanka and Malaysia respectively, why should the price of Rs. 8.25 fixed by our Government, be not found remunerative in India. Perhaps the producers and consumers can both advance arguments on each side: But the fact remains that if the prices to growers are not remunerative, they may in due course of time switchover to other high yielding crops and in that case the plight of the manufacturing industry can be well imagined. But such a situation should never be allowed to arise in the best interest of the economy. Both the producing and consuming sectors of the industry have to survive and co-exist.

Whereas the price of the raw rubber should be remunerative to the producers, it has to be affordable by the manufacturing industries at the same time. The sooner it is worked out, the better it would be for all concerned. The large edifice of the manufacturing industry now created has somehow to be protected in order to serve the masses of India as also to make a dent in to the competitive world market. It is here that both sectors have to help each other and work hand in hand. Survival of the one at the cost of the other would ultimately result in ruining of both.

Exports worth crores

Exports of rubber good which have touched an all time high of Rs. 500 millions or Rs. 50 Crores have not only to be sustained but also increased to enable the nation to buy the vitals from the world market. There is a large potential overseas market for the rubber goods industry. India can produce ancillaries for the automobile industry of the developed countries. The industry can produce consumer's goods of the highest quality, in large quantities. If Taiwan and Korea can export Cycle Tyres and tubes, to the tune of Rs. 100 crores annually, why.' cannot we, who have all the wherewithal to do so? Given the inputs at the right prices it is no wonder that we can raise our exports from the present level of 50 Crores to Rs. 300 Crores within a short span of 5 years.

But nothing would be possible without restoring normalcy in the rubber supply and prices, for which we have to work together in mutual interest. Newer plantations with high yielding clones should be undertaken on a war footing on the basis of experiments already done. Replantations should also be done wherever necessary. Imports should be made to fill the gap between demand and supply and that too in good time. The distribution system of the importing agencies be geared up for controlling the market operations.

Export efforts cannot be sustained without increasing and enlarging industrial base in the country for which the inputs have to be made available in abundance and at reasonable prices.

I have every hope that this august gathering representing all sectors of this vital industry and the high ups of the concerned Ministries and Departments will consider the aforementioned burning problems in right earnest and in the spirit these have been brought out and shall be able to find a just solution in the best interest of all of us and the national economy. □

SHELL CHEMICAL CO.

Shell Chemical Co., Houston, Texas, has completed and started its fourth thermoplastic rubber manufacturing unit at the company's Marietta chemical plant, near Belpre Ohio. The unit is expected to raise company-wide thermoplastic rubber capacity to 375 million pounds a year. Construction of the unit began in 1980 and was completed in late 1982. Six start-up teams began work last summer to bring the unit on stream. The new unit will make both "Kraton D" and "Kraton G" thermoplastic rubber, according to Marvin L. Baker, elastomers business center manager for shell. The plant will quadruple the company's capacity for producing "Kraton G" Products. The unit is oversized to allow economies of scale and has capacity to supply market needs through the 1980's, according to the company. Shell plans to hold one of its older plants "on standby in acticipation of growing demand" for the product, Baker said. The existing "Kraton G" unit has been in operation at Marietta since 1974 and has a capacity of about 30 million pounds per year.

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GROWTH OF THE RECLAIMED RUBBER INDUSTRY IN INDIA

ARUN K KAPOOR

The major consumers of reclaimed rubber in early sixties were companies of high international repute and specifications. In India, reclaimers had to buy scrap from unorganised sources. During early sixties, the cost of scrap rubber was Rs. 150.00 per ton whereas transportation cost was approximately Rs.110.00 to Rs. 130.00 per ton by rail. Today waste rubber is being collected by thousands of collection centres. Analysing the various stages, the author hightlights some of the very important features of the reclaimed rubber industry in India. He represents the organo Chemical Industries, Sonepat.

Reclaimed rubber is a product obtained from waste rubber goods like tyres, tubes moulded goods and latex goods etc., by converting used rubber from elastic to plastic state which can be re-used in the manufacture of rubber goods.

Reclaimed rubber was imported in India untill 1961 when the first Reclaim Plant of M/s. Organo Chemical Industries went into production in the year 1961 at Sonepat, Haryana. Until then India used to import 9000 tonnes of reclaimed rubber per annum.

More plants of reclaimed rubber went on stream during sixties, namely Indian Rubber Regeneration Co. Ltd Bombay, L.G. Balakrishna & Bros. Coimbatore, S. W. Rubber Works Ghaziabad, Rubber Reclaim Company of India (P) Ltd. Bahalgarh, Harayana, Kerala Rubber Reclaim Co. Ltd., Cochin and Reno Rubber Company, Vijayawada, and Sawani Rubber Industries, Chandigarh.

Since then a number of smaller Reclaim Rubber Plants have come up. On the whole there are 16 manufacturers of reclaimed rubber in the organised sector and some small units manufacturing reclaimed rubber by crude methods, figures for which are not available.

Early difficulties

The effort of reclaimed rubber manufacturers is unique in the sense that it being a basic raw material is used in the manufacture of high technology products like auto tyres, battery boxes, cables etc. The major consumers of this product in early sixties were companies of high international repute and were very particular of quality and specifications. Indian reclaimers had to buy scrap rubber from all sorts of unorganised sources and produce a finished product to match international standards. Tyre Companies, Battery Manufacturers and others extended full co-operation in helping reclaimed rubber manufacturers to produce goods of acceptable quality.

This co-operation was unique since there was no ban on the import of reclaimed rubber and these companies could have easily met their requirements by importing reclaimed rubber. Undoubtedly the consumers were greatly benefited in the later years, as reclaim became a cheap source of rubber.

The main difficulty faced by

reclaimers in earlier stages was collection of scrap rubber. At that time old tyres were purchased by roadside cobblers who would remove the plies from the tyres by hand knives and throw away pure rubber chips and cuttings. In winter months waste rubber was used as fuel by various industries. The reclaim manufacturers had to employ a large number of scrap collectors who went to small and big town and created small collection centres in each town. As soon as quantity collected was substantial, it was booked by rail or road to the reclaimers/factories. During early sixties the cost of scrap rubber was Rs. 150.00 per ton whereas transportation cost was approximately Rs. 110.00 to Rs. 130.00 per ton by rail.

Today waste rubber is being collected by thousands of collection centres. A large number of scrap collectors are supplying tyre cuttings whose plies have already been removed. Although tyres are the major source of raw material, other waste rubber goods like tubes, air bags, flaps, injection bottle caps, latex goods and other rubber goods are now being reclaimed. Even coloured reclaims are available—manufactured from the coloured scrap rubber.

Technological aspects

India today is using the following methods for the manufacture of reclaimed rubber in the organised sector.

1) Pan process.
2) High pressure autoclave process.
3) Rotary autoclave process.
4) Reclaimater process.

All the above were imported from western countries in the form of technology transfer as well as import of machinery.

Today the cost of putting up new plants has gone up many times. A new plant to manufacture 2400 tonnnes per annum might cost about Rs. 2 crores against Rs. 80 lakhs 5 years ago.

Indian reclaimers are upto date with technology as compared to foreign countries. Recently a few developments have taken place in the world using micro-wave technology to provide heat energy for reclamation of finely ground scrap rubber.

Reclaiming of vulcanised rubber is not devulcanisation process. Once raw rubber is converted into an elastic material by reacting it with vulcanising agents like sulphur. it is not possible to remove sulphur and recover rubber in its original form. Instead the reclaiming process takes advantage of the long chain molecules of rubber by cutting the same into smaller chains by Oxygen attack. Thus the elastic rubber is converted into soft plastic material which can be reused in fresh compounds.

Price structure

Reclaimed rubber prices have gone up from Rs. 1700.00 per ton in 1963 to Rs. 4500.00 per ton in 1983 i.e. in 20 years, whereas the natural rubber prices have gone up from Rs. 5.00 per kg. to Rs. 17.00 per kg. in the same period. The price of reclaim rubber used to be third of new Polymer whereas today it is fourth. Consumption of reclaimed rubber varies from 7% to 10% in foreign countries like U.S.A., West Germany, Canada, France and Australia.

The consumption of reclaimed rubber is not consistent with the growth of rubber industry. Reclaimed rubber consumption is 24000 tonnes per annum against installed capacity of 48000 tonnes. The production constraints like labour unrest due to which a large reclaim unit having installed capacity of 8000 tonnes per annum remained closed for almost one year and other plants are facing chronic power cuts.

Exports: Future trend

Inspite of tough competition abroad, Indian Reclaimers have been exporting on the average of 10% of their production. Today the Reclaimers are facing a tough situation both in raw material procurement and in finding new markets. India is today producing approximately 8 different grades available to the consumer to choose from, whereas in U.S.A. there are more than 200 grades available. Mostly tailor made grades are offered to the consumer. The Reclaimers Association of India are considering seriously as to how the consumers could be educated on the use of various grades of reclaimed rubber. New set of grades will have to be developed to help consumers to get most suitable quality so that they can use higher dosage of reclaimed rubber profitably.

Some of the Govt.departments like Defence are having specifications which restrict the use of reclaimed in the manufacture of defence items. These are very old specifications and defence services require to accept the usefulness of reclaimed rubber.

Consumption of reclaimed rubber is likely to go up to 30000 tonnes per annum by the end 1985. Although installed capacity is already 48000 tonnes and is likely to go up to 52000 tonnes by the end 1985 yet actual production cannot be projected correctly which is dependant on power and labour situation.Exports could pick up substantially if special low power tariff and concessional freight is given to exporters of reclaim.

Reclaimed Rubber Industry has made commendable contribution to Indian Rubber Industry. Now time has come to further explore new avenues of usage of this product to which I am sure that Indian reclaimers will rise to the occasion.

India has been exporting 1500 tons of reclaim rubber till 3 years ago. Unfortunately, the Government had withdrawn cash subsidy on the export of reclaim rubber and since then the exports have declined to 600 tons last year. Exports can again pick up if the Government reintroduces cash subsidy of 15%.

Excise disadvantage to small users

The small users of reclaimed rubber like paddle, floor mats, cycle tyre tubes, hose and other small manufacturers have to pay

an extra price of 10.4% due to anomaly of excise.

Under item 68 of Excise, 10% Excise is charged on reclaimed rubber. The big tyre companies, battery manufacturers and others are getting the refund of excise, whereas the small manufacturers are not entitled to this refund under the Excise Law with the result that they have to pay 10% plus Sales Tax on 10% which amounts to 10.4% extra. It is a fit case for Reclaimer's Association to take up this matter in the interest of Small Scale Industry to request the authorities to exempt reclaimed rubber from excise duty. The over-all collection of excise from small manufacturers is not more than Rs. 40 lakhs an year whereas the paper work and government staff involved to recover this money may be costing a substantial amount.

Tyre and non-tyre consumption

The percentage of reclaim consumption in non-tyre sector has increased in the last 5 years from 15.64% to 16.11% on total polymer consumed by them; whereas in the entire sector, the consumption of reclaim rubber has fallen from 9.59% to 6.83% on new polymer in the corresponding period.

It appears that some of the big tyre companies are using more of imported synthetic rubber because their technology is based on their principals abroad where the synthetic rubber is very cheap. In case, these tyre companies modify their formulations to Indian conditions, certain content of imported rubber can be replaced by reclaim rubber. □

SUMMERCARE

Mulching

It is very essential to keep the immediate vicinity of young rubber plants in the field as well as in the nursery, clean weeded in order to prevent competition from weed growth. But by doing so there is a possibility of soil degradation around the plants owing to the severe climatic condition prevalent in most of our rubber growing regions, particularly in northern areas. Mulching with dry leaves, grass cuttings and cover crop loppings around the plants is, therefore, recommended as a cultural operation for rubber nurseries and young clearings, because it will be helpful in preventing soil degradation. It is understood from a recently conducted experiment that the water weed Salvinia sp. (African payal) spreading as a menace in the waterways of Kerala, when used as a mulch material in seedling nursery at the rate of 5 kg per sq.m. as sun dried material during November gives either equal or better quality seedlings when compared to conventional leaf mulch. The benefits that can be derived through mulching are the following:

(1) Improvement of the water and plant nutrient holding capacity of the soil.
(2) Maintenance of the soil around young rubber plants in a cool and moist condition during summer months.
(3) Multiplication of the bacterial population of the soil, ensuring better plant nutrient availability.
(4) Protection of the soil from the beating effect of heavy rainfall resulting in soil erosion.
(5) Control of weeds around the plant bases.

Mulching should be undertaken in nurseries and young plantations after fertilizer applications and before the onset of the regular summer.

Sun-scorch

Young nursery seedlings often suffer from sun-scorch. The bark at the collar region dries up resulting in a girdling effect and the affected seedling dries up subsequently. This is mainly due to heating up of the soil around the collar and could be prevented by mulching the nursery beds with dry organic matter by the advent of hot dry weather. Fresh green mulch should be avoided.

In young clearings the bark at or above the collar region on the side facing south or south west often gets damaged due to sun-scorch. In buddings sometimes, the dead snags of stocks fall off leaving a cavity at the bud union. When this faces south or south west, sun-scorch effect becomes prominent and the bark on the scion dies. In these cases often the damaged bark is in the shape of a spearhead. The affected bark is colonised by wound parasitic fungi like Diplodia causing further damage. If untreated, such plants may dry up or may be blown over by wind. In plants where the damage is not deep and extensive, the affected region may be scraped washed with an organomercurial fungicide and a thin coating of wound dressing compound applied. Above the treated surface, white washing may be done. The clones GI 1 and LCB 1320 are known to be highly susceptible to sun-scorch. As preventive measure, white-washing of the stem from the collar upwards on the brown bark may be carried out using lime, during hot weather and this may be continued till the canopy closes. Once the canopy closes, only the border plants need be white-washed. Provision of bamboo baskets affording shade and mulching the plant bases with dry organic matter for young plants in the field will be helpful in reducing sun-scorch.

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PROSPECTS FOR SYNTHETIC RUBBER IN INDIA

S CHOWDHARY and A K MALLIK

The growth in Synthetic Rubber consumption during the last 7 years was about 6% inspite of no growth in the case of large volume SBR. The authors say that the consumption has been gradually declining to its present level of about 23,600 tonnes. Amongst the synthetic rubbers, BR has shown a significant growth over a short period after it became available from domestic production in 1978. The authors analyse various points connected with synthetic rubber and discuss its future prospects. Both of them are from the Indian Petrochemicals Corporation Limited.

The emergence of synthetic rubbers was primarily due to the shortage of natural rubber during the war, but it now accounts for about 60% of the total world rubber consumption. A wide spectrum of synthetic rubbers have now been developed including general purpose rubbers like Styrene-Butadiene Rubber (SBR), Polybutadiene Rubber (BR), and speciality rubbers like Butyl, Polychloroprene, Nitrile, EPDM etc; which are all vital today to the industry.

The present world consumption and long term demand forecast for natural rubber (NR) and synthetic rubbers including the pattern of consumption in the tyre and non tyre sector is shown in Table 1 and 2.

Table-1

World Rubber Consumption and Forecast

(000 Tonnes)

Type	Actual Consumption 1981	Demand 1985	Forecast 1990
Natural Rubber (NR)	3064	3535	4175
Synthetic Rubber (SR)	5879	7025	8263
—SBR	3349	3934	4573
—BR	960	1152	1394
—Butyl	423	492	570
—Nitrile	188	229	265
—Polychloroprene	287	327	373
—Others	672	892	1088
TOTAL	8943	10560	12438

Source:- I.I.S.R.P.
Excludes CPEC

For a quick analysis the following can be concluded from the above tables:

* Amongst all rubbers, SBR has the highest consumption of 37%, followed by natural rubber which contributes 34%.
* BR is normally used as complementary rubber in blends with NR,SBR and accounts for 11% of total rubber consumption.
* Other synthetic rubber accounts for 29%.
* NR consumption in tyre sector varies from 30 to 65%, while in India it is as high as 77%.
* In non tyre rubber products, world pattern of synthetic rubber consumption is 77 to 86% whereas in our country it is only 18%.
* In other words pattern of consumption of NR and SR in India is just the reverse of the world trends.

Table-2

Rubber Consumption in Tyre & Non tyre Sectors
Natural Vs Synthetic

Percentage

Country	Tyre		Non-tyre	
	N.R.	S R.	N.R.	S.R.
1. U.S.A	30	70	13	87
2. U.K.	42	58	23	77
3. France	43	57	20	80
4. Germany	65	35	17	83
5. Italy	41	59	23	77
6. Japan	39	61	21	79
7. Canada	29	71	16	84
8. Brazil	30	70	16	84
9. India	78	22	82	18

India occupies a unique position as one of the major natural rubber producing countries with domestic availability of synthetic rubbers also. However, the synthetic rubber consumption in India has so far been low and could perhaps be attributed to the following reasons:

* Traditionally, technology for both tyre and non tyre applications is based on NR.
* Easy availability of NR in the past.
* Greater production of truck tyres as compared to passenger car tyres.
* Reservation about increased usage of synthetic rubbers.

Looking at the world trends for rubber consumption and limitations on long term increase in production of NR, it is clear that synthetic would pay an important role in any future planning.

Despite a host of uncertainties which makes any forecasting a difficult task, we have attempted to highlight the future role of synthetic rubbers in India based on available data.

Pattern of rubber consumption in India

The consumption pattern for different types of rubbers in India is shown in Table 3 and 4.

The natural rubber consumption has been maintaining a steady growth rate of about 7% and except for the years 1974-75 to 1977-78, domestic demand was always more than local production and had to be met through imports which are currently required at a level of about 30,000 M.Tonnes.The consumption of NR is about 80% of the total rubber consumption.

Table-3

Total new rubber consumption

Type	Years				Growth Rate
	1975-76	1980-81	1981-82	1982-83	1975/82 %
Natural Rubber(NR)	125692	173630	188420	195545	7
Synthetic Rubber(SR)	32452	45200	46445	49600	6
—SBR	26033	25125	23355	23135	Neg-
—BR	599	7150	10950	13465*	64
—Butyl	3641	8410	7780	8500*	14
—Polychloroprene	379	950	815	1000*	16
—Nitrile	484	1105	1010	1000*	13
— — Latex	1917	2035	2153	2000*	13
—Others	299	425	362	500*	93
Total	158144	218830	234365	245145	

Note: The present usage of reclaimed rubber (not including above) is about 25,000 MT

Source: Rubber Board *Estimated figure

The growth in Synthetic rubber consumption during the last 7 years was about 6% inspite of no growth in the case of large volume SBR. In fact from a level of about 31,500 M.Tonnes in 1971-72 the consumption of SBR has been gradually declining to its present level of about 23,000 MT. This can be attributed to higher prices of SBR in comparison with NR and drop in production.

Amongst the synthetic rubbers, BR has shown a significant growth over a short period after it became available from domestic production in 1978. The quick penetration achieved both in tyre and nontyre sectors was essentially due to acceptable quality, stable prices and development efforts.

Butyl rubber has shown a progressive growth inspite of no domestic production, essentially due to its exclusive properties ideally suited for automobile tubes.

Future demand and supply balance

The reconstituted working group of petrochemicals in 1978 worked out future requirement of rubber for 1982-83 and projected demand for 1988-89.

The requirement of 1982-83 for all types of rubbers was based on the estimated production of tyres/tubes and various types of rubber goods. The average annual growth rate was estimated 7%. But the 10% growth rate for the tyre industry was due to the likely increase in demand for ADV tyres and tractor tyres. The requirement of special purpose synthetic

Table-4

Total new rubber consumption by end use

Product	1975-76	1980-81	191-82 (Esti)	1982-83 (Esti)
Automobile tyre & tube	79216 (62115)	113543 (87295)	134990 (104590)	135460 (105550)
Cycle tyre&tube	18735 (15979)	25600 (20664)	25400 (20400)	27000 (20000)
Camel back	7848 (5545)	11274 (9130)	18900 (9000)	12200 (9500)
Footwear	16522 (12387)	23401 18900)	23000 (19000)	23500 (19000)
Belt & hose	9837 (3943)	13546 (11812)	10100 (8300)	13000 (8000)
Latex foam	2033 (2033)	5753 (5753)	5600 (5600)	6000 (5000)
Cable & ware	890 (590)	1214 (779)	1230 (730)	1360 (860)
Battery boxes	841 (220)	1263 (485)	1300 (500)	1400 (600)
Dipped goods	3478 (3478)	4945 (4945)	5300 (5300)	5500 (5500)
Others	18744 (14342)	18291 (13867)	16445 (15000)	19725 (17000)
Total	158144	218830	23465	245145

Note: Figures in bracket are natural rubber consumption

rubbers was also considered. Based on all these assumptions the total estimated demand for new natural rubber / synthetic rubber for 1982-83 was estimated in the range of 2,50,000 MT to 270,000 MT. As already shown in the Table 3 the actual consumption in 1982-83 has nearly reached this level.

The forecast for new rubber requirements in 1988-89 is 4,50,000 MT per annum indicating a growth rate of just over 10% from the present consumption level of about 2,45,000 MT.

Against this demand,estimate the domestic availability by 1988-89 for natural rubber has been taken at2,65,000 MT. This would lead a consistent annual growth of about 7% from the current level of production i.e. 1,66,000 MT. For synthetic rubbers produced indigeneously i.e. SBR and Nitrile rubber from M/S Synthetics and Chemicals, Bareily and BR from IPCL, Baroda the availability has been estimated at equivalent to their installed capacities.

As shown in Table 5, based on the estimated demand and domestic availability, the gap for new rubbers by 1988-89 would be about 1,33,000 MT based on the above analysis.

For NR it would be indeed difficult to maximise production beyond the level of 2,65,000 MT by 1988-89. During the next six to seven years, therefore, to bridge the gap between demand and supply we would either have to import or plan for setting up additional facilities for suitable types of synthetic rubbers.

Considering the end use analysis shown in Table 4 and technical aspects for using natural rubber and synthetic rubbers in different applications it is suggested that this gap can be met effectively by additional quantities of SBR (Emulsion) and BR (Solution) to the extent of about 108,000 MT by setting up new plants or by expansion of existing facilities. If a new plant for Butyl rubber with the capacity of about 20,000 MT

Table-5

New rubber balance

	1988-89
Demand:-Natural Rubber (NR) / Synthetic Rubber (SBR) * SBR * BR	4,25,000
* Butyl	20,000
* Nitrile * Polychloroprene * Others	5,000
Total	4,50,000
Domestic availability:	
— NR	2,65,000
— SBR (Emulsion)	30,000
— BR (Solution)	20,000
— Nitrile	2,000
Total	3,17,000
Gap	1,33,000
Suggested action to bridge the gap through synthetic rubber:	
— New Plant/Expansion SBR (Emulsion)/BR(Solution)	1,08,000
— New Plant: Butyl	20,000
— Imports: Special rubbers:	5,000
Total	1,33,000

Derived from the report of reconstituted working group on petrochemicals.

is set-up the balance 5,000 MT of speciality rubbers can be imported.

The demand volumes for other speciality rubbers are currently not at a level to support an economic size production plant.

It may be mentioned that availability of synthetic rubbers in future would not only bridge the demand and supply gap,but would complement NR leading to improved quality of rubber goods. Taking some specific examples, in the case of tyres the use of SBR is essential in passenger car tyres, and use of BR in radial car tyres and truck tyres greatly adds to the life of the tyres due to better abrasion resistance. The advantage of using BR is also being experienced in the performance of cycle tyres. Similarly use of Butyl rubber instead of NR in tubes would not only lead to lower consumption of rubber due to thinner tubes but enhance performance.Butyl is also necessary for heat resistant belts. Similarly high styrene SBR has nearly exclusive application in microcellular and other types of footwear.

Feed stock availability for synthetic rubber

The major raw material for the manufacture of petrochemicals are:

* Naphtha
* Ethane and Propane gases
* Olefins from FCC units in the Refinery
* Ethyl Alcohol
* Calcium carbide

The monomers feed stock required for the manufacture of suggested synthetic rubbers would be:

* Benzene
* Iso-Butylenes
* Butadiene

The naphta fraction from indigenous crude oils are one of the best known sources in the world for production of aromatics. This advantage will be usefully exploited in the proposed aromatics production facilities at Bombay, Mathura and Barauni for making available Benzene as per requirement for ethyl benzene and styrene.

Offgases from FCC units in the refineries provide a suitable source for additional production of propylene and butylenes particularly because their availability from gas crackers will be limited. In addition additional C4 raffinate stream (after extraction of butadiene) containing significant quantities of iso-butylene is available from the IPCL complex. This stream alongwith butylene stream available from FCC unit of Gujarat Refinery will provide Iso-butylene in sufficient quantities for the proposed 20,000 tonnes Butyl Rubber Plant.

The sources for butadiene are limited. The butadiene requirement for 108,000 tonne annually of total SBR/BR would work out to about 65,000 to 80,000 tonnes based on the future demand pattern for SBR and BR. It would therefore be desirable to plan for increased Butadiene production in addition to the likely availability of about 16,8000 MTA from the proposed Haldia Petrochemicals Complex but evaluating the following available alternatives.

* Maximise butadiene production to the extent possible in the existing naphtha cracking units.
* Plan for additional butadiene through the alcohol route.
* Evaluate the economics of producing additional butadiene by de-hydrogenation of butylenes from FCC.
* Consider imports of butadiene to meet the shortfall after tapping the above possibilities.

□

Rs. 25000 FOR PORTABLE POWER SPRAYER

The Rubber Board at its 99th Board Meeting has decided that an award of Rs. 25,000/-will be presented to individual/institutions who will develop a portable power sprayer having the following features.

1. The total weight including 12 litres fungicide should not be more than 50 kg.
2. It should be capable of effecting satisfactory coverage upto a minimum height of 25meters.
3. It should be sturdy and trouble free.
4. The machine should work on low volume spraying principle; capable of delivering about 40 litres per hectare of fungicide in diluent oil in 30 minutes.
5. The sprayer should be suitably designed to be carried by 4 persons in undulating and steep terrains.
6. The price of sprayer should not exceed Rs. 10,000/-
7. The proto type will have to be fully tested and approved by a committee nominated by the Rubber Board.

nominatedby

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MOTORISED TAPPING KNIFE

The latest invention of a mechanised rubber tapping knife has aroused much interest in the rubber industry.

Prototypes of the knife,which was jointly developed by the Malaysian Rubber Research and Development Board (MRRDB) and Nihon Giken Kogyo Company Limited of Japan, were distributed to Government agencies connected with rubber production.

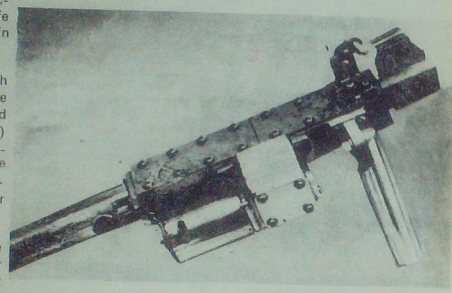
The presentations were made by Primary Industries Minister Datuk Paul Leong who earlier introduced the tool to delegates of the planters' conference.

Secretary-General of the Primary Industries Ministry, Tan Sri Rama Iyer, told newsmen that the prototypes were given to the agencies for them to gauge their effectiveness and to provide feedback to the MRRDB.

Idea

Ha said the knife pack, which includes a motor-operated tapping knife, battery charger and battery, would initially cost about $250.

An initial batch of the knife packs would be produced in Japan which would be delivered here in May 1984.



Under an agreement with the consortium of Japanese companies led by Nihon Giken Kogyo that are producing the packs, the tool would eventually be manufactured in Malaysia for local consumption as well as for export.

Tan Sri Rama Iyer said:"When the mould is sent here and the knife pack is eventually produced locally, the cost could be much less.

"With this tool, anyone can be easily taught to use it. The knife ensures controlled tapping which is quick and efficient and the tapping process does not wound the bark."

The knife,which is of the size of a large torchlight and shaped like a hand-drill, can be used continuously for four hours before the battery needs re-charging.

The battery can be charged up to 300 times before it is replaced.

The average time to tap a tree with the mechanised knife is between six and eight seconds.

The idea of the knife was mooted by the MRRDB while its design was developed by the Japanese. It took two years of research to come up with the prototype.

Rubb Board bull. 19, No. 2

THE AVAILABILITY OF MODERN RUBBER MACHINERY

SUDHIR C ANAND

The capability of the rubber machine building industry was hardly significant and the range of machinery available was very limited till the mid sixties. But surprisingly enough the boom in the road transport and passenger vehicles, however, changed the whole situation. Governments also constituted a task force to study the various aspects of the tyre industry. The resultant developments were encouraging. The technical collaborations that followed made it possible to achieve selfreliance in technology to the extent possible in the shortest time. The rubber machinery industry today covers the entire range of equipment for the rubber industries. In the article an attempt is made to assess the present position of the availability of modern rubber machinery. The author is the Chairman of Rubber Machinery Division of the Association of Indian Engineering Industry.

It is my privilege to present a paper on the development and availability of modern rubber machinery in the country on behalf of the rubber machinery division of the Association of Indian Engineering Industry. AIEI is the body for the engineering industry representing over 1500 companies from the small, medium and large scale units from the public and private sectors. The rubber machinery division, within AIEI, represents almost all the leading rubber machinery manufacturers in the country. The growth of the rubber machinery industry is linked with the tyre and nontyre industry. To have a brief background, would be better to review the circumstances in which the indigenous rubber machinery was established. This would provide us a perspective to review the present state and future growth.

Background

The rubber machine building industry has now come of age. Till the mid-sixties the size and capability of the industry was hardly significant and the range of machinery available was very limited due to the limited demand in the home market. The tyre and non-tyre manufacturers generally preferred machines manufactured as per the design of their collaborators and had their machines imported together with their main plants. However, it was the boom in the road transport and passenger vehicles during the late sixties that drastically altered the situation.

The increase in demand for auto tyre and later short fall in supplies was so acute that Government constituted a task force to study and report on the tyre industry. Based on this report, the Planning Commission projected an annual demand of 100 lakhs of tyres and tubes for the Fifth Five Year Plan. Therefore,Government with a view to saving precious foreign exchange, issued 17 letters of Intent for new tyre projects and encouraged the existing units to expand. Also, keeping in line with the overall objective of saving further foreign exchange as well as to develop indigenous machinery base, the Government initiated action to—

a) encourage the indigenous machinery industry to expand and diversify their range of production.
b) licensed new units in the small, medium and large scale sectors, and
c) approved technical collaborations, wherever necessary

The objective was to create the necessary base for meeting the modern requirement of tyre and non-tyre sector and achieve self-reliance in technoloy to the extent possible in the shortest time. As a result, a number of well known engineering companies in the

country entered into technical as well as financial collaborations with world renowned rubber machinery manufacturers. Government's approval of the collaboration was based on proper evaluation of the capacity of the collaborators and suitablility of their machinery for India. Underlying this approval was the tacit understanding that the tie-up would involve a transfer of know-how on a continued basis enabling development of Indian machinery industry and bringing it to a stage where it could be self-sufficient. This, therefore, was a positive step not only for indigensiation and import substitution but also improving the technology in India and to ensure that machinery manufacturers in the country were able to offer machinery of international standards.

Investment

Taking the initiative of meeting the present needs of the Indian tyre industry as well as non-tyre industry the rubber machinery manufacturers made huge capital investment. To keep pace with the fast changing rubber technology, the machinery industry has been making all out efforts to develop expertise through indigenous research as well as acquisition of latest know-how.

Some of the leading engineering companies in the rubber machinery industry are Alfred Herbert Limited,Associated Tyre Machinery Co. Limited, Devon Machines Limited, Farrel Anand Machinery Manufacturers Limited, L & McNeil Limited, National Standard Duncan Limited, Richardson and Cruddas Limited, SLM Maneklal Industries Limited etc. World renowned overseas companies, for example, McNeil Akron, U.S.A.; Leonh-Herbert, West Germany; Abex Corporation,U.S.A.; National Standard,U.S.A.; Herman Berstroff West Germany; Schisser AG, Switzerland; Francis Shaw & Co. Limited, U. K.; Fareel Company, U.S.A. have been associated with the manufacturers over the years in collaborative tie-ups.

Availability of modern machinery

The rubber machinery industry, today, covers the entire range of equipment for the rubber industries such as Bandbury Internal Mixers, 2 Roll Mixing Mills, Calenders, Extruders, Refiners, Crackers, Tyre Building Machines, Tyre curing Presses, Tube curing Presses, Flap Presses, Bladder presses, Moulds, Bias Cutters, Band building Machines, Drums, Retrading Equipment for tyre and tube industry as well as machinery for non-tyre sector, Automobile Parts, conveyer belt, Gaskets and Seals, Industrial Rolls, Shoe Industry and other rubber industrial products. Indian rubber machinery industry is, today, capable of supplying a wide range of equipments having assimilated the latest developments from abroad. Major type of machinery available are:-

Two roll mills

a) Mixing Mills have been produced for many years.Keeping in view of the latest developments, internationally, Indian rubber mechinery industry has also incorporated new developments and are offering mills with drilled rolls and unidrive gear boxes. These drilled rolls are used for obtaining the precise temperature control on the rolls surface, and are preferred by the industry for better quality control.Unidrive gear boxes eliminate the conventional Bull Gear/Pinion drive and saves working space.

b) Similarly Crackers and Refiners of latest design are also being offered by the Rubber Machinery Industry.

Mixers

Internal mixers commonly known as Banbury Mixers have been in the market for long. Banbury Mixers have progressed from the old spray side sliding door machine to the drill side, drop door type mixers. The latest development in the last few years are the 'F' series type of Banbury Mixers. These mixers are completely of new design incorporating many new features to obtain better quality, higher productivity and easy maintenance. To cope with the latest development the 'F' series type of Banbury Mixers are also being produced in India and are increasingly becoming popular with the Rubber Industry.

Calenders and its lines

A wide range of Calenders have been available in the Country. Indian Rubber Machinery Manufacturers are now able to offer 2, 3, 4 rolls of Calenders of all sizes incorporating the latest features such as, drilled rolls, roll bending, cross axis and other precision controls for obtaining uniform coating and sheet thickness, better productivity and processing of natural and synthetic rubbers.

Hot feed/cold feed extruders

Hot feed extruders had been in the Indian market for long. However to meet the requirements of the Rubber Industry, the Indian Rubber Machinery Manufacturers are now offering Cold Feed extruders including Pin type. The advantage of these extruders is that rubber compounds without prewarming can be fed directly to the extruders thus eliminating the use of warming mills which have been traditionally used the Hot Feed extruders resulting in lower capital cost and saving in space requirements.

The Indian Rubber Machinery Manufacturers are also offering Dual Head extruders for the manufacture of tread rubber.

Roller Die Type extruders are also produced in the country to take charge directly from the high capacity Banbury Mixers.

Tyre building Machinery

Almost the entire tyre building machines are available in the country for passenger tyres, trucks tyres, semi-automatic and automatic and tractor tyres.

Presses

Complete range of presses in different sizes and available for scooter, motor-cycle, passenger tyres, trctors tyres and tyres for earthmoving equipment.

a) Tyre curing Presses of all

sizes are being manufactured in India from 24" to 75" along with accessories.

b) Tube curning Presses are also available.

c) Flap presses: generally known as Mechanical goods presses are also available and have been supplied to Tyre Industry.

The rubber machinery industry has made rapid strides in the development of equipment by taking the best in technology from the developed countries. The industry is attempting to go in for advanced production techniques to continuously upgrade quality and reliablity. A new dimension is the emergence of micro processors which has led to a revolution in all fields of activity. Micro-processors can be used in application of tyre building machines production, monitoring and statistics as well as in Banbury mixing control. The application of computers is yet another significant area which the industry is attempting which would usher in a new ere of precision and productivity.

In some of the areas which our industry has not reached the level of sophistication attained by the developed countries, attempts are being made to develop the capabilities through acquisition of further know-how. But it can also confidentally be mentioned that indigenous rubber machinery industry has broken new grounds by even exporting rubber machinery to south-east Asia, Africa and even Japan.

The industry is fully geared to meet the projected requirement of tyres and tubes and has welcomed the setting up of a planning comission working group to estimate the demand projections in the next 15 years. □

DEVELOPMENTS IN NATURAL RUBBER PROMISE COMMERCIAL POTENTIAL

Research projects on epoxidized natural rubber and thermoplastics/NR rubber blends carried out at the Malaysian Rubber Producers Research Association could soon lead to the appearance on the market of important new materials. A natural rubber / polypropylene blend should shortly be available commercially. MRPRA has been working with a polymer producer on this project and anticipates it will shortly come to fruition. This material could have properties as good as EPDM blends but at a lesser cost. Different properties can be produced in these blended materials by varying the composition of the mix. It is possible on the one hand to produce vulcanized rubber particles within a thermoplastic matrix and on the other hand a material which greatly resembles rubber in appearance but demonstrates thermoplastic properties. A mix of 20% natural rubber to 80% polypropylene should prove of great interest to automobile manufacturers since it shows considerably high temperature resistance, up to 140°C and maintains its flexibility and impact resistance at temperature down to —50°C. Epoxidized natural rubber is another material which shows good commercial potential. By replacing varying proportions of the double bonds in the polymer chain by oxygen atoms, it is possible to produce materials with oil resistance equivalent to nitrile rubber or air resistance equivalent to butyl rubber while still retaining the toughness of natural rubber. Another great advantage is that silica can be used as reinforcement without the addition of coupling agents. Differing properties are produced by varying the degree of expoxidation. ENR—10 (10% epoxidation) shows good damping properties and has many possible engineering applications, ENR—50 could be used to replace butyl rubber in many applications, while ENR—25 shows significantly better wet skid resistance than natural rubber and good rolling resistance so would be eminently suitable for use in cars.

A 1 tonne capacity pilot plant for ENR has been built in the RRIM in Malaysia and samples of the material are being sent to certain selected companies for commercial evaluation. Another possible application in the tyre industry currently being investigated at MRPRA is the use of natural rubber in truck tyre retreads. During the retreading process, the amount of heat which needs to be applied to the tyre surface to produce vulcanization at the base of the tread causes overcure at the surface.

It has been shown however that the high proportion of sulphur present is responsible for this and using a semi-efficient sulphur vulcanizing system, abrasion resistance is not sacrificed and the NR retread shows between 10 and 30% better wear than synthetic rubber.

Rubb Board bull. 19, No. 2

The Indian Rubber Industry has grown steadily throughout the past decade with polymer consumption rising at around 6% per annum. The costs of raw materials based on petrochemicals would continue to escalate but the trend of polymer consumption in India at an annual rate of 5 to 6% is likely to continue in the present decade. Rubber consumption in India in 1981 had been around 200,000 tonnes and projections for 1985 and 1990 are 282,000 and 405,000 tonnes respectively. Rubber chemicals play an important role in rubber processing and based on past trend of 3.4% (w/w) of rubber chemicals usage in India the requirement of rubber chemicals for 1985 and 1990 would be about 9,900 and 14,200 tonnes respectively.

The rubber industry is concerned with the production of homogeneous products with appropriate physical properties by compounding rubber with ingredients, including cross-linking agents, followed by processing, moulding and introduction of chemical bonds. Chemicals used in the rubber industry can be broadly classified as:-

i) Accelerators
ii) Retarders
iii) Antioxidants
iv) Peptisers
v) Fillers
vi) Auxiliary chemicals

For the purposes of this discussion,rubber chemicals are defined as substances principally organic, used in the compounding of rubber for the purpose of effecting vulcanisation, regulating the rate of vulcanisation, facilitating the fabrication of the product and improving its quality and its stability in service. The following discussion considers accelerators of vulcanisation, retarders, antioxidants and peptisers.

CHEMICALS FOR RUBBER INDUSTRY

PS BHARGAVA & SK KAPOOR

Rubber chemicals play an important role in rubber processing. The estimated requirement of rubber chemicals in 1990 would be about 14,200 tonnes. The Industry is now concerned with the production of homogenous products.

Rubber chemicals are defined as substances principally organic for the purpose of vulcanisation, regulating the rate of vulcanisation, facilitating the fabrication of the product and improving its quality and its stability in service.

This paper briefly discusses the various types of chemicals used in the Rubber Industry and attempts to analyse the role of accelerators of vulcanisation, retraders, antioxidants and peptisers in the context of emerging opportunity for rubber chemicals. The authors are from the Application Research & Development (Rubber Chemicals) Division of the ACCI, Rishra, Hooghly, West Bengal.

Accelerators of Vulcanisation

Since the discovery by Goodyear in 1839 that the physical properties of rubber may be improved with sulphur, it has been the most commonly used cross - linking agent. The recent advances in rubber processing industry would not have been possible without the discovery and development

of accelerators for vulcanisation.

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iii) guanidines

The group comprising the mercaptobenzothiazole and derivatives is by far the most important and accounts for over 70% of accelerator production.

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During and after the second World War scarcity of natural gas led to the development of the reinforcing furnace blacks. With these nonacidic blacks the tyre tread compounds containing thiazole accelerators, became too scorchy, however, with sulphenamide accelerators the compounds could be safely processed without the danger of scorch. It can be rightly claimed that the usage possibility of the modern fine particle size furnace blacks in rubber industry has become possible only because suitable sulphanamide accelerators are available commercially.

The dithiocarbamates and thiuram sulphides rank second in importance among the accelerator groups. Zinc dimethyldithiocarbamate and zinc di—n—butyldirhiocarbamate are important accelerators. Among the various disulphides used in the rubber industry the largest volume is of tetramethyl thiuram disulphides (TMT). Other Commercial disulphides include the important tetraethyl thiuram disulphide (TET). There is one commercial tetrasulphide, presently not made in the country, bis (pentamethylene thiocarbamyl) tetrasulphide.

Guanidines rank third in importance and include 1,3—diphenylguanidine and 1,3—di—o—tolygunidine. Presently, guanidines are not manufactured in india.

Existing accelerators manufacture is based on petrochemicals feedstocks and there is a need, in future, to look into the feasibility of developing better accelerator systems based on renewable resources. Generally, the properties of an accelerator are dependent of the amine moiety as mentioned earlier. Search for amines of higher basicity from renewable resource could lead on to better/safer accelerator systems.

Retraders

In rubber processing, the need exists for an additive which increases only the scorch delay with time with minimal effects on other cure parameters and vulcanisate properties. Such compounds are called retarders and are in commercial use.

Historically, N-nitrosodiphenylamine and anhydrides or carbo xylinc acids have been used as retarders to enhance scorch safety of rubber stocks. Effectiveness of these compounds is limited at best and is dependent on types of accelerators and rubber formulation. In the year 1967, Trivette and Coran discovered organic polysulphide as retarders. The search continued and certain types of sulphenamides were found by Coran and Kerkwood, which were highly effective at low concentrations, had little effect on cure rate or vulcanisate physical properties.

Monsanto developed thioamide and thioamine type retarders and in 1970, introduced cyclohexylthiophthalimide (CTP) as an efficient retarder.

With the advent of compounds containing divalent sulphur linked to nitrogen as retarder, the rubber compounder gained a new dimension in compounding for maximum productivity. Cyclohexylthiophalimide improved the processing safety and green stock storage stability of activated system without altering cure rate and physical properties. Presently, CTP is not manufactured in the country and entire rubber industry demand in India is met by imports.

A product gap existed for Indian Rubber Industry and this was realised several years back. The matching R&D efforts which were deployed by ACCI have led to the developmenf of a process entirely by local R&D effort and the product has been launched for the industry.

Antioxidants

Unlike the usage of rubber accelerators and retarders which is much the same in India as in the rest of the World, the requirements of rubber antioxidants are quite distinct and different in certain important aspects from the practice elsewhere. The reasons for this are many but the important ones are summarised below:

i) high ratio of natural to synthetic rubber usage
ii) high ratio of truck to car tyres
iii) types of tyre cord used
iv) climatic conditions
v) health and environmental considerations

Rubb Board bull. 19, No. 2

CHEMICALS FOR RUBBER INDUSTRY

PS BHARGAVA & SK KAPOOR

Rubber chemicals play an important role in rubber processing. The estimated requirement of rubber chemicals in 1990 would be about 14,200 tonnes. The Industry is now concerned with the production of homogenous products.

Rubber chemicals are defined as substances principally organic for the purpose of vulcanisation, regulating the rate of vulcanisation, facilitating the fabrication of the product and improving its quality and its stability in service.

This paper briefly discusses the various types of chemicals used in the Rubber Industry and attempts to analyse the role of accelerators of vulcanisation, retraders, antioxidants and peptisers in the context of emerging opportunity for rubber chemicals. The authors are from the Application Research & Development (Rubber Chemicals) Division of the ACCI, Rishra, Hooghly, West Bengal.

The Indian Rubber Industry has grown steadily throughout the past decade with polymer consumption rising at around 6% per annum. The costs of raw materials based on petrochemicals would continue to escalate but the trend of polymer consumption in India at an annual rate of 5 to 6% is likely to continue in the present decade. Rubber consumption in India in 1981 had been around 200,000 tonnes and projections for 1985 and 1990 are 282,000 and 405,000 tonnes respectively. Rubber chemicals play an important role in rubber processing and based on past trend of 3.4% (w/w) of rubber chemicals usage in India the requirement of rubber chemicals for 1985 and 1990 would be about 9,900 and 14,200 tonnes respectively.

The rubber industry is concerned with the production of homogeneous products with appropriate physical properties by compounding rubber with ingredients, including cross-linking agents, followed by processing, moulding and introduction of chemical bonds. Chemicals used in the rubber industry can be broadly classified as:-

i) Accelerators
ii) Retarders
iii) Antioxidants
iv) Peptisers
v) Fillers
vi) Auxiliary chemicals

For the purposes of this discussion,rubber chemicals are defined as substances principally organic, used in the compounding of rubber for the purpose of effecting vulcanisation, regulating the rate of vulcanisation, facilitating the fabrication of the product and improving its quality and its stability in service. The following discussion considers accelerators of vulcanisation, retarders, antioxidants and peptisers.

Accelerators of Vulcanisation

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i) high ratio of natural to synthetic rubber usage
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iii) types of tyre cord used
iv) climatic conditions
v) health and environmental considerations

vi) implications of 'imported' tyre technology
vii) user practices.

Quite independent of the emergence of the specialised antioxidant requirements of the Indian Rubber Industry, the World antioxidant market has undergone drastic changes over the past decade. The main feature of this change had been not so much the emergence of new products but the loss in importance of long established antioxidants. These include phynyl naphthylamines, dinaphthyl paraphenylene diamine, diphenyl ethylenediamines, aldehyde amine condensates, phenolics, alkyl and alkoxyaniline/acetone condensates etc. This has hit the rubber chemical manufacturing indusry. This meant loss of business in established and profitable products but also the loss of opportunity to recoup the high cost of developing several 'new' products. For all practical purposes the rubber industry is now left with paraphenylenodiamine derivatives, DPA-acetone and aniline-acetone condensates as the main bulk type staining antioxidants. Only fewphenolic antioxidants have survived the change, but are struggling due to other reasons.

The important need in India is for the most effective antioxidants regardless of the fact whether or not they are also good antiozonants. This requirement is readily met by IPPD and 6 PPD (ZA and SC). They are, of course, very effective antiozonants too and thus come close to being a universal type of antioxidant.

Although Z/ZC are the most important antioxidants for rubber, they are also having undesirable side effects. They have a tendency to bloom, and to disappear from rubber in a relatively short time under extreme high temperature service conditions. For this reason, they are often used in conjunction with other antioxidants to get a better technical and economic effect, e. g. Wingstay 100 and N,N-diphenyl paraphenylenediamine (D PD), DPA-acetone condensates and aniline-acetone condensates. Ideally, a rubber compounder would like to have an antioxidant with very low volatility, minimum migration and minimum loss by leaching out process. Recent advances indicate the direction where antioxidants can be grafted on to polymer back-bone or to use chemical of high molecular weight from natural resource having antioxidant properties. It would be worthwhile for the scientists engaged in natural product chemistry to screen and isolate effective antioxidant systems from natural products. Possibilities of phenolic derivatives of natural source as antioxidants are under evaluation in several laboratories.

Peptisers

The thermo-oxidative breakdown of rubber can be catalysed by chemicals. Such catalysts are known as peptising agents or peptisers. Due to the rocketing cost of energy, the peptisers have become very important and are likely to remain so for a long time, especially where natural rubber is used. There is thus a good market potential for an effective peptiser. Surprisingly, only a few rubber chemicals manufacturers market peptisers. Bayer introduced in rubber industry Renacit 7, a good peptiser based on pentachlorothiophenol with an activator. In India, ACCI has established manufacturing capacity starting from basic raw materials and market pentachlorothiophenol based peptiser called 'Accimel'.

In this area, there is a need to develop more efficient peptisers capable of carrying out therooxidative breakdown of the rubber at lower temperature. This relates to an indepth systematic study of the various electron transporting agents which would perform the task of breakdown of higher molecular weight rubber.

Conclusion

It is evident from the above presentation that tremendous opportunities still exist in the area of rubber chemicals. These will stem from the development of new technology to serve the industry. Emphasis must now be focussed on the creation of new products, the development of more efficient manufacturing processes and improvements in the physical forms of existing products. Rubber chemicals suppliers would need to focus on new products to help rubber manufacturers maintain/improve the quality of the rubber goods produced and on new processes to help conserve energy, control waste and improve productivity. □

RUBBER PLANTATION DEVELOPMENT SCHEME

The Rubber Board is implementing an integrated Scheme which offers a package of incentives and assistance for large scale development of rubber plantations. Applications are invited from growers who intend to carry out newplanting/replanting under the Scheme during 1984. Applications in the prescribed form should be forwarded in duplicate to the Deputy Development Officers in charge of the Board's Regional Offices serving the area where planting is proposed to be done. Application forms and leaflets can be had free of cost from the Board's Regional Offices, on request.

The last date for receipt of applications is 31st May, 1984. Only those who intend to undertake planting during the current year need apply now.

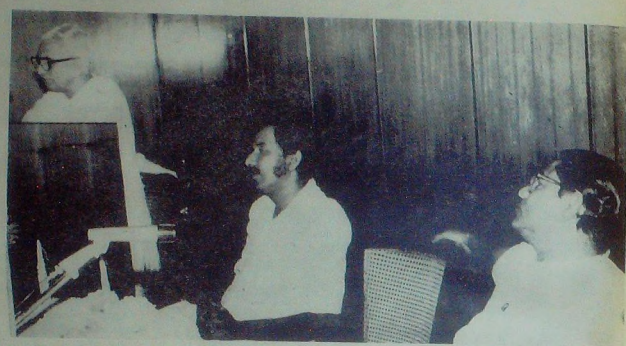
NEWS IN PICTURES

SUB-SOIL WATER INJECTOR
A NEW DEVICE FOR IRRIGATION

A new mechanical device for injecting water in the sub-soil has been developed by a group of youngsters at Coimbatore. The Injector consists of a knapsac plastic carboy the capacity of which is 18 litres. The carboy releases water to the sub-soil through an aluminium cylinder the pedal of which can be operated by leg. The tubular needle of the cylinder consists of 6 holes which is to be pressed deep in the soil. Thus the water spreads through the holes to the sub-soil.

By this process, optimum quantity of water is made available for irrigation depending upon the soil moisture, age and requirement of different crops. The loss of water by surface evaporation from soil is also minimised.

Soluble fertilizers could also be applied in the water to be used for irrigation. The injector costs about Rs. 540/- and it is intended for irrigating young rubber plants during summer season.



To implement the new endeavour of the Rubber Board to promote small-scale and largely home based industries, a training and demonstration centre for products was inaugurated by the Chief Minister Shri K Karunakaran in October 1983. Shri Oommen Chandy MLA and Sri PJ Thomas, Chairman are also seen.

A view of the participants at the inaugural session.

RECEPTION TO THE CHAIRMAN RUBBER BOARD

A warm reception was accorded to Shri PJ Thomas, Chairman Rubber Board by the Cochin Malabar Estates and Industries. The Chief Executive, Shri K Rama Menon presided.

A team of rubber growers led by Shri VJ Sebastian Ex MLA visited RRII under the Sasthradarsan programme. Shri V Bhaskara Pillai, Secretary, Rubber Board and Shri PN Radhakrishna Pillai, Jt. Director of Research are seen in the picture.

The Chairman, Rubber Board is inaugurating the Rubber Seminar organised by the Akhila Kerala Balajana Sakhyam at Karukachal.

The participants at the Rubber Seminar.

NEWS AND NOTES

RUBBER SEMINAR AT GOA

A seminar on rubber cultivation was held at Ponda (Goa) on 27th January, 1984. The seminar was inaugurated by the Honourable Chief Minister of Goa Shri.Prathap Singh Rane. About 80 participants attended the seminar. They included existing and prospective rubber growers and government and bank officials. S/S M.G. Jagadish Das, M. J. Henry, K. M. Philipose, K. M. Devanna and Dr. V. Haridasan of the Rubber Board spoke at length on various aspects of rubber cultivation and processing. Mr. Roy Antao, a progressive rubber planter of Goa, spoke of his experience in rubber planting. The seminar could generate considerable enthusiasm among the participants. A number of industrialists who propose to take up rubber planting were among the participants of the seminar.

EARTHQUAKE BEARINGS ARE AMONG PROJECTS SHOWING SUCCESS

The practical use of natural rubber bearings to protect buildings from earthquake damage is the most exciting application to be developed' by the Malaysian Rubber Producers' Research Association (MRPRA) since 1962 'one which may outrank all others as a contribution to the safety of mankind.' That is the view expressed by Dr. Leonard Mullins, retiring MRPRA director of research, in the Association's Annual Report for 1982. Full-sized commercially-manufactured natural rubber bearings to protect buildings from earthquake damage have been shown te conform to the behaviour predicted from earlier laboratory studies. Serious consideration is currently being given in California to the use of this base isolation system, both in the construction of a major new civic center, and to bring an

existing historic building up to modern safety standards.

This project demonstrates the strength of MRPRA in its ability to apply fundamental research to practical needs. Beginning with the established use of steel-laminated natural rubber bearings in bridges and anti-vibration mountings for buildings, and applying first theoretical and then experimental research programmes, the concept was established- Collaboration with other organisations enabled more powerful techniques and more extensive technological facilities to be used. The reputaton derived from over forty years of scientific achievement has enabled the results and their interpretation to be presented authoritatively to consultants and legisiators to pave the way for innovation.

JAPAN FIGHTS TO RATIONALISE PETROCHEMICALS

European petrochemical producers—who are still struggling to achieve a much-needed rationalisation of their own beleagured industry—can at last comfort themselves with the thought that they are not alone. For, despite its formidable reputation as an industrial powerhouse, Japan faces a similar problem: how to rescue a group of 10to12 materials processing industries which grew rapidly during the 1960s and early 1970s but became hopelessly uncompetitive in the era of high oil prices. The fundamental problem the petrochemical manufacturers face in the same as that of their opposite numbers in Europe.Both industries use naptha as their basic feedstock, unlike the newer petrochemical industries of Canada and the U. S. which use ethane, the feedstock based on natural gas. Both the European and Japanese industries have suffered from the gap which has opened during the past decade between the world market price for naptha and that for ethane.

Being a naptha, rather than an ethane-based industry, however, is not enough to explain all the woes that Japanese petrochemical manufacturers have experienced during the past three years. The industry has borne the additional burden of having to pay a premium for its naptha over world market prices as a result of the Japanese Government's policy of protecting the "stategic" oil refining industry, many of whose members, ironically, are engaged in protrochemical manufacturing as well. Finally, Japanese petrochemical companies tend to be small and numerous, rather than few and powerful, with the result that price cutting within the industry is endemic.

The counter-measures which the manufacturers have taken during the past year to cope with the crisis have included a nine-month "production cartel" under which the entire industry is cutting back its ethylene output, with the approval of Japan's Fair Trade Commission. In addition, under a complex deal agreed by the Ministry of International Trade and Industry, there has been a marginal reduction in the price at which naptha is bought from the oil refining industry. With the aid of these two props the industry should be able to scrape through 1983 with losses slightly less than last year's and without any major company going bankrupt. Beyond that, survival will depend on the success of an ambitious restructuring programme worked out by Miti. The Miti plan proposes a drastic cut of 36 per cent (2.93m tonnes) over the next two years in Japan's ethylene annual production capacity and a roughly similar scrapping of facilities for most of the main derivatives,including a 22 per cent cut in annual polyolefin production. The plan also provides for "production consolidation" within the different sectors of the industry under which companies might agree to "swap" their individual capacity scrapping obligations.

U. S. CAR INDUSTRY STEPS UP PRODUCTION

The U.S. car industry is stepping up production targets for the rest of this year after an unexpected surge in demand since June. Sales have risen this year by around 17.5 per cent or 613,000 units to mid-August, but the bulk of the increase has come in the last three months, as figures have been running about 60 per cent ahead of a year ago. The demand has been met partly by running down stocks, now on an extremely low supply rate of 53 days against a normal 60-65. But both General Motors and Ford Motor, the U. S.'s two largest motor groups, have been unable to increase production swiftly enough and are now planning significant increases in the last quarter. Part of the production problem over the past few weeks has come from bottlenecks in the components industry. GM in particular has complained about difficulties with suppliers. Low quality and a high rate of component rejections is reckoned to have cost the group around 40,000 units on its proposed August schedule. Although official figures have not yet been released for early August, GM and

(continued from page 4)

skim latex is concentrated four-fold to d.r.c. of approximately 20%, prior to coagulation was reported by Menon and Selvaraj of Socfin Co.Bbd., Kuala Lumpur. This leads to better final product and also enables the rubber to be processed in the same manner as the other block rubber grades using high temperature dryers, Further, the reduction in the usage of spent sulphuric acid by 80% was expected to improve the treatability of effluent from latex concentrate factories. Abednego from Research Institute for Estate crops, Bogor, Indonesia dealt with advantages of self prepared copper cleate as another substitute peptiser for dirt content determination of every grade of Indonesian crumb rubber. The basic chemicals of copper cleate were obtained easily and cheaply. It was aslo easy to prepare and was effective. The present status of plantation effluent utilisation in Malaysia was dealt by Yew of Oil Palm Research Station and Ahmad Kamal, of Malasian Oil Palm Growers' Council. Their paper examined the various contemporary technology made available to the industry after years of trials and evaluation. Ahmed Ibrahim gave an account of anaerobic digestion using an upflow anaerobic filter recognised as a comparatively more efficient process for treatment of rubber processing waste water. His paper evaluated such filters in the laboratory and demonstrated the advantages and implications of the process for treatment of rubber processing waste water. Potential benefits included reduction in land area requirement and indirect operating cost savings for factories currently employing the oxidation ditch system.

The Panel Discussion focussed on the need for mechanisation in the Natural Rubber Industry to increase productivity of land and labour. One positive step in this direction is highlighted related to the development of the mechanised tapping knife unveiled by the Minister for Primary Industries and presented to representatives of the industries on the first day of the Conference. (Brief report on tapping knife published elsewhere) □

Ford appear to have suffered a loss in market share because of these output shortages. Chrysler and American Motors, the group now controlled by Renault of France, have gained at their expense. Industry analysis expect GM and Ford to hit back in the final quarter when they raise their original production targets by about 4 per cent. The industry as a whole is now aiming for total October-December output of about 1.9m units, an increase of 61 per cent on a year ago.Chrysler is aiming to create additional car and truck capacity of around 700,000 units over the next 12 months through the use of the plant at Sterling Heights,Michigan recently acquired from Volkswagen and refurbishment elsewhere.Sales in the year ended July totalled 1.18m.

RESCHEDULING OF PUBLIC SECTOR PROJECTS

The Malaysian government is expected shortly to decide on a major rescheduling of public sector development projects in a bid to reduce the continuing severe strain on its finances. The exercise, the outcome of which will determine the shape and content of the 1984 budget to be announced in October, is causing much heart-searching for Government Ministers. But it has become clear that last year's painful decision to abandon the Government's Keynesian-style attempt spend its way out of recession has proved insufficient. Officials refuse to say which projects are at risk, but the review is likely to include ones on which work has already begun as well as those under negotiation or planned. Two projects deferred are a $1.8bn (£1.2bn) oil refinery in Malacca and a $700m military air base in Kelantan State facing Communist Vietnam. On a brighter note, unexpectedly firm prices for palm oil and a much improved outlook for rubber have helped turn the merchandise trade balance back in the black. The deficits of M$1.4bn (£ 440m) last year and M$29m in 1981 were the first in the country's post-independence history. However, Malaysia's 1983 current account deficit seems likely to be little better than the M$67bn forecast last year, and there is growing concern at the level of foreign borrowing which has resulted in a ballooning of outstanding foreign debt from M$4.8bn in 1980 to an estimated M$11.8bn in 1982. The rescheduling exercise now under way is aimed at reducing development expenditure, the key component of the government's overall budget deficit.Like the current account deficit, this has soared from M$8.5bn in 1980 to about M$15bn for each of the past two years.

MALAYSIA TOP RUBBER PRODUCER

Malaysia continues to be the top rubber producer in the World. She is confident of maintaining its position as the world's top rubber producer, supplying 45 per cent of world needs, said Prime Minister Mhatir Mohammad responding to Indonesian claims that it intends to become the top rubber producer. □

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Cover: KP Sreeranganathan

THE RUBBER BOARD
KOTTAYAM 686 001 INDIA

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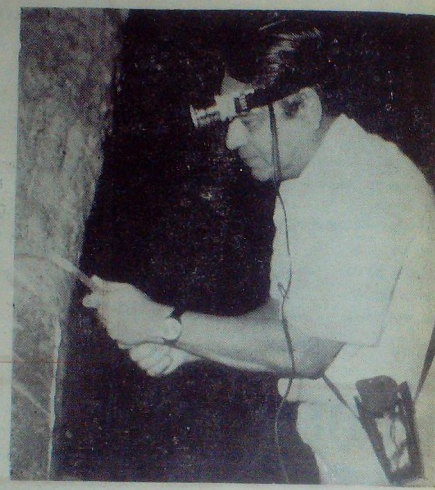
THE QUARTER

The National Rubber Conference organised by the Indian Rubber Growers Association at Kottayam on 4th February 1984 could go a long way in identifying the problems of the Rubber Plantation Industry in India. The pricing policy, spraying subsidy, income tax on subsidy, capital gains tax, monopoly purchase of rubber, import policy and rubber market were some of the items subjected to detailed discussions. Synthetic rubber was described as a threat looming large over the horizon. To substantiate this, the sponsors clarified that the country would have surplus rubber in about three or four years time. The papers presented at the conference invariably upheld the relative ideas which covered all the aspects in terms of increasing productivity of the existing holdings. We are now publishing a few selected papers presented at the conference. The views expressed by the authors are not necessarily those of the Rubber Board.

New 'Head Light' For Tapping Rubber Trees Early Morning

It is well known that rubber trees tend to yield 15-20% more latex if tapped before day break. This is because the turgour pressure in the cells of plants reaches its climax in the small hours of the day, as transpiration is arrested when sun sets. Therefore if the rubber trees are tapped before the day dawns, there will be accelerated flow of latex in a bid to release the pressure accumulated in the plant cells since sun set.

But this is not being practised widely now as tapping cannot be done in the dark. To tide over this situation, a battery operated 'Head light' has been developed by Shri Jose Abraham, Physics Lecturer of Newman College at Thodupuzha in Kerala. The 'Head light' which is more of an adaptation of the Hunter's light, draws energy from a 'NICKEL-CADMIUM' battery made abroad. The Head light can be fixed to the fore-head of the tapper with the help of an elastic tape and the battery wrapped in a rexin bag hung to his shoulder. The battery is rechargeable by plugging its cord to the sockets (220 volts) available with the power connection in households. With a continuous charge of 8 hours, the battery can be used to energise the lamp for 7-8 hours at a stretch.



The Chairman Rubber Board, Shri PJ Thomas is trying to tap rubber tree using the Head light.

After a day's operation, it is advisable to plug the battery for recharging.

Besides increase in crop without extra inputs, tapping before dawn provides more leisure hours to workers which they could gainfully utilise for engaging in other remunerative jobs as well. In addition, tapping before day break reduces exhaustion of workers.

This head light is now priced Rs. 250/- including cost of the battery. Shri Jose Abraham is trying his best to bring down the cost by introducing further alterations to the device. But the cost of the battery is the major component that hikes the price of the light. This could be solved effectively, only if he is able to import the battery direct. Even the present cost of this device would not appear to be very high as the total investment could be recouped by the users with the proceeds from the extra crop realised within a period of 3 to 4 weeks.

Early tapping of rubber has to emerge as a routine estate practice as it will enable to increase domestic production of rubber by 10-15%. Besides increasing the return for farmers, this will help to reduce the quantum of rubber imports proportionately.

— PK NARAYANAN.

Putting Down Roots

Before stabilization with vegetation, the banks of Johnson Creek in northern Mississippi were ready to collapse, destroying valuable adjacent farmland.

Engineers are evaluating a variety of grasses, shrubs and trees, both alone and in combination with structural materials, to determine the best ways of establishing and maintaining plants for effective erosion control on streambanks.

"Bank erosion has reached acute stages in many sections of the country," says Andrew J. Bowie, a hydraulic engineer at the ARS Sedimentation Laboratory, Oxford, Miss. He estimates that the 300,000 miles of eroding streambanks in the United States produce approximately 500 million tons of sediment each year.

Effective structural streambank protection has been costly to install and maintain. In a report to the Secretary of the Army by the Chief Engineers, it was estimated preventive treatement for 148,000 miles of seriously eroding streambanks would cost about $420 million a year. This indicates that treatment of many areas suffering damage cannot be economically justified unless the newer, more effective methods under study are initiated.

"Practical criteria are urgently needed by conservationists and engineers so they can effectively incorporate vegetative erosion control measures as integral parts of channel planning design," Bowie says.

"Our research will determine, first, the maximum flow velocities that various plants can withstand along the bank boundary, with different soil types and degrees of bank slope; second, the vegetative and structural designs that are most economically effective in terms of durability and initial cost; and third, the establishment and maintenance requirements for controlling growth and stream encroachment.

"Preliminary studies for the northern Mississippi area indicate that native species of both grassy and woody plants are preferable to imported varieties," Bowie says. "Sprigging is better than seeding for crown vetch and ivies. Good stands of most grasses are obtained by seeding. Native black willow *(Salix nigra)* appears to be superior to the hybrid varieties of willow in both survival and growth. River birch *(Betula nigra)* shows some potential when planted under the right environment. The shrubs, indigo bush and bristly locust, also respond quite well," he says.

Studies are continuing for a more complete evaluation of the vegetative treatments. A more detailed report of plant establishment will be possible after one or two more growing seasons, but an evaluation of survival rates and erosion control effectiveness will require even more time. No stabilization program, regardless of how well designed, will remain effective, however, without maintenance, Bowie stresses.

Structures installed in conjunction with vegetative plantings may deteriorate in time or become ineffective because of changes in physical characteristics of the stream. Plant cover is subject to change from destructive physical forces and through natural laws of plant succession. Too much plant growth can reduce channel capacity.

Periodic onsite appraisal of the channel condition is necessary

Hydraulic engineer Andrew J. Bowie inspects the same stretch of creek after vegetation and rocks were used to stabilize the banks.

to detect possible weak points and to schedule maintenance and repairs before potential problems reach the acute stage. Determination of an effective maintenance program is necessary to prolong the useful life of stabilization measures and safeguard banks against possible erosion in the future.

Andrew J. Bowie is located at the USDA Sedimentation Laboratory, P. O. Box 1157, Oxford, Miss. 33655. (By Neal Duncan, New Orleans, La.) (Reproduced from Agricultural Research) □

OPTIMISE RUBBER YIELDS AND MAXIMISE PROFITS

In view of the new findings and developments, correct agro-management planning and discriminate inputs have assumed great importance. The current economic recession has underlined the need for greater cost consciousness and thus a very careful approach towards plantation expenditure and management input has become the order of the day. An article published recently in Planters' Bulletin, entitled "Management of soils under *Hevea* in Peninsular Malaysia" summerises the latest findings on discriminate agromanagement in accordance to soils. To optimise rubber yields and maximise the profits, implementation of management practices are essential. The recommendations on general management practices summerised in the article are reproduced below:-

Establishment of a good creeping legume cover in the immature phase of rubber and the maintenance of a light cover during maturity.

Mulching around the base of young rubber trees or allowing legume covers to creep to the base of the trees and spraying out periodically to ensure mulching effect.

Ploughing of soil on steep slopes must be along contours.

Mechanical cultivation must be carried out at the proper moisture content.

Terracing or digging of silt pits on steep slopes to be encouraged.

For serious physical limitations caused by shallow soils, trees with a light crown to be grown.

Split application of fertilisers on sandy soils.

Effective control of soil erosion.

Proper drainage of waterlogged soils or soils with high water-table.

What is a Computer and how does it work?

Computer does the calculations at a very high speed helping the scientists to carry out the work more rapidly. A computer is a device capable of solving problems by accepting instructions, data, processing data and generating results of the processed data. The article follows gives an idea of the computer and its functioning.

G Mohanachandran

Introduction

A computer is an electronic device capable to receive instructions and data and process the data according to the instructions. at a very high speed. To day for doing scientific research innumerable calculations have to be done speedily without sacrificing accuracy. The human brain is incapable of accomplishing these much calculations at higher speed. Computer does the calculations at a very high speed helping the scientist to carry out the work more rapidly.

The efficient and creditable running of the huge establishments like industry call for judicious and timely decision making by the management after periodical appraisal of the working of the concerns. But the outmoded and conventional clerical system fails to give accurate and timely information to the management for taking vital decisions on various matters concerning the organisation. This encouraged the management to look for some other alternative. The answer was electronic data processing equipment.

Most of the developed countries are making use of the computer to meet some of their social needs. The schools and colleges for students of various calibre are making use of the computer. In hospital, computer is used in diagnosis and patients care. Thus computer has become indispensable in day today life of the people of advanced countries. Computers are today, being used for a wide range of commercial, scientific engineering and other applications in India as well.

Types of Computers

A Computer is basically a calculating machine capable of performing the operations of Additions, Subtraction, Multiplication and Division. It can store the data and make use of it at a later stage. It can perform billions of computations in a few minutes. It can give intellectual results as a human brain.

There are two types of computers analog and digital. The analog computer does not compute directly with numbers' it measures; continuous physical magnitude(eg; pressure, temperature voltage, speed etc.) it is used for scientific and engineering applications because they deal with quantities that are continuously variable. The digital computer on the other hand, operates by counting numbers. These are more accurate than the analog computer since there is no analogous representation. This computer is best suited for business as well as scientific and engineering applications. The digital computers can be further divided in to two viz. Special purpose computers and general purpose computers. A special purpose computer is designed to solve a specific type or class of problems. A general purpose computer is one that has the ability to perform a variety of operations. It can store different programs. So the most commonly used computer is the general purpose digital computer.

Organisation and Working of a Computer

The study on the computer can be broadly divided in to two.

a) Study of the hard-ware features ie study of the mechanical and electrical components of the computer.

b) Study of the soft ware features ie study of the computer programs.

A computer system is a combination of different units such as input unit, central processing unit and output unit.
(See fig. 1)

A computer is a device capable of solving problems by accepting instructions, data, processing data and generating results of the processed data. A computer processes the data through the input devices such as card reader, tape unit, disc unit, etc. and directs the results of the processing to other destinations may be the printer, card punch, paper tape, magnetic tape unit or disc unit. The input unit directs the programmed instructions to the processor. Since the computer is not

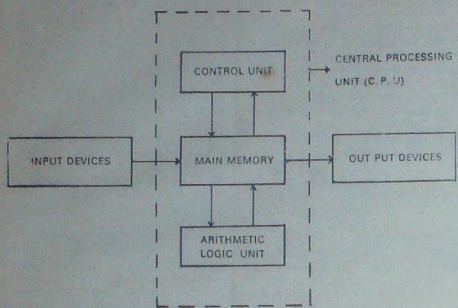


Fig. 1 Organisation of a Computer

capable of accepting information from type written documents it is necessary to convert the information into one of the input media like card, tape or disc. For eg. punched card is the medium used in a computer which has got card reader as the input unit.

The central processing unit (C. P. U.) is the central part of the computer system. The C.P.U. is divided in to three functional element Viz. Storage unit (memory Unit) the arithmetic and logic unit and the control unit. This unit receives data and instructions from the input unit. The storage Capacity must be enough to retain a usable amount of data and necessary instruction for processing. When we say that the storage capacity of a computer is 2000 (2k), it means that the computer can store to a maximum of 2000 characters at a time.There are computers which can have storage capacity of billions of characters. The arithmetic and logic unit performs operations such as addition, subtraction, multiplication, division, shifting, transfering comparing and storing. More over it has got ability to test various conditions, that come across during processing and to take appropriate actions. The control unit controls and supervises the execution of the program instructions stored in the storage unit. The input, output, and C.P.U units work is being Co-ordinated by this unit and there by makes the entire computer system to function as one multipurpose machine.

The most commonly used output devices are printer, punch unit, magnetic tape unit and disc unit. Any or all of these can be used in a computer. The media used in these units are paper, card, magnetic tape and disc respectively. If the results of the processed data to be got in readable form, there the unit in use is the printer. All other output devices can be used to store the result for further processing.

The computer should be told specifically what it should do in respect of each job. In other words it needs to be instructed. Thus instructions should precede data. The instructions read in to the computer will be stored and held until the processing for the job is completed. It is therefore called stored program. Preparation of the output format in the first step is the preparation of the program for a job. The result of the job should give all necessary details required by the user department and also in the required format. On this basis the spacing chart is made cut incorporating the headings and other details which will be the specimen of the actual report to be produced on the computer. A systematic analysis of the original data is to be done to make sure that the data gives all the information required to prepare a statement on the computer as indicated in the specimen made out. As the computer blindly deals with the data it receives, it is imperative to see that the data is perfect in all respect. If the data is defective the result achieved from the computer also will be defective.

Flow Charts & Computer Program

A program flow chart depicts in a pictorial form the sequence in which the conditions are to be tested and calculations performed for solving a problem on a computer for iterative calculations,which are common in numerical analysis flow charts are more useful. The most important use of the program flow chart is to provide the programmer with a means of Visualising during the development stages of the program, the sequence in which the operations should take place and relationship of one portion of the program with that of the another.

A program is a series of instructions for a specific job. As the computer does not accepts instructions written in any language other than the machine language the instructions has to be developed in that language itself. The task of preparing a machine language instruction for solving problems is extremely tedious. This is in part due to the need of extensive book keeping by the programmer on memory allocations for data and instructions Further machine language instructions being a set of numbers bears no resemblance to English or any other natural language and consequently taxes the memory of the programmer. Now a days it is not necessary to write all programs in machine language. Most professional programmers write in one of the programming languages called higher level languages.

The instructions used in these languages are easy to learn and resembles ordinary arithmetics, algebraic and english language statements.

A program written in a programming language is called a source program and is translated into a machine language program called object program. The translating program is called a compiler. The compiler analyses each statement in the source program and generates a sequence of machine instructions which, when executed, will precisely carry out the computation specified in the statement. The most commonly used languages are

(1) FORTRAN (Formulae translation) which is used in computers which are put to higher mathematical calculations especially for scientific purposes.
(2) COBOL (Common Business Oriented Language) which is used for the solution of business problems and is often called an "English Language" language.
(3) BASIC (Beginners All Purpose Symbolic Instruction Code) which is mainly used for scientific or mathematical applications. Because of its simplicity it is now a days used in many business applications.
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Main frame computer, Mini computer and Micro computers

The third generation of computers was introduced in 1964 by IBM with its 360 line of computers, which used integrated circuits in the hardware. It also has the provision of facilities for time sharing and multi programming. Due to the integrated circuitry, these computers were much faster. A Mini computer does the same job that the large computer can do but it cann't do so many jobs so fast. Micro computers are very small computers low in price and consisting of only a few large scale Integrated circuit (LSIC) packages.

Typical Micro Computer Installation

A typical micro computer installation may consist of a visual display unit which has a key board and a CRT screen with 22×80 characters, a double floppy disc drive microprocessor memory and a dot matrix printer (80/132 column 150-300 character/sec printer) A slightly bigger installation may have an additional line printer (300-1200 lines/minute, tape drive, 7/9 track, 800/1600 bytes/inch tape) and a hard disc drive.

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    READ, K
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    J = 1
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20  READ, A
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    J  J + 1
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    PRINT, BIG
    STOP
    END
```

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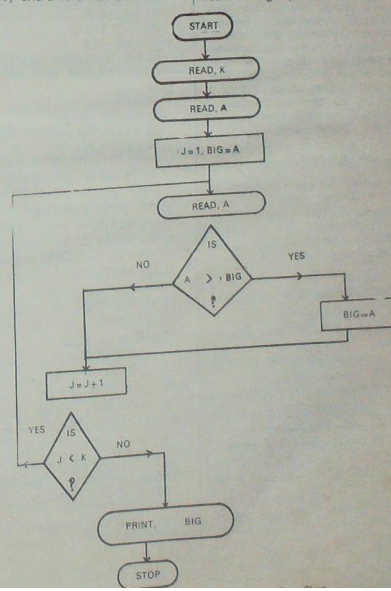

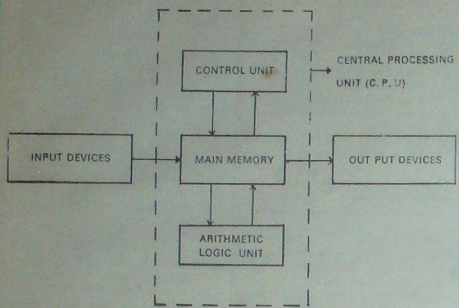

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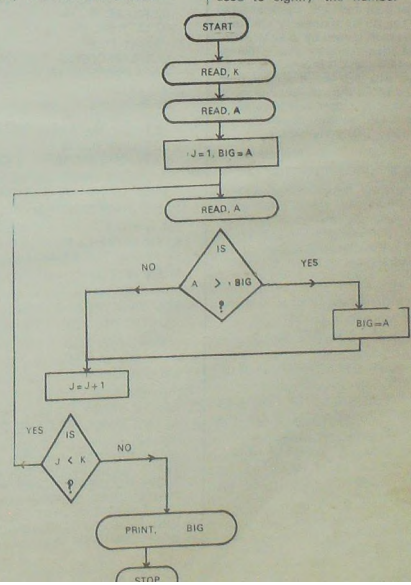

items to be compared. The first READ statement reads the value of K. The first number is read next and stored in a variable BIG which is used in the program to store the current largest number (the first number read is the current biggest number) A variable J is used to count the number of items read and is initially is given a value as the first item has been read. The next instruction READ A reads the number from the second data card in to A replacing the previous value read (which has been stored in BIG). The number in A is now compared with BIG and if it is larger it replaces BIG. Else the previous value of BIG is retained. The variable J is increased by 1 to indicate that the second data has been read. It is then compared with K to check if all data items have been compared. In the problem if K = 3 J = 2 is less than 3 control will be transfered to the READ statement. The third data card is read by this statement and this replaces the previous contents of A.A is now compared with BIG and the larger one goes in to BIG. The variable J is incremented by 1 and as it becomes 3 (as K = 3) control passes to the PRINT, BIG statement.

A simple computer program using BASIC language

Example. 2

For calculating the roots of the quadratic equation

$$aX^2 + bX + C = 0$$

for different values of a, b and c. The roots are given as

$$X = (-b \pm \sqrt{(b^2 - 4ac)}\ 2a.$$

The required program is given below:-

```
C   10 REM TO FIND ROOTS OF
C          QUADRATIC EQUATION
    20 INPUT A, B, C
    30 LET D = SQR(B*B-4.0AC)
    40 LET R1 = (-B+D)/(2. * A)
    50 LET R2  (-B-D)/(2. * A)
    60 PRINT A, B, C, R1, R2
    70 GO TO 20
    80 END
```

A Computer Program to Print out the addresses of Employees of an organisation using COBOL Language

Example. 3

```
IDENTIFICATION DIVISION
PROGRAM-ID ADDRES.
AUTHOR. MOHAN.
ENVIRONMENT DIVISION.
CONFIGURATION SECTION.
SOURCE-COMPUTER. IBM 360.
OBJECT-COMPUTER. IBM 360.
INPUT -OUTPUT SECTION.
FILE -CONTROL.
        SELECT CARD -FILE ASSIGN TO CDR
        SELECT PRINT - FILE ASSIGN TO LPT.
DATA DIVISION.
FILE SECTION.
FD CARD FILE.
  LABEL RECORDS ARE OMITTED.
  DATA RECORD IS C-REC.
01 C-REC.
  02 NAME PIC IS X (20)
  02 FILLIER PIC IS X
  02 HOUSE PIC IS X (30)
  02 FILLER PIC IS X
  02 CITY PIC IS X (20)
FD PRINT FILE
  LABEL RECORDS ARE OMITTED
  DATA RECORD IS P-REC.
01 P-REC.
  02 P-NAME PIC IS X (20)
  02 FILLER PIC IS X ( 5)
  02 P-HOUSE PIC IS X (30)
  02 FILLER PIC IS X ( 5)
  02 P-CITY PIC IS X (20)
  WORKING-STORAGE SECTION
  END-OF-DATA - INDICATOR PIC IS X X X
PROCEDURE DIVISION.
MAIN PARA.
OPEN INPUT CARD FILE
     OUT PUT PRINT FILE
MOVE NO TO END-OF-DATA-INDICATOR.
PERFORM PARA-1
PERFORM PARA-2
  UNTIL END-OF - DATA -INDICATOR IS YES
CLOSE CARD FILE
      PRINT FILE
STOP RUN.
PARA-1
  READ C-REC
  AT END MOVE YES TO END-OF-DATA-INDICATOR.
PARA-2
  MOVE NAME TO P-NAME
  WRITE NAME BEFORE ADVANCING 1 LINE
  MOVE HOUSE TO P-HOUSE
  WRITE HOUSE BEFORE ADVANCING 1 LINE
  MOVE CITY TO P-CITY
  WRITE CITY BEFORE ADVANCING 1 LINE
  PERFORM PARA-1
```

Conclusion

It will not be an exaggeration if one says that the future of the computer science is not only greater than we suppose, but greater than we can suppose. They will bring great changes in the various activities of the human race. The knotty problems in agriculture, industry, research and in all other areas, where men's ingenuity is working, will find solutions with the aid of this powerful equipment. There will be changes for better in the working of the future computers also. The computer will read or respond to program instructions in the spoken language. This will be a great leap forward since the difficult software development will be made easier.

It is estimated that there are about 600 to 800 main frame computers and around 2000 micro computers (which was introduced in 1980) in India.

Some of the computer manufacturing groups in India

1.	Electronic Corporatin of India Limited, Hyderabad	Micro 78, TDC 12, 312 316, system 332
2.	Bharat Electronics Limited, Bangalore	Mini Computer Peripherals
3.	Hindustan Computers, Delhi	8C, system 4
4.	I C I M, Bombay	2904, S-101
5.	D C M Data Products, Delhi	Spectrum-7, Galary 9, 11, 21, Micro 1121
6.	O R G, Baroda	2001,80
7.	Nelco, Bombay	4000, 8000
8.	P S I, Bangalore	Action Station, Omni, Data Wealth
9.	M M C, Bangalore	M M C 201, 401
10.	I D M, Bombay	I D M-30
11.	WIPRO, Bombay	86 Series
12.	B P L, Bangalore	I D B-8
13.	Zenith Computers Limited, Bombay	ORION 8000
14.	Uptron, Lucknow	S-800
15.	HINDITRON Computers, Bombay	HINDITRON Computer Systems

□

SURVEY PREDICTS SHORTFALL IN EUROPEAN MADE BUTADIENE

European-made butadiene supply will decline 100,000 metric tons annually through 1985 as producers shift to lighter fuels to make the material according to the 21st edition of "World Butadiene Survey." European producers are shifting to ethane from the North Sea to make butadiene, much of which is used for synthetic rubber production. Those producers made twice the amount of butadiene in 1982 as did U.S. based producers and the U. S. imported 350,000 tons of the European product, according to Ericsson Chemical Services Inc., publisher of the survey. A look at supply and demand of the material also takes into account the following factors:

—improved tyre wear has reduced the replacement tyre demand, and

—how an improving world economy might trigger a tight or short supply/demand situtation for the chemical

Ericsson said the survey offers detailed statistics on production, consumption, imports and exports of natural and synthetic rubber for 23 of the major producing/consuming countries in the free world and the centrally planned economy countries—the People's Republic of China, the Soviet Union and the Eastern European countries. The 21st survey also includes a special feature on the 25-year history of dehydrogenation vs. coproduct butadiene production in the U. S. Dehydrogenation, which accounted for more than 80 percent of all butadiene made in the U. S. between 1958 and 1963, has taken a back seat to the coproduct procedure, accounting for less than 14 percent of butadiene produced domestically in 1982, the report said.

Rubb Board bull. 19, No. 3

A Dynamic Programme for Increased Production in Small Holdings

V K Bhaskaran Nair

The main objective of the Rubber Development Project of Modi Rubber Limited is to create an awareness among small growers on the modern scientific methods of rubber cultivation, to implement them without any external help and thus bring an increase in the output of the small holdings over a period of 3 to 4 years. The Project has proved to be of much help to the rubber growing community in Akalakunnam village where the programme is being implemented. The author Shri VK Bhaskaran Nair is Project officer, Modi Rubber Limited, Kottayam.

Natural Rubber Industry occupies an important position in the economy of India. An area over 3,00,000 hectare is covered by the crop. The rubber plantation industry is predominently of the small holders sector (units of 20 hectares and less in extent) which accounts for 75% of the area under the crop and makes the major contribution to the total production of natural rubber in the country.

Unfortunately the productivity of the small holders' sector is low compared to that of the estate sector (units above 20 hectares in extent). The average productivity in the small holders' sector is only around 770 Kgs/ha/year, while that of the estate sector is over 1046 Kgs. There is scope for stepping up the productivity of the small holders' sector which, on resuscitation, will be able to add more than 60,000 tons of natural rubber per annum.

Rubber Board has implemented a number of schemes in the past to increase the productivity and improve the economic viability of the small holders. But the reports indicate that the response was rather slow although a good deal of work done in the past has gone into the improvement of the small holdings. Some of the reasons listed out for the slow response are 1) Lack of awareness of the schemes 2) Lack of the awareness of the modern agrotechniques of planting and development works among the small holders 3) Inadequate coverage of extension service among them 4) Cumbersome procedures to be adhered to by the small holders in the implemetation of the schemes and 5) Financial Constraints in the initial period.

Consequently Board has suitably modified and recast their schemes based on the results of the investigations made. But the tempo of adhering to modern practices is not very satisfactory among small holders and the scope for improving this sector appears to be high as is evidenced by their production statistics. It is also reported that the quantum of uneconomic holdings to be replanted now numbers more than 50,000. This situation therefore calls for giving further guidance and impetus to the progress of the small cultivators.

It is in this context that the Modi Rubber Limited has launched a Rubber Development Project for the development of this weak sector. The Project is working as a catalyst for the quick implementation of the development programmes already launched by the Rubber Board.

The Rubber Development Project of Modi Rubber Limited started operation in April 1979. The Project area comprised of the whole of Akalakunnam Village and certain peripheral areas of Elikulam, Anicad and Kooropada villages. As per 1983 statistics 2630 holdings and 1693 small holders come under the Project. The total area covered by this Project is 1495 hectares. The main objective of the scheme is to make the small growers well aware of the modern scientific methods in rubbber cultivation and how to implement them without any help from outside and thus bring an increase in the output of the small holdings over a period of 3 to 4 years from the start. The project has also developed the infrastructure and expertise to give guidance to the small holders through its Extension Staff, which includes four Extension Assistants and two Tapping Demonstrators. The Extension Staff gives the necessary advice by visiting the holdings frequently. Emphasis is given to:-

1. Regular application of Fertilisers.
2. Timely Spraying against diseases especially Phytophthora.
3. Proper methods of tapping.
4. Timely steps for the control of shoot, root, bark and leaf diseases.
5. Tapping with rain-guards on rainy days
6. Soil and leaf analysis to fix scientific manuring programmes.
7. Application of stimulants in the case of rubber ear-marked for replanting, and

8. Establishment of proper cover crops in young rubber areas.

During the spraying season the Project makes available to the small holders its own sprayers, including power sprayers, at a nominal rent.

The Project maintains 5 hectares of Demonstration Plots of mature and immature rubber to demonstrate the effectiveness of all the above scientific methods to increase the production of rubber. A slaughter tapping area is also looked after by the Project in order to demonstrate the correct procedure of stimulant application.

The Project Officer co-ordinates all the field work and extension/ advisory activities in the Project area

Results

The Project catered to 2630 small holdings belonging to 1693 parties in 1983. The number of visits which were covered by the Project under the schemes recorded progressive increase since the scheme was launched in 1979. The scheme covered both mature and immature rubber. The Project could also make the holders aware of the importance of replanting/ new planting in general, even though there are areas still supporting unselected rubber. This would necessitate constant approach and more frequent contacts with the holders to bring home the full significance of replanting/ bringing up additional areas under the crop.

There has been significant increase in the implementation of timely manuring and spraying. In 1979 only about 46% of the holdings were receiving fertilisers, which steadily increased in the subsequent years. During 1983, 87% of the holdings received fertilisers. The progress with regard to plant protection was also satisfactory. The percentage of holdings which were sprayed against abnormal leaf fall disease increased to 85% in 1983, from 45% in 1979.

The productivity of the holding sector in the Project area showed steady increase since launching the scheme The estimated average yield per hectare per annum was only 325 kgs, in 1979 before launching the scheme. The average yield rose to 450, 494, 577 and 590 kgs during 1980, 1981, 1982 and 1983 respectively. In other words. compared to the average yield in 1979, the yield estimated during 1983 would be around 81% more. It is also worth mentioning that there are a few holdings which have recorded more than 100% yield increase. Marked improvement has been noted in tapping practices also. There were 891 holdings undergoing daily tapping in the Project area in 1979 which has been brought down to 490 by 1983.

The progress achieved in the demonstration plots is more commendable. At the time of adoption the two mature areas were in a badly neglected state and were giving yield of hardly 300 to 400 kgs. of rubber per hectare per year.But by adopting proper maintenance and cultural practices under the direct supervision of our Extension staff a steady increase in the yield was recorded and by 1981 productivity in these areas have reached to three fold which is still being continued.

The immature holdings taken over by us in 1979 has shown satisfactory growth and is ready for tapping by 1983-1984. It may be noted that the planting in this area is made with high yielding varieties like RRII 105, GT 1 and RRIM 600.

An old planting was selected to demonstrate the effect of yield stimulants like Ethrel and Calcium Carbide. The result of this trial was also very encouraging, separate data for all these are being maintained.

New Ventures

1. The Project arranged 'Intensive Replanting Drive' programme in collaboration with the Rubber Board at different centers of the Project area to wipe of all the uneconomical units in the area. This was followed by a new venture by which applications for new planting and replanting subsidy were collected from prospective small holders in groups and handed over to the concerned Regional Officers of the Rubber Board after necessary scrutiny. Through this venture more than 73 holdings were replanted in 1983 season.

2. Sastra Darshan & Seminars —The Project has initiated programmes like Sastra Darshan and Grower's Seminars to educate the cultivators about the modern scientific methods of rubber planting and processing as well as to discuss their problems and obtain solutions to them. Accordingly during 1983-'84 two programmes of Sastra Darshan, and two Seminars were arranged in the project area. Trials and observation plots were also started in the project area in collaboration with the Rubber Board to create scientific awareness among the growers.

3. A campaign for Mobile Soil and Tissue testing laboratory of Rubber Research Institute of India was arranged in Akalakunnam village. About 108 soil and tissue samples were analysed from the project area.

4. Expansion to new villages— Modi Rubber Development Project has already created a new awakening in the field of rubber cultivation among the small holders of Akalakunnam and nearby villages. In response to the wishes of the cultivators, we have selected another village called Vakathanam having an area of over 2406 hectars for extension work during the year 1983-'84. We made a comprehensive survey in the village collecting all details regarding their rubber areas, cultivation practices, economic status and other related problems. The survey is over and the data is being analysed. The Vakathanam village at present have 1800 small holdings. Besides Vakathanam village, a part of the adjoining Madapally village is also included in the project as a working arrangement The usual extension work has commenced by the end of 1983. The total area is divided into four sectors and our extension staff will be visiting every holding four times a year. A calendar of operation monthwise and advisory leaf-lets on important planting operations are supplied

to every holder which will serve as a ready reckoner to them. Seminars, Sastra Darshan and Soil Testing programmes will be arranged in due course in collaboration with the Rubber Board. Demonstration plots will also be taken up in the new area on consultation with the Rubber Research Institute of India.

In our old project area, a skeleton staff is maintained to make follow up studies and keep recording of the progress.

5. The project has also started a Rubber Nursery at Ponkunnam for the supply of improved planting materials. The Rubber Nursery at Ponkunnam is maintained in a very scientific manner and is able to supply budgrafts and polybag plants of all improved varieties at reasonable price to the growers.

The Rubber Development Project and the Rubber Nursery of Modi Rubber Limited are the best examples of private sector co-operation with the Rubber Board in the matter of research and development effort in rubber plantation undertakings in general and in particular in the field of improvement of rubber small holdings. □

IS THE SUN A POSSIBLE ALTERNATE SOURCE OF ENERGY?

Sun warms the earths surface and atmosphere, drives the winds and ocean currents, and produces all the food, fuel and free oxygen on which life depends. Looking into history and the source of energy to our fore-fathers, we cannot deny the contribution of the role of solar energy then and now. As wind it served to grind the grain, pump the water and drive ships, converted trees to firewood, which heated homes and public buildings and provided steam for industrial heat engines. With the disappearance of the forests, slowly,the resourceful mind of the man turned towards coal and fossil fuels as a means to cheap energy source. But with ever increasing demands of energy source and slow extinction of fossil fuels we have turned our attention towards the Sun, the star of our planetary system, to serve our energy needs. It will not be out of place if we also take the economic cost of the depth to which we can reach to find the fossil fuel the Sun can easily serve us with cheap energy we need.

The Sun As An Energy Resource:

Solar energy is generated by a continuous nuclear chain reaction in the Sun which converts 4×10^6 tons of hydrogen into helium every second. The amount of energy called solar radiation constantly being released by the Sun equals $380 \times 10^9 \times 10^{12}$ (380 billion (trillion) kilowatts: Even the infinitesimal amount that reaches the earth—170. trillion kilowatts—is an incomprehensible figure. On comparing these with the kilowatt output of any power station, we see that the solar energy that reaches the earth is very large. For example,in USA the entire capacity of Tennessee Valley Authority is about 12×10^6 kw; its Kingston plant, the largest steam power plant in the world has a capacity of about 1.5×10^6 kw. The solar radiation annually reaching the U.S. is equivalent to the energy of $1,150 \times 10^9$ tons of coal.

The Sun radiates energy in a relatively narrow band of wavelengths between 0.22 and 3.3 microns.Visible radiation lies between 0.36 and 0.76 microns and represents approximately 40% of the radiation which reaches the earth. Of the remaining 60%, 9% is UV radiation and 50% is infrared radiation. At the outer limits of the earth's atmosphere, the solar radiation falling on a surface perpendicular to the Sun's rays has an intensity 429 BTU [British Thermal Unit: (BTU) heat required to raise 1 lb of water through $1^{\circ}F = 252.0$ calories.] per hour per square foot. This is known as solar constant equal to (2.00 cals./cm²/minute). As solar radiation enters the atmosphere it is split as follows:

1. 25% is absorbed by the atmosphere.
2. 20% is reflected by clouds.
3. Approximately 5% is reflected by the ground.

Of the 50% which remains about 30% reaches the ground in direct parallel rays and 20% in diffused rays which have been scattered by clouds, water vapour, dust and other components of the atmosphere.

The Need for Increasing Productivity of Holdings

Dr. K. C. SANKARANARAYANAN

Dr. N. C. PILLAI

Since independence, Rubber Plantation Industry in India has made rapid strides. The production of natural rubber which was only 15,394 tonnes in 1948-49 increased to 160000 tonnes by 1982-83. Similarly the yield per hectare which was only 320 kg in 1948-49 increased to 762 kg by 1982-83. This indicates the phenomenal growth both in production and productivity during the postindependence period. The aut hors review the developments that took place in the rubber plantation sector and stress the importance of increasing productivity in rubber holdings.

Dr. K. C. Sankaranarayanan is Professor & Head of the Department of Applied Economics, University of Cochin and Dr. N. C. Pillai is faculty member in the School of Management Studies, University of Cochin.

THE plantation sector has an important role in the economic development of India. It provides employment to hundreds of thousands of people. The major plantation crops are tea, coffee, rubber, cardamom etc.

Rubber enjoys a pivotal place among the commercial crops in Kerala. The state accounts for about 90.8 per cent of the total areas under rubber and nearly 91 per cent of the production of natural rubber in India.

The geographical distribution of rubber area has not changed in any significant manner over the years. Rubber was cultivated mainly in Travancore. Cochin and Malabar district of Madras state in 1949. These are almost merged in the Kerala state and even after 34 years rubber still continues to be concentrated in this State. It is true that recently some interest in cultivating rubber has developed in Maharashtra, Goa, Tripura, Andra Pradesh, Assam, Andaman & Nicobar islands.

The rubber plantation industry has made rapid strides since independence. The production of natural rubber which was only 15,394 tonnes in 1948-49 increased to 160000 tonnes by 1982-83. Similarly the yield per hectare which was only 320 kg in 1948-49 increased to 762 kg by 1982-83. This indicates the phenomenal growth both in production and productivity during the post independence period.

But India's production of rubber in relation to the production of the major rubber producing countries is hardly significant. This can be discerned from table-1.

From table-1 it can be seen that India's contribution to the world production increased from 2.90 percent in 1970 to 4.13 per cent in 1982. Malaysia contributes the lion's share to the world's natural rubber production (40.65 percent in 1981). The other two major contributing countries are Indonesia and Thailand. They contributed 25.29 per cent and 13.42 respectively in 1981.

TABLE—1

Production of Natural Rubber in Principal Territories

(In thousand metric tonnes)

Countries	1970	1975	1980	1981 (Estimated)
Malaysia	1,263	1,459	1,552	1,575
Indonesia	815	823	1,020	980
Thailand	290	355	501	520
India	90	136	155	160
Sri Lanka	159	149	133	140
Siberia	83	83	69	76
Nigeria	65	68	45	40
Philippines	20	52	65	65
Vietnam	28	20	50	35
Brazil	25	19	28	30
Zaire	40	30	25	25
Total	3,102	3,315	3,825	3,875

Source: The International Rubber Study Group; Cf. Rubber Board Diary, 1982, P. 106.

In the early stages of production the major share of the rubber produced in India was exported. In 1938 the internal consumption of rubber in India was only 5600 tonnes out of a total annual production of about 14000 tonnes. (Government of India: Report of the Plantation Inquiry Commission, 1956; Part III, Rubber, New Delhi, P.35) Since then, with the growth and expansion of rubber manufacturing industry in India, the position has been reversed and at present the entire indigenous production is absorbed by the Indian rubber manufacturing sector. Of late we experienced some gap between production and consumption of natural rubber. Consequently we imported rubber during 1978-79, through 1982-83.

The consumption of rubber in India is not very significant compared to U.S.A., Japan and China. The following table explains the position. (Table-II).

Structure of the Plantation Industry

The British planters had started rubber cultivation on a plantation scale. At a later stage a number of indigenous planters started cultivation of rubber on a small scale basis. Today such small holders predominate the rubber plantation industry.

Rubber plantation in India range in size from holdings having less than 1 hectare to estates of nearly 10,000 hectares. Under the Rubber Act, 1947 rubber plantation of over 20.23 hectares (50 acres) under a single ownership is treated as estates, and those whose area range upto 20.23 hectares are treated as holdings. Table-3 furnishes statistics regarding the number of rubber growing units registered with the Rubber Board at the end of 1982-83. From Table-3 it can be seen that the number of rubber growing units registered with the Rubber Board at the end of 1982-83 was 1,72,368 of which 511 were estates. The number of estates in 1967-68 was 654 and ever since the number of estates declined and by the end of 1982-83 the number of estates stood at 511. The registered area under rubber at the end of 1982-83 increased to 2,53,466 hectares from 1,87,514 hectares at the end of 1969-70. The share of the small holding sector in the total area in 1982-83 came to 73.54 per cent. It was only 65 per cent in 1969-70.

TABLE-II

Consumption of Natural Rubber in Main Consuming Countries

(In thousand metric tonnes)

COUNTRY	1970	1975	1980	1981 Estimated
U.S.A	568	666	586	650
Japan	283	285	427	425
China (P)	208	225	340	340
U.S.S.R.	327X	235X	225	220
Germany, Federal Republic	201	197	180	177
France	158	156	188	175
India	86	129	171	180
U. K	195	171	131	115
Italy	113	118	132	130
Canada	51	72	80	90
Brazil	37	59	81	85
Czechoslovakia	54X	54X	56	56
Poland	51X	67X	50	43
Australia	40	50	42	43
Rumani	37	41	43	45
Total	2,990	3,367	3,800	3,875

P—Provisional; X—Net imports.

Source: The International Rubber Study Group of Rubber Board Diary: 1982.

The Problem

Estimating the rate of increase in consumption of natural rubber by 40 per cent every five years, the country requires 6.65 lakh tonnes of natural rubber by 2000 A.D. Even if part of this requirement is met by synthetic rubber, an increase of 6 lakh tonnes of natural rubber may be necessary. Estimating an additional crop of one lakh tonnes from the areas now in immaturity stage five lakh tonnes should be obtained from higher productivity in areas now yielding and from areas to be replanted or newly planted between now and 1994. This requires considerable improvement in present cultivation in about 15000 to 17000 hectares every year up to 1994.

Since the area suitable for rubber cultivation is limited the only way to make up the gap in demand is increased productivity. The increase in productivity seems not that difficult if we concentrate our efforts on holdings As has already been pointed out the rubber plantation sector today is dominated by the small holders. Compared to estates the productivity of the holdings are low. If we could raise the productivity of holdings to that of the level of estates then the gap in demand and supply can be solved without much difficulty.

The performance of estates and small holdings had been examined in detail by the Plantation Industry Commission. The Commission observed that: "the larger estates were able to

TABLE - III

Classification of Registered Holding and Estates According to Size at the End of 1982-83

Group Size	No. of Units	Area in hectares	Average size in hectares
A. HOLDINGS			
Upto 0.40 hectare (below 1 acre)	38,818	10,470	0.27
Above 0.40 hectare (of and above 1 acre)and upto and including 2 hectares.	114,767	97,782	0.85
Above 2 hectares and upto and including 4 hectares	11,919	31,427	2.64
Above 4 hectares and upto and including 6 hectares	3,244	15,194	4.68
Above 6 hectares and upto and including 10 hectares	1,832	13,596	7.42
Above 10 hectares and upto and including 20 hectares	1,277	17,928	14.04
Total	171,857	186,397	1.08
B. ESTATES			
Above 20 hectares and upto and including 40 hectares	239	7,492	31.35
Above 40 hectares and upto and including 200 hectares	206	16,993	82.89
Above 200 hectares and upto and including 400 hectares	25	7,389	295.56
Above 400 hectares and upto and including 600 hectares	14	6,739	481.36
Above 600 hectares and upto and including 800 hectares	10	6,684	668.40
Above 900 hectares	18	21,782	1,210.11
Total	511	67,069	131.25
GRAND TOTAL	172,368	253,466	1.47

increase their output owing to their better resources but small growers had various difficulties in doing so". (Madhava Menon, P; Plantation Inquiry commission, p.98). From the above statement we can infer that the major problem faced by the small holder is lack of resources. So the role of the Rubber Board in making available the required resources at the disposal of the small holders seems to be rather significant and in our opinion any effort in this direction by the Board should be welcomed. This is because such efforts on the part of the Board will help to save our scarce foreign exchange resources.

From Table-3 it can be seen that out of a total area of 2,53,466 hectares under rubber 1,86,397 hectares are under the control of small holders. If we succeed in increasing the productivity per hectare of the holdings to that of the level of the estates we could increase the total producton by about four lakh tonnes. This will help us to bridge the gap between demand and supply.

To achieve increase in productivity the following measures are suggested:-

i) A scheme for the widespread irrigation of the holdings.

ii) Consolidation of holdings forming co-operative societies.

iii) Introduction of better plant protection schemes.

iv) Use of high yielding varieties in the case of new planting and replanting.

v) A higher support price—The support price may be fixed at Rs. 1500 per quintal. As the market price oscillates between Rs. 1800 and Rs. 2000 there is nothing wrong in increasing the support price. This will enable the small holders to take much more interest in increasing the productivity of their holdings.

vi) By purchasing the produces of the growers directly at the notified price and by setting up a buffer stock the Government can ensure the notified price to the growers.

vii) The demand in the rubber market controlled by some top ten companies. Consequently they control the fate of the unorganised small holders. This situation can be corrected by implementing the suggestion given as item VI.

viii) Often it is found that the produce of small holders is inferior to that of the estate sector in term of quality. So to improve the quality of their produce, the Board has to take initiative for improving the processing of small holders rubber by establishing technically specified rubber processing units either directly or through co-operatives.

ix) At present information regarding the various schemes implemented by the Rubber Board are not reaching the small holders in time. So also there is lack of awareness about the modern agro-techniques of planting and development works among the small holders. This calls for better extension services. Procedural formalities in the implementation of schemes should be streamlined and all cumbersome production to be adhered to by the small holders in the implementations of the schemes should be deleted.

In conclusion, it may be said that by providing a higher support price to the natural rubber, and by extending the facilities enumerated above, India will be saving the scarce foreign exchange resources and generating employment opportunities, providing better living standardsfor the growers and workers at large etc. □

Plantation Management A Perspective

OOMMEN MATHEW

The Rubber Plantation is an economic and social institution developed over many centuries. But the scientific management of plantations as a business is relatively new. The process of managing a plantation successfully is measured by the test of profitability. The management functions are primarily a mental process. The choice and action that results is conditioned by the attitudes, values and goals of the manager.

The paper was presented at the National Rubber Conference, 1984 held at Kottayam on 4th February, 1984. The author Shri Oommen Mathew is the Assistant Professor, Institute of Management.

Introduction

MANY participants who attend this conference are concerned with the management of plantations. Plantation means a piece of land where perennial crops are planted and has specific boundaries. Management is a major productive resource in the economy and serves to coordinate the use of land, labour and capital. Management focuses on the decision-making process: on the intelligence of man to make the "right" selection from among possible alternatives. Management combines man's mental efforts to identify, organise and classify, analyse, decide, act and evaluate.

Though the plantation is an economic and social institution developed over many centuries, the scientific management of plantations as a business is relatively new. The term Plantation Management conveys different meanings to different people. Some consider it synonymous with production economics or agricultural economics while others consider it nothing more than the planter's art of carrying out the daily routine. The daily work of supervision of plantation labour and carrying out the directives of superiors by the manager of the plantation is generally referred to as plantation management. It may also be stated as the process of managing a plantation successfully, as measured by the test of profitability. In fact, there is no single definition acceptable to all.

Like any other economic problem, Plantation Management is a rational resource allocation Proposition more particularly from the point of view of the planter. On the one hand a planter has a certain set of resources such as land, labour, farm buildings, working capital, farm equipments, etc. that are relatively scarce. On the other hand, the planter has a set of goals or objectives to achieve. The task of matching these necessitates taking a series of rational decisions in respect of the plantations.

Thus in simple words, Plantation Management can be defined as a science which deals with judicious decisions on the use of scarce farm resources, having alternative uses to obtain the maximum profit and personal satisfaction on a continuing basis from the plantation as a whole and under sound plantation operations.

A good plantation manager must be able to observe problems on the plantation and to identify them precisely. By defining problems, he exhibits his awareness of the situation confronting him. He has to display his knowledge about it through his ability to devise ways to cope with the problems.

Problem analysis involves identifying the exact situation causing the problem, as well as the formulation of several different ways to solve it. However management is not content with only analysis; it must put the analysis into action. This is the decision-making function of the plantation management. The manager must choose which of several alternative plans of action offers him the "best" solution in view of his particular goals and of the resources at his disposal. Once the manager makes the decision, action must be taken to implement the solution. Once the action is taken, the manager becomes responsible for the outcome, good or bad. Finally, constant evaluation at each step of the decision-making process, both before and after the solution is put into action, helps to insure management that the "right" decision was made. It is to be emphasised that managing a plantation is a continous process of decision making. The need for it arises out of changes occurring in the plantation as well as those occurring outside; hence need of continuous adjustment of operations on the plantations to these changes become inevitable. The principal changes frequently

encountered by the planter are: fluctuation in prices, weather variations, inventions in plantation, operation changes in socio-economic environmet including changes in Government policy and social responses and values.

Successful Plantation Management requires not only to make decisions, but to make the correct decisions. To improve Plantation Management competence, a model identifying the following eight processes may be resorted to:

(1) formulation of goals or objectives of the plantation

(2) recognition or definition of a problem or an opportunity

(3) obtaining information— observation of relevant facts

(4) specification and analysis of alternatives

(5) decision-making— choosing an alternative

(6) taking action

(7) bearing responsibility for the decision or action taken

(8) evaluating the outcome

Understandably a plantation manager may not consciously proceed systematically from process one through eight.

Since the management functions are primarily a mental process, each choice and action that results is conditioned by the attitudes, values and goals of the manager. His goals and value systems unconsciously determine what he will observe, what variables he will consider, what information he will gather and which alternative he will choose. Thus, the formulation of these goals is essential in effective management because they give directions to the whole managerial process.

Research indicates that indentification of problems in plantation business is surprisingly difficult to planters. However, problems need to be recognised and defined to arrive at the most acceptable results. Problems are recognised as a result of:

(a) a forced action situation

(b) a systematic study of plantation operations, or

(c) ordinary opportunities for action

Good plantation managers will pinpoint more problems as a result of systematic analysis of the plantation business.

Functions

Plantation Management can be viewed as a distant process consisting of planning, organising, motivating and controlling activities in plantation to accomplish definite objectives. This holds good irrespective of the size of the plantation or its form of organisation.

Planning

Planning is fundamental to the management process in a plantation, because it forms the basis from which all other management actions take place. It is futuristic. It implies a thorough understanding of the goals of the particular plantation involved and requires intellectual effort, reflective thinking, foresight and imagination. A planner must visualise the working order of a proposed pattern of activities.

Planning being a dynamic function, a good manager will continually reassess a plan and modify it as needed. The timing aspect of planning is very critical. There is a proper time to implement a plan.

Planning describes what courses of action should be adopted and how and when they should be followed. Necessarily then, planning is deeply involved in policy-making and its implementation. A useful plan should be simple, easy to understand, geared to the needs of those in charge of implementation and flexible. Scheduling gives viability and practical meaning to planning. A schedule may be made on a basis of annual, monthly, weekly, daily or even hourly breakdowns of the work to be accomplished. Techniques such as PERT (Programme Evaluation and Review Technique) come in handy for managers in proper scheduling.

Organising

The important question of organisation is, "where should action take place, and who should do the work?" Organising involves breaking work down into various components, assembling tasks into operative units, placing people on proper jobs, assigning authority and responsibility so that links in the system will coordinate smoothly and making adjustments in the system in the light of control results. It is a function of top level management in plantation and it follows closely the function of planning.

Organising is necessary for gaining effective group action Through good organisation, management hopes to attain, synergism—a situation in which the total effort of group action is greater than the sum of the individual efforts put into it.

Motivating Personnel

Planning and organising are futile activities unless people are motivated to act. "Actuating" deals entirely with people and involves effective leadership, communication, providing of incentives and constructive criticism. The ultimate goal of this management function is to get each employee to do his work willingly and well in an enthusiastic spirit with co-workers and his boss.

Motivating people to action is largely a matter of choosing people already predisposed to certain types of work, effectively communicating to them what they are to accomplish and how to do their job,

giving them the authority to do it and inspiring them to have confidence in their ability to succeed. In essence, it is good leadership.

There are several possible approaches one can take. Most managers rely on some type of reward system. Employees receive rewards that are conditional on performance.

Still another approach, a more difficult one, is to try to satisfy human wants solely through work situation. The manager attempts to integrate the entire manpower resources of his group. The basic idea is that man has many needs and works to fulfil them. By skillfully applying knowledge of human beings towards continual job satisfaction, the manager will from a highly enthusiastic group of co-operative workers.

Some of the more important guides to effective personnel management include giving adequate guidance, recognising individual differences, making people feel important, consulting them in advance as to changes to be made, being a good listener, avoiding unconstructive arguments, and providing effective supervision.

Controlling

The last function of Plantation Management is controlling the activities. Controlling identifies what is being accomplished, evaluates it against a standard and applies corrective mechanisms to restore activities to confirm to plans.

Controlling practices on a plantation should be reasonable and attainable, as well as being enforceable. If they are not, the effort is costly and fruitless. Since the human response to controlling is vital to its overall success employees should be convinced that it is in their best interests.

Conclusion

The manner in which the above functions are performed should be responsive to the changing times. Development of industry in a country enhances the scope of the application of the subject of Plantation Management. Progressive industrialisation puts forward many alternatives in relation to type and use of fertilisers, insecticides, implements and agricultural machinery. This requires managerial skill to adopt these new inputs and make other adjustments in the plantation to rationalise the resource use under new set of alternatives. □

FOREIGNERS FIND KEEN LOCAL BUYERS

"The next commodity boom will see the streets of Kuala Lumpur paved with gold," says an accountant with a major Malaysian plantation group. This is an exaggeration perhaps but the sentiment is not misplaced. What the accountant means is that the full benefits of the next commodity boom will remain within Malaysia, instead of being repatriated abroad, because most of the plantations and tin mines are now Malaysianised. In the past three years alone, not less than 600,000 acres of plantations have been brought under Malaysian ownership and control. One still sees British name like Sime Darby, Guthrie and Dunlop proudly displayed at the gates of many estates, but these estates are now Malaysian owned. As a result of numerous take-overs, some of them accompanied by fierce boardroon and market battles, the corporate structure of Malaysia's plantations has been transformed in the past decade. The first major controversial coup affected the Sime Darby group. The British board was ousted and replaced by a Malaysian team, led by Tun Ta Siew Sin, a former Finance Minister, in December 1976.

Guthrie passed into Malaysian hands following a 1bn ringgit (US$440M) dawn raid in September 1981. Dunlop directors had to sell its plantations for 252m ringgit to Malaysians to stave off a bid on the UK parent company itself. Pegi, the Malaysian group now controls some 26 percent of Dunlop Holdings and there have been repeated rumours in both Kuala Lumpur and London of a take-over bid being made. There are two main reasons for the sales. The first is political. The Malaysian Government's New Economic Policy requires foreign companies to restructure their equity so that by 1990, they should have 70 percent local ownership. The second is the generous prices offered for foreign plantations, particularly those with a listing on the Kuala Lumpur stock exchange. There now remains less than a dozen large foreign owned plantations in the country and some of these are reported to be in the final stages of negotiations on Malaysianisation.

Manuring of Rubber

DR. P. K. VIJAYACHANDRAN

A systematic and scientific application of fertilizer increases the health of rubber trees and thereby the yield of rubber. It reduces the immaturity period, increases the yield and maintains the health of the rubber trees. The paper on manuring of rubber prepared by Dr. P. K. Vijayachandran, Dy. Chief Agronomist, FACT was presented at the National Seminar on Rubber held at Kottayam.

IN our country Rubber Industry has now assumed great importance. We have seen impressive progress in this industry during the last three decades. This is evident from the following table which indicates the increase in area, production, and the average yield taken place during the above period. The plans on these aspects for the coming future are also indicated.

Year	Area (ha)	Production (tonnes)	Average yield kg/ha
1950	69,000	15,830	284
1980	243,000	148,500	770
Plans for near future	275,000	192,000	980

However, it is found that even after attaining the above increase as per the plans, we have to import a sizable quantity of natural rubber to meet the increasing requirement. In short, to attain self sufficiency, there is an urgent need to increase the production of natural rubber.

A noteworthy feature of this industry is that more than 90% of the area under its cultivation is in Kerala State. Further, with regard to the holdings,92% comes under small growers sector, (which is popularly known as holding Sectors), with an average area of less than 2 hectors. It is interesting to see that this holding accounts for 70% of the total production. This sector has a very vital role to play for increasing the production of rubber to meet the ever growing demand.

Manuring—An Important yield Booster

Adoption of a systematic and scientific fertiliser schedule is found to increase the health of trees and thereby the yield of rubber. In general,the application of fertilisers to rubber trees results in the following improvements.

1. Reduces the pre tapping stage—trees attain the tappability much earlier.
2. Increases the girth of the main stem—More bark area is thus available for tapping.
3. Increase the yields of good quality latex.
4. Maintains the health of the trees.

The nutrient requirements of the rubber trees show clear variation at three growth stages—nursery, immature and institute, has recommended different dosages of nutrients for application to these three growth stages. The quantities of FACTAMFOS to be applied at these stages based on these recommendations are listed out below.

1. Nursery

2. Immature Phase

The application of fertilisers at this stage is very important. This is found to reduce the unproductive phase and help the trees to attain the tappability at least one year earlier.

The quantities of Factomfos to be applied upto 4th year are as follows.

The fertilisers are to be applied in circular bands around the plants. When canopies close,

Type of Nursery	Quantity of Fertilisers Factamfos	Muriate of Potash (20-20-0-15)	Remarks
A.Seedling Nursery:			
a) Per 100sq meters.	12.5 kg	1.75 kg +2.5 kg Mag.Sulphate.	Urea @5kg. 6-8 weeks after
b) Per effective Ha.	1250 kg	275 kg +250kg Mag.Sulphate.	@500 kg after 6-8 weeks after
B.Bud wood Nursery: Per plant	125 gm.	15 gm. +25 gm. Mag.Sulphate.	
After cutting back and second and subsequent crop of bud wood	65 gm.	10 gm. +15 gm.Mag.Sulphate.	

Year of Planting	Month after Planting	Dosage per plant F/Fos., Mop Mag.Sul. (20-20-0-15)			Dosage per Ha (400-450 planting point) F/Fos., Mop Mag. sul. (20-20-0-15)		
1st year	3 Months (Sept-Oct)	115g	15g	25g	50kg	6kg	10kg
2nd ,,	9 ,, (Apr-May)	225g	30g	50g	100 ,,	12 ,,	20 ,,
—do—	15 ,, (Sep-Oct)	225g	30g	50g	100 ,,	12 ,,	20 ,,
3rd year	21 ,, Apr-May)	275g	35g	55g	150 ,,	15 ,,	25 ,,
—do—	27 ,, (Sep-Oct)	275g	35g	55g	150 ,,	15 ,,	25 ,,
4th year	33 ,, (Apr-May)	225g	30g	50g	100 ,,	12 ,,	20 ,,
—do—	39 ,, (Sep-Oct)	225g	30g	50g	100 ,,	12 ,,	20 ,,

application is to be done in square or rectangular patches between the rows, each patch serving four plants/trees.

After the fourth year, till the trees attain the tappability, the dosage to be applied depend on whether the field is mulched or a leguminous cover crop is raised and maintained. Hence the following two recommendations are suggested.

	Factamfos 20-20-0-15	Muriate of Potash	Remarks
a) With cover crop	150kg/ha	50gk/ha	In two split applications
b) Without cover crop 4th year	200kg/ha	40 kg/ha + kg Urea (or 100 kg Amm.sulphate)	—do—
5th year onwards	100 ,,	20 kg/ha 20 kg urea or) 50 kg Amm.sul)	—do—

3. Mature Rubber Trees

The main purpose of manuring rubber trees under tapping is to obtain an economic response and to maintain the health for a prolonged period. The following schedule is recommended.

The method of application of this fertiliser depends on the stage of growth. The principle to be followed is that it is to be applied in zones where the roots of the plants are active.

	Factamfos 20-20-0-15	Muriate of Potash	Remarks
Mature Rubber trees under tapping	150 kg/ha (0.5 kg/tree	50 kg/ha (0.25 kg/tree)	Apply in two split applications, first in March - May and second in Sept.-Oct.

Factamfos—An Ideal Complex Fertiliser For Rubber

Factamfos, the NP+S complex fertiliser manufactured and marketed by FACT, is found to be the most ideal fertiliser for rubber. The main characteristics which impart this high agronomic suitability for this complex fertiliser are as follows.

1. Nitrogen-Most efficient

The rubber soils are very well drained. This results in the applied nutrients, especially N being washed out and thus lost. Only ammoniacal form of N can withstand this loss since it gets fixed on the clay particles and withstands the leaching losses.

The entire N in Factamfos is in ammoniacal form. Hence its N is not washed out or lost from the soil. It is retained and kept in an available form to the roots for easy and ready absorption. This characteristic is rarely seen in other types of fertilisers.

Ammoniacal N in Factamfos, besides being resistant to leaching, acquires the maximum efficiency due to this chemical association with water soluble P (ammonium phosphate) and sulphate Sulphur (especially in rubber soils low in sulphur content.)

Hence the N contained in Factamfos has the maximum efficiency among the fertilisers.

2. Phosphorus--With maximum Mobility and Availability

The roots absorb phosphorus only when it is in water soluble form. Further, more absorption occurs especially when the phosphorus is made available near the roots zone. In other words, the water solubility as well as the mobility are the important characteristics required for phosphorus to facilitate maximum root absorption.

Both these characteristics are present in the P contained in Factamfos. It has entire P in water soluble form, that too as Ammonium Phosphate, which, is quite mobile in the soil. Thus, from Factamfos the roots get the easily absorbable water soluble form of P right at the absorbing zone. There is, hence, greater absorption of P by the roots when Factamfos is applied, resulting in

maintaining the health of trees and increasing the yield of latex.

3. N-P Chemical combination Further boosts efficiency

These two nutrients, when occur in chemical combination as ammoniacal N and water soluble P (Ammonium Phosphate) further enhance the efficiency of both these nutrients—due to their synergetic effect.

This also enhances the mobility of P in the soil.

In short, both N and P have the maximum efficiency when Factamfos is applied.

4. Sulphur-the fourth Major Nutrient

The health of rubber trees and the yield of latex depend very much on the fertility status of the soils on which they grow. In this context the application of sulphur containing fertilisers has now become very vital since these soils are very low in Sulphur content. This is because of the following reasons.

i) Rubber is cultivated on laterite soils which are highly weathered and drained. Since sulphur is a highly mobile nutrient, it is lost through drainage and hence its content is always low.

ii) The intensive cultivation especially through the planting of high yielding clones has resulted in the greater withdrawal of nutrients, including Sulphur, from these soils.

iii) The fertilisers presently available in the market do not contain Sulphur–even if available, it is in negligible quantities. The Ammonium Sulphate, with its 24% S content used to supply this vital nutrient as an 'incidental' source. This fertiliser presently has become costly and scarce in the market.

iv) As indicated above, rubber soils have only negligible quantity of Sulphur. Application of Non–S containing fertilisers to these soils, especially where only small quantities of fertilisers used to be applied, has aggravated the situation.

These factors have made sulphur as a critical plant nutrient. It is now considered to be the.

'FOURTH MAJOR NUTRIENT'

Factamfos—The only Source of Sulphur

In this context, FACTAMFOS, with its 15% Sulphur comes as a boon to the rubber growers. Besides, supplying the most efficient N and P, it also supplies 15% Sulphur-that too as a 'BONUS' nutrient. It is the only complex fertiliser presently available to the rubber growers with as much as 15% Sulphur. It is, in fact, a NP+S complex fertiliser.

FACTAMFOS is a chemically combined product of 60% Ammonium Sulphate and 40% Ammonium Phosphate. It is an ideal source of the costly fertiliser, Ammonium Sulphate, which is highly preferred fertiliser among rubber growers.

5. Potash—Split application is a must

The requirements for potash for the rubber trees vary at the different stages of crop growth. In addition to this, the laterite soils, where rubber is cultivated is inherently low in potash content. Both these factors make potash a very vital nutrient, in the fertiliser schedule for rubber.

When FACTAMFOS is preferred, the application of potash in the correct quantities is easily possible.

All these special attributes of FACTAMFOS 20-20-0-15 makes it the most efficient and ideal fertilizer for rubber.

Fact Service for Rubber Growers

FACT is making FACTAMFOS 20-20-0-15 available at all its depots which are spread over throughout the length and breadth of this State. A farmer is able to find a FACT depot everywhere, within his walking distance.

Besides the above, FACT is rendering free agronomy service to the rubber growers. Two soil testing laboratories, one stationary at Udyogamandal and another Mobile Laboratory are available for rendering free service to the rubber growers. □

FIRESTONE TO BUILD GUAYULE FACILITY

Firestone Tyre and Rubber has announced that it is to build and operate a prototype guayule rubber processing plant near Phoenix, Arizona, having received the rights to do so by the local Gila River, Indian community. The U. S. rubber giant will be project sub-contractor and will accommodate all research work for the development of rubber from the shrub that grows wild in the south western US and in northern Mexico. Firestone will also build a plant to demonstrate guayule processing's commercial feasibility, with construction due to begin in 1986 and the plant to come on-stream in 1988. Firestone has planted the shrub at its Fort Stockton tyre test centre in Texas and plans to lease the guaylue R & D crop to Texas University.

Marketing of Raw Rubber In India

ET VARGHESE

IN order to appreciate the importance of raw rubber marketing it is essential to analyse the structure of the rubber industry as a whole. The rubber industry in the country comprises of two sections, the producing sector consisting of petty small holdings to large estates and the consumig sector consisting of small manufacturing units to sophisticated modern plants to produce automobile tyres. The production of natural rubber is confined to the Southern States of Kerala, Tamil Nadu and Karnataka. Of the total area under rubber, Kerala accounts for 91%, Tamil Nadu 5% and Karnataka 3%. Therefore these three States which are treated as traditional areas of rubber cultivation account for almost 99% of the total area under rubber in the country. Efforts are now being made to popularise rubber cultivation in non-traditional areas also significantly eastern States like Tripura. While this is the picture of the producing sector the consuming sector presents a different set up. Rubber goods manufacturing units in the country which number slightly over 3000 are distributed in the various States with comparatively better concentration in Maharashtra, West Bengal and Utter Pradesh. If the total natural rubber consumption is analysed it will show that Maharashtra and West Bengal account for 16% each of the total natural rubber consumption in the country followed by Uttar Pradesh with 13%. It is interesting to note that these three States are non rubber producing States located at far distant places, miles apart. This necessitates the need to have an effective marketing channel to link the producers and consumers who are at the two extreme ends.

Yet another feature which demands a well developed marketing net work is the fastly changing structure of the plantation industry. To begin with rubber cultivation was confined only to large estates. Slowly small growers also entered the field attracted by the lucrative price of rubber. Due to the various socio-economic changes rubber is fastly becoming a small holders crop. In 1961-62 the small holdings accounted for only 60% of the total area under rubber which by now has increased 72%. Similarly production from small holdings which formed only 21%, in 1950-51 has increased to 71% by 1981-82. Majority of the small holdings are located in villages. In effect within a decade or so the lions share of the natural rubber produced in the country will come from numerous rubber growing villages. Due to sub division and fragmentation the average size of a holding is also coming down. When the number of the producing units increases and the volume of goods available for sale per producer becomes smaller, the marketing mechanism assumes vital importance. Without a well spread out marketing net work the produce of lakhs of petty producers can not sucessfully reach the factories located at far off places.

Through the past many years an efficient marketing system has been developed in the rubber plantation industry. It will not be incorrect to say that natural rubber is one of the rare commodities gifted with a well developed marketing set up doing useful service to the producer and the consumer alike.

Structure of the Rubber Market

The main constituents of the rubber market are producers which includes processors, intermediaries or middlemen and consumers.

The rubber trading community is as old as the plantation industry itself. Since Kerala accounts for over 90% of the natural rubber production in the country it is natural that bulk of the dealers are found in this state. A rigid classification of dealers according to this system of operation is indeed difficut. Rubber trades and marketing is as old as rubber plantation. The paper presented at the National Seminar on Rubber held in New Delhi in september 1983, discusses in brief the history and growth of the raw rubber trade in the private and co-operative sectors in the country. It touches upon how the trading community had helped in promoting the rubber producing industry. The author of this paper Shri. E. T. Varghese is Member of the Rubber Board and President, Rubber Dealers' Association and Rubber Crepe Mill Owners' Association.

To have an idea of rubber marketing in India, we have to analyse the Rubber Plantation Industry itself. A well-developed marketing network is changing the structure of the plantation industry as a whole. The main constituents of the market are producers which include processors, intermediaries and the consumers.

the consumers. A close analysis of the system of sale will enable to classify rubber sales into two broad categories viz. (1) Direct sale by producers to consumers and (2) sale through middlemen or intermediaries. Some of the large estates, significantly State owned plantations can be grouped in the first category as they sell their produce directly to consumers. Processing units producing pale latex crepe, latex concentrates, estate brown crepe crumb rubber and selling their products directly to consumers can also be classified under this group. All the sales not covered above come under the second category. In terms of volume of trade, direct sales account hardly 20% and the balance is accounted for by sales through intermediaries. The two main intermediaries dealing in rubber are dealers and rubber marketing co-operatives.

With the active encouragement given by the Rubber Board and the Kerala Government both financially and otherwise, rubber marketing co-operatives have sprung up in all the pre-dominant rubber growing areas. At present there are 39 such societies dealing in rubber. There is also an apex organisation namely the Kerala State Co-operative Rubber Marketing Federation to co-ordinate the activities of the primary societies. However co-operetives handle less than 10% of the total rubber production in the country. The analysis given above will undoubtedly show the vital importance of dealers in rubber trade.

Origin and Growth

The rubber trading community may perhaps be as old as the plantation industry itself. There were dealers in rubber from a very early time. However, their activities were neither controlled nor regulated. With the enactment of the Rubber Act 1947 and Rubber Rules 1955 dealings in rubber have become a regulated trading activity. Section 14 of the Rubber Act provides for a licence to deal in rubber. The Rules include elaborate provisions for issue,renewal and suspension of dealers licence. Rubber Board is vested with all the powers relating to control and regulation of rubber dealings including powers for enforcing legal provisions related to these basic functions. In brief rubber trade is controlled and regulated.

Growth of dealers

The increase in the number of dealers over the years sigificatly in the last decade has been indeed phenominal. There were only 608 dealers in 1965-66 which has shot up to 2036 by 1975-76. The increasing tempo was maintained further and by 1981-82 there were 3670 dealers licensed by the Rubber Board.

Locational Distribution

Since Kerala accounts for over 90% of the natural rubber production in the country it is natural that bulk of the dealers are found in this State. The locational distribution of dealers is depicted in table 1 and 2.

Nearly 83% of the dealers are found in Kerala. Among the remaining a sizeable number is in the Kanyakumari District of Tamil Nadu which is also a predominant rubber growing area.

In table 2 the locational distribution of rubber dealers in Kerala is presented. Besides an attempt is also made to find out the extent of coverage of growers by the dealers in each district.

The table indicates that on an average a dealer covers 50 growers. Except in Alleppey District the average number of growers covered is less than 100. However in the case of Alleppey district rubber estates are widely scattered, and in areas of concentration there are enough dealers to cater to the needs of the growers around. In brief the coverage is quite satisfactory by any standard.

Classification of Dealers

A rigid classification of dealers according to the system of operation is indeed very difficult

TABLE 1

Year	No. of dealers in Kerala	No. of dealers on other States	Total No. of dealers
1965-66	505 (83%)	103 (17%)	608
1975-76	1756 (86%)	280 (14%)	2036
1980-81	3041 (84%)	600 (16%)	3641
1981-82	3047 (83%)	623 (17%)	3670

TABLE 2

District	Total No. of growers (Estates and small holdings)	No. of dealers in 1980-81	No. of growers covered by each dealer on an average
Trivandrum	5497	155	35
Quilon	21224	532	40
Alleppey	4961	47	106
Kottayam	61907	1306	47
Idukki	12320	155	79
Ernakulam	17549	392	45
Trichur	1647	26	63
Palghat	2124	38	56
Malappuram	4137	64	65
Kozhikode	6745	137	49
Cannanore	12946	189	68
TOTAL	151057	3041	50

mainly because the mode of purchases and sales of dealers are not always identical and uniform. However a broad classification is possible. Rubber dealers can be classified into three groups such as primary, middle and big. Primary dealers operate at the village level collecting sheet and scrap rubber from the growers in and around his place of business. He is the course through which bulk of small holders rubber is channelled. The rubber thus bought by him is brought to towns once in a week or fortnight and sold usually to middle dealers or to big dealers. Yet another peculiar feature is that at the level of the primary dealers there is no grading as such. The entire quantity is sold as lot to middle dealers for a marginal profit. Middle dealers buy mainly from Primary dealers and from estates. They in turn sell the rubber thus collected to big dealers. Grading often starts at the level of the middle dealers. Big dealers operate big estates. The rubber is suitably graded and packed at the level of the big dealers and sold to final consumers either directly or through their branches. The above analysis in brief shows the marketing chain linking the producers and the consumers. The trader, it is obvious, is the vital link in this chain.

Strict classification of dealers as primary, middle and big is difficult as explained. However, dealers could be grouped according to the volume of their purchases as shown below:

Dealers who purchase upto 50 tonnes per year can be normally treated as primary dealers. Accordingly 70% of the dealers are primary dealers. Those who purchase between 50 and 250 tonnes annually may be taken as middle dealers. They form 20% of the total. The remaining 10% constitute big dealers of which 2% are the biggest having sales over 1000 tonnes per year.

Branches and Agencies

An analysis of the marketing chain developed by big dealers for effecting sales to consumers in the most expeditious way, would highlight the importance of branches. Bulk of the big dealers are located in Kerala and they operate branches at important rubber consuming centres like Bombay, Delhi, Calcutta, Jullundur etc. Similarly big dealers with headquarters outside the State of Kerala usually operate branches in Kerala Kanyakumari. As per the Rubber Rules 1955' approval from the Rubber Board is required for opening branches. Sufficient office and godown facilities are required for obtaining approval for branch licence from the Rubber Board. Similarly there is also agency system. Dealers act as the agent of other dealers/manufacturers. Here again the approval of the Rubber Board is required. In the agency system the agents make purchases on behalf of the principals and transfer the goods to them. The agents are paid a commission ranging from 0.5 to 1% on the total turnover. Besides, big dealers operating at town also open purchase depots at important rubber producing areas for purchasing rubber. This is also done with the permission of the Rubber Board. The rubber market also consists of brokers whose main job is to bring the buyer and seller together. Brokers are found to be active in Kottayam and Cochin markets.

TABLE 3

Purchase in metric tonnes	No. of dealers	% in terms of total number of dealers.
10 and below	1603	44
Above 10 and upto and including 25	519	14
,, 25 ,, 50	433	12
,, 50 ,, 100	371	10
,, 100 ,, 250	371	10
,, 250 ,, 500	185	5
,, 500 ,, 1000	109	3
Above 1000	79	2
TOTAL	3670	100

Role of Rubber Traders

From the above marketing and trading mechanism the role of the rubber trading community is amply clear, that it is basically a service oriented organisation. Its service activities commence in the field of procurement of rubber in all grades and types from the small growers at the village level and extend into asssitance of various type i. e., offering financial help and providing manure and other chemicals, pesticides and tools needed in rubber production to the growers are such services which only the growers at large appreciate and count upon.

As already explained that there is a well spread out net work of dealers in villages from where the bulk of rubber produced in the country originates. The competition between the dealers from village level upto the active trading centres are to ensure a reasonable price to the growers. It is also a fact that on the average the dealers gross margin is hardly 1% due to intensive competition.

The system of advancing money against stocks is yet another incentive provided by the dealers. So the grower has no necessity to borrow money at high rate of interest and on the contrary he can count upon his stocks with the dealers as a safe asset which can be converted

into cash as and when it suit his fancy.

This age old practice even the modern banking has not been able to disburb. This itself speaks that rubber dealers are inseparable link in the rubber industry.

In this context it is interesting to note that natural rubber is of 31 different grades as per the Green Book, while in India there are 63 grades of various processed and unprocessed rubber. Out of these only 39 grades of natural rubber are directly consumed by the rubber consuming industry. The rest are not consumable as such, which the Rubber Dealers convert into marketable and readily consumable grades for rubber industry by processing in Crepe Mills.

Most often the Rubber Dealers are accused of exploitation and twisting of prices to reap sumptuous profits out of situations deliberately created by them. But it is not true. It is a common experience that market price of any commodity including rubber is the actual price. It is arrived at through negotiation by the seller and buyer, which is the direct result of the inter play of forces of demand and supply. Therefore practically no scope is left for any exploitation by the dealers. This misunderstanding, I wish to erase from the minds of all interests connected with Rubber Industry.

This takes us to the other sector of our services, which we extend with the service zeal and sincerity to the rubber consuming industry. Our record of services to that sector is equally creditable and protective through this marketing mechanism, we make this basic raw material available to the industry at their door steps throughout at the most competitive rates. By virtue of prompt and dependable services and fair dealings, the rubber dealers have become indispensible part of Rubber Industry.

Rubber Trade and marketing is as old as rubber plantation, it is evidently growing in volume and widening in scope along with the natural rubber. However, with the inception of Rubber Act and Rules rubber trade has been systematised regulated and controlled to suit to the changing fabric of rubber industry.

Conclusion

The rubber trade and marketing like any other trade thrives on the good will of converging interest in its bosom, whose welfare & betterment, it aspires to serve. Therefore it extends its both hands of co-operation, service and assistance at all levels and at all times to its beneficiaries because the motto of rubber trade is "SERVICE BEFORE SELF" and to SERVE TO GROW and GROW TO SERVE deeply involved in the progress, prosperity of both interests.

With the service emphasis, we always extend our co-operation to the Rubber Board from where we owe our existence and survival under all circumstances in order to discipline and streamline the rubber trade for the benefit of all. □

RECESSION OR NOT, SMR STILL IN DEMAND

Prevailing recession in consuming countries did not deter consumer demand for Standard Malaysian Rubber, the exports of which set a new record last year. A Total of 649,273 tons was exported by Malaysia, exceeding the total SMR shipments in 1981 by more than 20,000 tons. It was an impressive performance for SMR, but, by far more impressive is the performance of a relatively new grade of SMR, the General Purpose Standard Malaysian Rubber or SMR GP. Consumer uptake of this grade jumped four-fold from 1,019 tons in 1981 to 4,506 tons last year. Malaysia is currently the sole producer of this SMR grade which gives the consumers a ready-mixed blend of high quality latex-type rubber and field coagulum. It contains no oil additive.

The United States was still the top consumer of SMR last year. However, its imports declined by nearly 23 percent from 92,498 tons in 1981 to 71,437 tons in 1982. The lower grade SMR 20, which derives from field grade material, made up 40 percent of the imports. The other leading consumers of SMR were Italy with 53,920 tons, (41,822 tons), the United Kingdom 49,059 tons (39,495 tons), South Korea 43,357 tons (28,825 tons) and West Germany with 43,159 tons (31,399 tons). (Natural Rubber News)

NEWS IN PICTURES

THE NATIONAL RUBBER CONFERENCE

A view of the participants

Shri VP Singh, Union Minister of Commerce addressing the concluding session. Shri MM Jacob, M. P. State Ministers E Ahamed, KM Mani, Chief Minister Shri K Karunakaran, Shri TP Seetharaman, Minister Shri AL Jacob and Rubber Board Chairman Shri PJ Thomas are also seen.

Inauguration of the National Rubber Conference by the Acting Chief Justice Shri K Bhaskaran.

The National meet of the rubber growers at Kottayam on 4th February 1984 organised by the Indian Rubber Growers' Association discussed among other things a variety of topics pertaining to the problems of rubber growers as a whole especially in the context of the growing importance of a national dialogue between producers and manufacturers in solving major issues confronted by both the sectors. Those who addressed the gathering included Hon'ble Commerce Minister Shri VP Singh, Chief Minister of Kerala Shri K Karunakaran, Acting Chief Justice of Kerala Shri K Bhaskaran, State Ministers and important persons from Rubber Board and Rubber Plantation Industry.

The participants paid glowing tributes to Shri K Joseph Monipally who organised the rubber meet.

Shri K Joseph Monipally addressing the concluding session.

HEAD QUARTERS BUILDING FOUNDATION LAID

Shri VP Singh, Union Minister of Commerce laying the foundation stone. Near him are Shri K Karunakaran, Chief Minister of Kerala Shri PJ Thomas, Chairman, Rubber Board and Shri BK Nair M.P.

The foundation stone of the six-storey building complex to house the Head Quarters of the Rubber Board was laid by Shri Viswanath Pratap Singh, Union Minister for Commerce on 4th February 1984. Shri K Karunakaran, Chief Minister of Kerala presided over the function.

Addressing the colourful function, the Minister ruled out any monopoly procurement of rubber or fixation of a ceiling to rubber price. He also promised that the import of rubber would only

On the dais: Shri KM Mathew, Shri BK Nair, Shri KA Ayyappan Pillay, Chief Minister Shri K Karunakaran, Commerce Minister Shri VP Singh, and Chairman Shri PJ Thomas.

Union Minister lighting the traditional Kerala lamp

to the extent needed to fill up the gap between availability of rubber and the demand for it. The Chief Minister promised to extend all help for the well being of the rubber growers. S/Shri KA Ayyappan Pillay, Municipal Chairman, KM Mathew, Chief Editor Malayala Monorama and PS Habeeb Mohammed, Vice-Chancellor of Kerala University spoke on the occasion. Shri PJ Thomas, Chairman, Rubber Board welcomed the gathering. Shri BK Nair M.P. proposed a vote of thanks.

Earlier the Hon'ble Minister visited the Head Office of the Rubber Board in Sastri Road where he was given a warm welcome by the Chairman and staff.

A view of the audience.

Spray Conference

Addressing the spray conference held on 27th February 1984 at the Rubber Research Institute of India, Shri PJ Thomas, Chairman announced that the Board was exploring all possibilities of using fixed wing aircrafts for spraying. Two pilots had already visited some of the estates. The Chairman informed that the Union Commerce Minister had requested the Ministry of Agriculture for making available as many aircrafts as possible for the next rubber spraying season. The Rubber Board has also approached many companies for developing a suitable ground spraying equipment for use in rubber plantations and M/s. Shaw Wallace and Company had developed one such machine.

Dr. MR Sethuraj, Director of Research in his welcome address requested the planters to extend their co-operation in collecting their data on crop loss due to abnormal leaf fall disease from the areas which are left unsprayed. Last year due to paucity of helicopters 30,000 hectares were left unsprayed and resulted in an estimated crop loss to the tune of 10,000 tonnes.

A total area of 39,084 hectares were aerial sprayed in the 1983 season. An estimated area of about 10,000 hectares were sprayed with micron sprayers and 55,000 hectares by high volume spraying. Thus a total area of 1,04,000 hectares were sprayed against abnormal leaf fall disease in 1983 season. In that season, about 30,000 hectares booked for aerial spraying could not be sprayed due to want of sufficient number of helicopters. Eventhough 10 helicopters were brought for aerial spraying two of them crashed, one two days and the other a month after starting operations. Others had frequent breakdowns resulting in leaving considerable areas unsprayed. This would have resulted in a loss of about 10,000 tonnes of rubber costing over Rs. 14 crores.

Cost of spraying

In 1983 season, a total of 263 156 metric tonnes of oil dispersible copper oxychloride 56% powder, 22,857.5 litre 40% oil based copper oxychloride and 16,112.5 litre 40% water based copper oxychloride were used for rubber spraying. In addition to these, it is estimated that about 511 tonnes of copper sulphate was also used. Total quantity of spray oil used was 5,200 barrels. There was not much change in the cost of spraying chemicals and spraying charges during the 1983 season in comparison to that of 1982.

Incidence of abnormal leaf fall disease during 1983 season was rather severe due to repeated attack with the vagaries of weather condition and late monsoon. In unsprayed areas, heavy defoliation was noticed in August. In sprayed areas also, the leaf retention was not satisfactory. No disease incidence was found in Kanyakumari District as noticed in the previous year.

Climatic conditions which prevailed during the period May to August were congenial for the incidence of disease. There was continuous rainfall for a week to 10 days in July which caused mild disease incidence. The weather cleared up later but congenial weather appeared during middle of August. Recently a meeting was called by Joint Secretary, Ministry of Commerce to discuss the ways of countering the problems of inadequate helicopters. Import of new helicopters is not feasible in the near future. Hence, as an interim measure, the possibility of using fixed

wing aircrafts should be explored. Last week, two pilots of Department of Agricultural Aviation visited the rubber areas in Punalur, Mundakayam and Chalakudy. They are of the view that the terrain of rubber plantation is quite suitable for aerial spraying with fixed wing aircrafts. But the only problem is to have an airstrip of dimension 2,000 ft x 100 ft within 10 kilometres radius of areas to be sprayed. One such airstrip was located near Kodumon and Chandanapally Estates of M/s. Plantation Corporation of Kerala Ltd.

A new systemic fungicide specific to *Phytophthora*, Ridomil (Metalaxyl) was field tested. Combination products of this fungicide, Ridomil + 50 WP, Ridomil MZ 72 WWP, Ridomil copper 45 WP, Ridomil 5g., IOC oil with copper napthanate with 56% COC were tried. All these formulations were sprayed using micron sprayer at a dosage of 4 kg of total active ingredient per hectare. The leaf retention of the treatment plots were very poor (20 to 40%) compared to 80% in the control with recommended fungicide.

Tiga Fogging Machine

Using Tiga Fogging machine, fogging trials were carried out in 4 locations using copper oxychloride and oil mixture in 1:4 proportion at 20 litres per hectare. Satisfactory disease control was obtained only in one location. Compared with year before last year trials, it is found that a minimum of 25 to 30 litres of 1:4 mixture should be fogged for obtaining satisfactory results Field testing of Pulsfog could not be carried out successfully, as this machine is not quite suitable for fogging a suspension of copper oxychloride powder in oil. Metallic copper gets deposited in the delivery nozzle and clog the nozzle hole; and due to this there was frequent fire hazards.

Copper oxychloride 56% powder formulation manufactured by M/s Karnataka Chemical Industries Corporation, Pvt. Ltd., Bangalore and spray oil manufactured by M/s Gujarat Petrochemicals, Bombay and M s Raj Lubricants Madras and spray oil processed at Cochin Refinery by Indian Oil Corporation were field tested. Among these, except the spray oil of M/s Raj Lubricants, other products were found to be useful for giving good leaf retention and these products are being recommended for large scale use in rubber plantations.

As in the previous years, crown budding experiment plots in three locations were left unsprayed during 1983 season also. Leaf retention was found to be extremely good in crown budded plots in comparison to the sprayed control plots. Yield recording was done on an enlarged sample of 30 trees per plot and the yield was more in crown budded plants with the trunk RRIM 600 and RRIM 628 and less in GT 1; compared to control.

Seventeen plots of one hectare each in seventeen different locations at Kanyakumari District were protected with micron spraying of copper oxychloride 56%, 8 kilograms in 40 litres of oil. Since, there was no incidence of abnormal leaf fall disease in this area, the leaf retention in sprayed and unsprayed areas was almost similar. It is concluded that regular spraying is not required in Kanyakumari District.

At the 99th Rubber Board meeting held on 4th May 1983, it was decided to institute an award of Rs. 25,000/- to any individual or organization developing a good ground sprayer for rubber. The efforts made by M/s Shaw Wallace and Co., bore some good results. Their Microspray Power 400 developed recently has improved features over their previous model Shaw duster cum sprayer. The new model has been tested by RRII and recommended for use in rubber plantations.

Import duty

Shri. R. V. Narasimhan from M/s Peirce Laslie India Ltd., informed that they could cover only 42,000 hectares out of the 60,000 hectares contracted for aerial spraying using 5 helicopters during 1983. This year six helicopters would be made available for spraying by his company. He requested the Rubber Board to plead with the Government for reduction of import duty for helicopter spare parts.

Shri. S. Ramankutty from M/s Harrisons and Crossfield India Ltd., stated that they have carried out aerial spraying in 38,000 hectares out of 40,000 hectares contracted but the results were not quite satisfactory due to delayed rains. He suggested that glider spraying and Microlite aircraft may be experimented on rubber plantation and requested the Rubber Board to investigate the possibilities.

Subsidy

Shri. T. V. Joseph from Kerala State Co-operative Rubber Marketing Federation informed that they could not keep up last years promise to make helicopters available for rubber spraying. However they could manage to cover 2,000 hectares by approaching other aerial spraying companies. He expressed the hope that 2 helicopters would be made available during 1984. He also requested the Rubber Board to extend the subsidy for buying the new machine developed by M/s. Shaw Wallace & Co.,

Shri. A. Ramachandran from M/s Plantation Corporation of Kerala Ltd., informed that they could not do aerial spraying in Perambra estate due to shortage of helicopters and the leaf fall and resultant yield loss were severe. He demanded that the Rubber Board may extend subsidy for aerial spraying also. He also expressed his apprehension to take up large scale aerial spraying using fixed wing aircrafts.

Shri. T. Upendran from M/s A. V. Thomas & Co., informed that 4,000 hectares were sprayed during 1983 season. Eventhough, the results were satisfactory, two estates did not perform well resulting in considerable reduction in yield, which he attributed to severe drought. sixty hectares were sprayed using Shaw Wallace Duster cum sprayer and the results were satisfactory.

The representative of Rehabilitation Plantation Ltd., informed that they had aerially sprayed 1,211 hectares at micron dose and 602 hectares at half dose and could obtain 50-75 percent leaf retention.

Shri. H. Dakyanaik from Karnataka Forest Plantation Corporation stated that they could not undertake aerial spraying in 1983 and the yield loss was 0.8 to 43 percent consequent to severe leaf fall.

Shri. V. R. Chitrapu from Tamil Nadu Govt. Rubber Plantation sought the advise of RRII experts on aerial spraying against *Oidium*. He also requested for allotment of one helicopter to Kanyakumari District as a safeguard against the outbreak of *Phytophthora* leaf fall diseasd in that region. He also expressed that fixed wing aircraft spraying would be ideal for rubber plantations in Tamil Nadu.

Non-availability

Shri. S. Gopalakrishnan from State Farming Corporation of Kerala informed that they could spray 462 hectares under young rubber plants using motorised knapsack sprayers.

Shri. Madhava Menon from Cochin Malabar Estates & Industries Ltd., said that two of their estates could not be sprayed due to non-availability of helicopters during 1983. This resulted in some crop loss. He requested all concerned to make available only serviceable helicopters for the next spraying season.

Shri. M. T. Varkey from Kanjirappally Co-operative Rubber Marketing Society stated that the cost of chemicals used for rubber spraying are extremely high and could not be afforded by small holders. He requested the Rubber Board to extend the subsidy for buying 2 sprayers to each co-operative Society. Regarding the availability of Chemicals Shri. S. Srinivasan from M/s Travancore Chemicals & Manufacturing Co., Ltd., justified the current price of copper oxychloride by explaining the high cost of inputs for the manufacture of the fungicide. Due to this reason the cost of fungicides will be higher in 1984. He stated that thermal fogging with Pulsfog K3 fog generator done in large areas, failed completely. He opined that increased spraying efficiency in micron spraying could be obtained by the carrying workers. In this context he requested the Rubber Board to issue a handout for the planters, describing correct spraying techniques.

New spray oil

Shri. L. Natarajan from Indian Oil Corporation announced that a new spray oil with some fungicidal properties incorporated in it would be available in the market for the next spraying season. There will be no problem in supply of oil during 1984.

Shri. A. C. Govindan from M/s Rallis (India) Ltd., informed that they had supplied 112 tonnes of copper oxychloride during 1983 and would supply 120 tonnes during 1984.

Shri J. Devairakkam from M/s Shaw Wallace & Co., described the merits of the new sprayer developed by them and announced that the price of 'Microspray Power 400' model would be Rs. 12,012 /-. He informed that spare parts and service would be available to customers from the service centres at Kottayam, Ernakulam and Calicut and also from a mobile service unit in Kerala. He also offered to train the operators for maintenance of these sprayers by his company.

Shri. P. Mukundan Menon, Rubber Production Commissioner announced that a subsidy of Rs. 6,000/- would be made available from Rubber Board for buying the sprayers. This facility would be extended to registered associations of rubber growers having at least one year standing in addition to Co-operative Societies.

Glider spraying

Shri. P. N. Radhakrishna Pillai, Joint Director, RRII, in the concluding remarks clarified the points raised by the participants. He informed that the Research Institute has already initiated action for experimenting glider spraying in rubber plantations. In order to promote healthy competition among manufacturers, the Rubber Research Institute has issued certificates to many manufacturers of copper oxychloride and spray oil after large scale field tests. However, many of these companies failed to ensure a steady supply. He said that fixed wing aircraft spraying will prove very effective in combating abnormal leaf fall disease if suitable landing pads could be located and made available. He informed that aerial spraying against *Oidium* may not prove effective. Due to the heavy task on each helicopter during the spraying season, it would not be possible to allot helicopters to Tamil Nadu in anticipation of chance outbreak of leaf fall disease in that region. He also promised that a handout will be issued by the Rubber Research Institute describing proper use of sprayers and correct spraying techniques to achieve best results. He pointed out that the heavy loss of crop at Perambra and other estates, where spraying was not done during 1983, clearly indicate the severity of abnormal leaf fall disease and its effect on yield.

GROWTH OF RUBBER PLANTATIONS IN TRIPURA

Rubber plantations has opened up a new horizon of economic development for North East India with Tripura emerging as the pioneer State in this region. It now ranks next to Kerala, Tamil Nadu and karnataka in rubber production.

Rubber plantation was taken up in Tripura in 1963. And in 12 years over 400 hectares in small plots have come under rubber.

Following encouraging results, the National Agricultural Commission. recommended the formation of a Corporation mainly for raising large scale rubber plantations with institutional finance. The Tripura Forest Development and Plantation Corporation was registered in 1976 under the Companies Act with the object of cultivating rubber plantations on 500 hectares, maintenance of older plants, tapping, processing and marketing of rubber along with the task of raising citronella and bamboo plantations.

Resettlement of landless tribals:

Thus, large-scale planting of rubber began from 1976-77. The Corporation brought 4,646 hectares under rubber up to 1983, out of which 428 hectares accounted for resettlement of landless tribal families and ex-servicemen. Now there are 28 plantation centres of the corporation spread over the State.

Besides, private rubber plantations started coming up under the Rubber Board's plantation development scheme with about 742 hectares up to 1983. Thus the base level for development of rubber plantations in Tripura exceeded 5,000 hectares under Government and private undertakings.

According to a survey carried out by the Rubber Board, there is need for expansion of rubber plantation to stop an annual import of 30,000 to 40,000 tonnes.

As there was little scope in the traditional areas of the Southern States, North Eastern India with vast land resources was found suitable. The Rubber Board has recommended bringing 1.05 lakh hectares under rubber in this region - Assam 50,000 hectares. Tripura 30,000 hectares and other States and Union Territories 25,000 hectares.

Centre's Plan:

Except for Tripura, the other States have not made much headway. Upto 1983 a total of 7,600 hectares had been planted.

Tripura accounted for 5,389 hectares in order to harness the available resources in the North-East, the Centre is considering the implementation of a programme of rubber development on 94,000 hectares by the turn of the century. The estimated capital investment is Rs. 200 crores.

In Tripura the first project of the Corporation for raising 5,000 hectares is expected to be completed by 1985-86. The Government will launch a second project on 5,000 hectares in the Seventh Plan. Another corporation has started functioning from 1983-84 for the economic resettlement of landless tribal Jhumias.

At present, more than 350 hectares of rubber plantation is being tapped and the yield is anticipated to exceed 150 tonnes. Production of natural rubber from the older plants will reach 1,000 tonnes by 1986-87. Rubber cultivation is labour intensive and provides jobs for 1,200 daily labourers a hectare during the development stage, from the first year to the seventh year.

Now, more than 3,000 families are working in rubber plantations under the Tripura Forest Development and Plantation Corporation over 60 per cent of them are tribals.

Rubber Plantation works have not only created avenues for large-scale employment of labourers but have given birth to a distinct class of skilled workers from the traditional Jhumias within a short period of 10 years. Tribal women have been adapted to the grafting and nursery work. (The Hindu)

RUBBER SEED CAKE AS ANIMAL FEED

Rubber seed cake left behind after extracting rubber oil can be used as a protein and energy source in the animal feed concentrate for cattle, swine and other livestock. The technique for converting the seed cake into animal feed has been perfected by the All India Co-ordinated Research Project on agro-industrial by-products and the new finding can fetch an additional revenue of up to Rs. 125/- per hectare for the rubber growers.

DR. HW GREENSMITH RETIRED

Dr H W Greensmith retired from the Malaysian Rubber producers' Research Association on 23 January 1984, after a life-long career devoted to the service of natural rubber.

Bill Greensmith graduated in Physics from Imperial College, London, and carried out further research at London University leading to a PhD in 1949, before joining the Physics Group of the Malaysian (then British) Rubber Producers' Research Association. His early work in this field contributed to the understanding of the flow characteristics, rupture and tear of natural rubber.

In the early 1960s he became head of the Association's Physical Testing Group, and in the next few years was responsible for the development of the Relaxed Modulus Test and ring fatigue test methods. This period also marked the beginning of his involvement in the Standard Malaysian Rubber Scheme: he developed the Plasticity Retention Index, which is still used in the SMR scheme as a method of assessing the quality of raw rubber in terms of oxidation resistance.

In 1966 he was seconded to the Association's sister Institute in Kuala Lumpur, the Rubber Research Institute of Malaysia. For two years he headed the RRIM's Technology Group, part of the Chemistry Division. Following his return to the UK, Bill Greensmith joined MRPRA's Technical Advisory Service (TAS) and Development Division. In 1974 he became head of the TAS group, a position which he held for ten years until his retirement. During this period he gained an international reputation as an expert on rubber specifications. He has published over 20 papers, both on the physical properties of natural rubber and more recently on topics relating to market grades of natural rubber. □

FORM 4

Statement of ownership and other particulars about
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I, P. K. Narayanan, hereby declare that the particulars given above are true to the best of my knowledge and belief.

Kottayam, (Sd)
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THE QUARTER

The observation in most of the rubber producing countries is that natural rubber will continue to be a valuable and irreplaceable material. The climate of confidence obtaining in the world today could very well serve as a morale booster to the rubber planters. On their part, they have to concentrate on three main areas: good management, better use of cultivars and exploitation methods and increased use of high technology and mechanisation. This is increasingly significant especially when the land under rubber has already reached a static level and production through new areas becomes an impossible proposition. The only alternative is to increase productivity and product quality

New tyres for rapidly expanding Malaysian market

A NEW SERIES of heavy-duty commercial vehicle tyres, known as the G291, is to be introduced by Good year Malaysia Berhad (GMB). The tyres will incorporate an all-steel, wide-tread construction and use a natural rubber compound specially developed to give added safety and durability. Predicted operating life is up to two-and-a-half times that of existing truck tyres, and to add to this the tyres also have good retreading characteristics. According to GMB, demand is increasing from commercial fleet operators for high performance tyres, and trials by major fleet operators have shown that the new tyre reduces down time associated with faulty tyres.

Production of the new tyre has been made possible by a £19 million expansion programme at GMB's Shah Alam factory, expected to be completed later this year. A key factor in the expansion has been the installation of a 'duplex' hot/cold feed extruder capable of handling 4500kg of raw material an hour. This ultramodern extruder produces sheet compound suitable for a whole range of motorcycle, passenger car and truck tyres, including the NCT passenger steel radial. When the new facilities are fully commissioned, the factory will be able to produce over 6000 tyres a day on three-shift working.

Dunlop Malaysian Industries Berhad (DMIB) has also announced a new tyre, a steel-belted radial for the Malaysian market, to compete with the locally-produced Goodyear NCT and imported Japanese tyres. Dunlop's tyre, the *Steelmax*, is currently being supplied to assemblers, and is fitted to the Mitsubishi Tredia 1.6. It will be fully launched as original equipment in September with replacement market sales following later. In 1982 steel-belted radials accounted for 15 per cent of Malaysian replacement tyre market, an increase of 2 per cent over the previous year.

The Dunlop Steelmax (right) and the Goodyear G291 (left). The run-flat Dunlop military tyre, available in two sizes, can run a minimum of 50km at 50km/h when completely deflated.

Dunlop Malaysia have been doing well with other types of tyres recently. A military run-flat tyre developed and manufactured by DMIB has just won the 1983 Federation of Malaysian Manufacturers award for new and improved product development. Eight criteria are taken into account for the award, including innovation and creativity, usage of local content, durability, economy, and contribution of the product to the enhancement and modernization of the manufacturing sector.

DMIB took three years to meet the design objectives, which were to give the tyre full manoeuvrability up to 50 km/h over a distance of 50 km under full combat weight. Tests by the Malaysian army have resulted in the tyre being approved for use in its armoured units, and an initial order worth £50 000 has been received from another South East Asian country. No synthetic rubber is used on the tyre which contains 82 per cent local material, only the nylon tyre cord and some rubber chemicals being imported.

DMIB, the only company in Malaysia making military run-flat tyres, also recently won a £250 000 contract for off-the-road tyres in Eastern Europe against fierce international competition. The order, for extra-large earthmover tyres, destined for the mining industry, will enable DMIB to gear up production capacity to meet anticipated increase in demand for this type of tyre when the recession ends. □

FRONTIERS IN GENETICS*

Dr. Y. ANNAMMA

The XV International Congress of Genetics was held in New Delhi from 12-24 December, 1983. This mammoth congress of Genetics is held only once every five years. The XIV congress was held in Moscow (1978) and the XVI will be held in Canada (1988). This is the first time this congress is held in a developing country and the credit of choosing India as the venue goes to Dr. M. S. Swaminathan, our most distinguished agricultural scientist.

The scientific programme of the congress was inaugurated by our honourable Prime Minister Mrs Indira Gandhi. Dr. M. S. Swaminathan delivered the key-note address of the congress: 'Genetic conservation— from microbes to man'. He stressed the need for the conservation of genetic stocks of plants and animals and also emphasised the importance of exploratory efforts to identify and conserve dwindling genetic stocks for the future.

The scientific programme included three plenary sessions based on broad general interest viz. (i) Genetic Engineering, (ii) Biotechnology and its varied applications and (iii) Genetics and Society. The scientific sessions comprised of invited lectures, contributed paper sessions and poster sessions. Renowned scientists from different parts of the world gave lectures during the conference. Over 150 such lectures covered a wide range topics. The talks by nobel laureates like Drs. H.G.Khorana, David Baltimore and H.O.Smith are worth-mentioning.

The contributed papers covered all important areas in the field of modern genetics. They were presented and discussed in 34 sessions which formed a major part of the congress. In addition, there were a number of poster sessions, a few pre- and post-congress satellite symposia, panel discussions and evening lectures on selected topics.

It was after the rediscovery of Mendelism in 1900 that genetics became established as a science. The landmarks in the history of modern genetics can be traced back to this event. Although Avery and his colleagues (1943) proved that deoxyribonucleic acid (DNA) is the substance of the gene, the manner in which it functions was not known until Watson and Crick (1953) discovered the three dimensional structure of the DNA molecule. In the 1960's geneticists cracked the genetic code. The sixties also saw the artificial synthesis of the gene. In 1973 it was discovered that the DNA molecule could be cleaved at desired sites using a set of enzymes, the pieces joined with another enzyme and the spliced material put back into the parent cells. Now methods for the identification of specific genes on chromosomes and their nucleotide sequences are available. This rapid progress in molecular and cellular biology, when applied in higher plants could revolutionise modern agriculture.

The need to preserve natural genetic diversity which is being threatened by deforestation and monoculture was stressed by different scientists. One possible danger of monoculture of a few high yielding varieties of important crops in a geographical area is the narrowing down of genetic variablility which in due course may lead to disease and pest epidemics. The disastrous corn leaf blight disease of the USA in 1970 as a consequence of cytoplasmic uniformity (which none could foresee) is worth mentioning in this context. Natural diversity is a useful source of individual alleles that confer adaptive advantages such as resistance to diseases and pests or physiological characters like insensitivity to day length.

The importance of introduction of genes from wild relatives for improving crop productivity was stressed by Prof. K. J. Frey of Iowa State University. Primary gene pools of crops like oats, barley, sorghum and pearl millet have proved to contain wild genes of potential value for crop improvement.

Much of the improvement in yield potential in the sixties resulted from the redistribution of dry matter in wheat and rice so that the products of photosynthesis were diverted more for grain production. This has helped to increase the harvest index of these cereals; for example, the harvest index of traditional wheat is 25%, in the dwarf varieties 45% and in the modern dwarf varieties it is 50%. However, there is a limit for the

* Report of the XV International Congress of Genetics.

redistribution of dry matter and increasing the harvest index. This would necessitate modified approaches to harness available resources and it was revealed in the discussions that efforts are in progress to increase the photosynthetic efficiency of certain crop plants and also to increase the partitioning of assimilates.

Recent advances in plant tissue culture have found various applications in agriculture. Cells of numerous species of higher plants can be cultured, though with varying degrees of efficiency, on definite media consisting of inorganic salts, trace elements, certain organic constituents, a carbon source and plant growth regulators. Plantlets of certain orchids, ornamentals, fruits trees vegetables and oil palm are being propagated commercially by tissue culture. Pioneering work for the *in vitro* multiplication of forest trees like eucalyptus, teak and bamboo has been carried out in India. In crops like turmeric, ginger, cardamom, diascorea, citrus, santalum, sugarcane and papaya the contribution from India deserves special mention.

Conventionally, turmeric and cardamom are propagated through rhizomes which yield a few plants per year. Tissue culture technique has proved to be of much value for the mass multiplication of such crops. In the National Botanical Research Institute, (Lucknow) a technique has been developed by which over 2,560,000 clonal plants of *Disocorea floribunda* could be produced through single node stem cutting in one year as compared to only 8 to 10 plants by the conventional method of propagation. Similarly, over 1000 trees of citrus could be mass multiplied from proliferating shoots at very fast rate in one year. Such plants raised from *Citrus aurantifolia* produced normal fruits under field conditions. Similarly triploids of *Santalum album* were raised from endosperm culture. The sugarcane variety Co 740, predominantly planted in Maharashtra is susceptible to mosaic disease resulting in gradual decrease in yield. By shoot meristem culture of infected plants, several virus-free plants were obtained which also yielded 15% more cane over four generations in comparsion to the control. Over 40 ha are now under cultivation with this newly developed cane material.

In Eucalyptus vegetative methods of propagation are not successful and seed grown progeny shows wide variations. Tissue culture techniques were developed at the National Chemical Laboratory (Pune) where about 20,000 plantlets could be obtained from a single bud in an year. Similar is the case of teak, where vegetative propagation is difficalt and slow. By tissue culture over 500 viable plants were produced from a single bud per year which were transferred to forests to study their performance.

Cultivated papaya (*Carica papaya*) is highly susceptible to papaya mosaic virus (PMV) whereas a wild specie *C. cauliflora* is resistant. Transferring the resistance genes from the wild to the cultivated species through inter specific hybridisation is not successful because of post-fertilisation incompatibility barriers. The hybrid embryos were found to abort *in vivo*. By embryo culture technique, the hybrid embryos were cultured and the resulting plants transferred to the field. It was informed that all F_1 plants were found to be resistant ro PMV.

Plant cell culture is not restricted to the somatic cells of plants but includes the male gametophyte also. The technique of anther culture which gives rise to haploid plants either directly or through the formation of haploid callus was pioneered by Guha and Maheswary (1964) in *Datura* and extensively developed by Nitsch in tabacco. Haploid plants can be produced by anther culture of many species including several crops like rice, wheat and barley. In a conventional breeding programme five to six generations are required to produce a homozygous line from a genetically heterozygous population. But using anther culture techniques it is possible to produce haploids in abundance and later double the chromosome number of halpoid using an alkaloid like colchicine. Thus homozygous diploid plants can be produced in a much shorter period. Such plants have great significance in plant breeding. The use of the doubled haploid technique automatically selects against any inviable gene combinations and also exposes mutations causing sterility.

Dr. Hu Han from the peoples Republic of China listed certain of their important contributions in the production and utilisation of haploids in fundamental and applied genetics. In about 40 species including wheat, corn, pepper, poplar, rubber, flax, strawberry, apple etc. pollen derived plants have been developed through tissue culture.

Using the anther Culture technique in combination with sexual hybridistation, several new varieties of rice, wheat, tobacco etc. and inbred lines of corn were also reported to be developed in recent years in China. Anther culture technique for hybrid rice has made much progress recently. Four out of six pollen plants derived from the F_1 anthers of hybrid rice 'Shan You No.2' were found to have phenotypic and economic traits very much similar to those of the donor plants. This would ultimately save the trouble of producing hybrid seeds.

Somatic cells can be fused to produce new genetic combinations. Fusion can

(Contiuned on page 34)

NATURAL RUBBER IN INDONESIA

Indonesia is the second largest producer of natural rubber in the world. The share of Indonesia's production of natural rubber in the world's total production averaged 25.0% during the the period from 1978-1981. Of the total production of rubber there, 92.56% is exported. The natural rubber contribution to the foreign exchange also comes to about 18.3%. Of the rubber produced there, indigenous consumption accounts for only around 7.45%.

The greater part of the rubber plantations in Indonesia belong to small holders with an area covering an average of 81.2 per cent of the total area of rubber plantations there. The rest of the plantations belong to the large private estates and Government owned PNP and PTP, which on the average cover 10.5% and 8.3% of the total area every year. The following article issued by the Indonesian Embassy in New Delhi gives a good account of the growth and development of rubber plantations in Indonesia.

I. Introduction

The rubber tree 'Havea brasiliensis' is the producer of rubber latex and grows well in tropical regions. The uses of rubber latex have long been known, that is, for making tyres for motor vehicles, sports goods, medical equipment and other needs.

Rubber trees need a hot climate of considerable humidity with a temperature of around 25 to 30°C. In Indonesia, rubber is planted in areas with a height of between 1 to 600 metres above sea level, with an annual rainfall of around 2,000 to 2,500 mm spread evenly throughout the year. Rubber can grow and produce well in soil that is not very fertile, although fertile soil with a pH value of 5 to 6 is better suited to rubber trees.

Indonesia is the second largest producer of rubber, coming after Malaysia, even though in the period of 1978-1982, its production declined by an average 0.4% a year. The highest level of production ever achieved by Indonesia was 989.4 thousand tons in 1980. The share of Indonesia's production of natural rubber in the world's total production averaged 25.0% a year in the 1978-1981 period.

Approximately 92.56% of the total production of natural rubber in Indonesia is exported As one of the sources producing foreign exchange for the state, natural rubber has an average share of 18.3% year in the total value of Indonesia's exports outside of oil and natural gas. The highest share ever reached was 19.5% in 1980, with a value of US $ 1,165.3 million.

However, with the fall in world prices for natural rubber in recent years, there has also been a decline in the foreign exchange proceeds from natural rubber exports. The principal countries of destination for Indonesia's exports of natural rubber are the United States of America, Singapore, West Germany and the Soviet Union. The kinds of rubber exported are mainly crumb rubber, latex, sheet rubber, crepe rubber, etc.

Besides exporting natural rubber, Indonesia also imports rubber, especially of the kinds not yet produced here, in the form of synthetic rubber and other manufactured products. Only around 7.45% of the total production of natural rubber is used to fulfil Indonesia's domestic requirements.

II. Production and area of Rubber Plantations

A. Production

Developments in the production of natural rubber in the 1978-1982 period showed a decline of an average 0.4% a year, falling from 885 thousand tons in 1978 to 861 thousand tons in 1952 This decline was chiefly due to the fact that the production of natural rubber by Small-holders Estates suffered a decline of an annual average of 2.3% during the 1978-1982 period, even though the estates managed by large private estates and by the government owned estates known as PNP and PTP showed an increase in production of an average of 2.9% and 4.1% a year respectively. However, in view of the fact that Smallholders Estates produce an annual average of 67.8% of Indonesia's output of natural rubber, if the natural rubber production of the Smallholders Estates falls, the result will be a decline in Indonesia's total output.

Looking at the developments in the production of natural rubber every year, we see that the highest production of natural rubber in the period 1978-1982 was reached in 1979, with an increase of 8.9% from 885 thousand tons in 1978 to 964 thousand tons in 1979. The extent of this increase was due to increases in the production of natural rubber of 9.9%, or 60.7 thousand tons from Smallholders Estates, of 10.2% or 11.2 thousand

tons from the Large Private Estates and of 4.4% or 7.1 thousand tons from the PNP and PTP, comparing the figures for 1979 as against those of 1978.

In 1980, Indonesia's production of natural rubber showed an increase of 2.6% so that output became 989.4 thousand tons, but in 1981 and 1982 production began to show a decline. Among the reasons for this were the fall in the price for natural rubber on world markets, a very long dry season in Indonesia and the fact that aging trees became unproductive whilst the trees planted in rejuvenation programs had not come into production yet. Complete developments in the production of Indonesia's natural rubber can be seen from Table 1 below:

Meanwhile, world production of natural rubber from 1978 to 1981 rose by an average 0.9% a year, that is, from 3,714 thousand tons in 1978 to 3,807 thousand tons in 1981. In the same period, Indonesia's production of natural rubber rose by an average 3% a year, whilst that of Thailand rose by an average 3.2% a year, and, in contrast, the production of natural rubber by Malaysia and Srilanka fell respectively by 0.4% & 5.0% a year. The natural rubber produced by Malaysia, Indonesia, Thailand and Srilanka on the average covers 84.4% a year of the total production of natural rubber in the world, while the balance of 15.6% is produced by such other countries as Brazil Burma India and so forth. As the second largest producer of natural rubber in the world, Indonesia produces an annual average of 25% of the world's total production of natural rubber. Developments in the complete world production of natural rubber are shown in Table 2, as follows:

B Area of Rubber Plantations

The greater part of the rubber plantations in Indonesia belong to Smallholders Estates, with an area covering an average 81.2% of the total area of rubber plantations in Indonesia. The rest of the plantations belong to the Large Private Estates and the Government-owned PNP & PTP, which on the average cover 10.5% and 8.3% of the total area every year. In 1978, the total area of rubber cultivation covered 2,313 thousand hectares, which rose to 2,473 thousand hectares in 1982. If the total area of rubber plantations is viewed from the angle of the type of estate, we see that, in 1982, the area of the Smallholders Estates was 1,996 thousand hectares, whilst the Large Private Estates and the PNP & PTP covered respectively 245 thousand hectares and 232 thousand hectares.

The increase in the area of rubber plantations during the 1978 to 1982 period was due to the success of the program to increase production through the intensification, rejuvenation and expansion of cultivated area and renovation for exports crop commodities (PRPTE program) with its two patterns of implementation, namely the Nucleus Estates for Smallholders and the Project Management Units (PIR and UPP).

The results of the rejuvenation conducted under this program can be seen from the fact that the area of rubber cultivation showed an increase every year, with an absolute increase in the area of the Smallholders Estates, as shown in the following Table:

C. Processing of Rubber Latex

The sap of the rubber tree is obtained by tapping the trunk and the extract is called latex. Depending upon how the latex is processed in the factory, various names are given to the resulting product, such as sheet rubber, crepe rubber, concentrated latex and crumb rubber.

Sheet rubber is processed from latex that has been congealed by a 1% solution of formic acid or a 2% solution of acetic acid. The congealed latex is then rolled out into sheets. The sheets are dried in a smoking house for about 3 to 5 days, at a room temperature of between 50-60° C. After drying, they are sorted by quality. Sheet rubber is known as RSS or Ribbed Smoked Sheet, of which there are 6 grades of quality.

Crepe rubber is processed from latex after refining and determining the dry rubber content (KKK: Kadar Karet Kering). It is then thinned out with approximately 20% water to which natrium bisulphite has been added to obtain a white coloured crepe. The liquid latex is congealed in tanks by adding formic acid or acetic acid. When congealed, it is cut up and is then rolled out to obtain sheets of crepe, which are then dried for 5 to 7 days at a temperature of around 33°C. When dry, the sheets are sorted into the different qualities known as white Crepe, Pale Crepe, Brown Crepe, Thin Brown Crepe, etc.

Concentrated latex is obtained by adding 3 to 5 grams of ammonia solution to every litre of liquid latex. The liquid latex is precipitated and then put into a centrifuge to produce latex with a dry rubber content (KKK) of 5%. It is then stored in tanks and is ready for export.

Crumb rubber or rubber with qualities according to technical specifications is processed from latex and smallholders rubber of low quality. The latex is refined and then precipitated in coagulation tanks by adding coagulants and white colouring matter. It is crumbed in a machine with rotary knives or a pelletiser, after which it is washed and then dried. It is then sorted by quality and packed. If the rubber being processed came from smallholders and is of low quality, such as slabs, scraps, etc., when it has been sorted, washed and cut up, it is put into a mill and crumbed by a pelletiser. The further process is to soak

Table : 1
Indonesia's Production of Natural Rubber
1978-1982
(In Thousands of Tons)

Year	Small holders Estates			Large Private Estates			Govt. owned Estates PNP & PTP			Total		
	Volume	Δ %	Share %	Volume	Δ %	Share %	Volume	Δ %	Share %	Volume	Δ %	Share %
1978	612.4	-	69.2	110.1	-	12.4	162.5	-	18.4	885.0	-	100.0
1979	673.1	9.9	69.8	121.8	10.2	12.6	169.6	4.4	17.6	964.0	8.9	100.0
1980	689.1	2.4	69.6	114.5	-5.6	11.6	185.8	9.6	18.8	989.4	2.6	100.0
1981	642.3	-6.8	66.7	127.5	11.4	13.2	193.4	4.1	20.1	963.2	-2.6	100.0
1982	549.1	-14.5	63.8	121.8	-4.5	14.1	190.1	-1.7	22.1	861.0	-10.6	100.0
Average	—	-2.3	67.8	—	2.9	12.8	—	4.1	19.4	—	-0.4	100.0

Source : Directorate - General of Estates.

Table : 2
World Production of Natural Rubber
1978-1981
(In Thousands of Tons)

COUNTRY	1978		1979			1980			1981		Average		
	Vol	Share %	Vol	Δ %	Share %	Vol.	Δ %	Share %	Vol.	Δ %	Share %	Δ %	Share %
Malaysia	1,607	43.3	1.617	0.6	41.8	1.600	-1.1	42.1	1,590	-0.6	41.8	-0.4	42.2
Indonesia	885	23.8	964	8.9	24.9	989	2.6	26.1	963	-2.6	25.3	3.0	25.0
Thailand	469	12.6	540	15.1	14.0	510	-5.6	13.4	510	-	13.4	3.2	13.4
Srilanka	156	4,2	153	-1.9	4.0	133	-13.1	3.5	133	-	3.5	-5.0	3.8
Others	597	16.1	593	-0.7	15.3	564	-4.9	14.9	611	8.3	16.0	0.9	15.6
Total	3,714	100.0	3.867	4.1	100.0	3.796	-1.8	100.0	3,807	0.3	100.0	0.9	100.0

Source : F A O Production Year Book, Directorate-General of Estates.

TABLE: 3
Area of Rubber Plantations in Indonesia
1978–1982
(In Thousands of Hectares)

Year	Small holders Estates			Large Private Estates			Government Owned Estates PNP & PTP			TOTAL		
	Area	Δ%	Share%	Area	Δ%	Share%	Area	Δ%	Share%	Area	Δ%	Share%
1978	1,871	—	80.9	253	—	10.9	189	—	8.2	2,313	—	100.0
1979	1,926	2,9	80.8	271	7.1	11.4	187	-1.1	7.8	2,384	3.1	100.0
1980	1,947	1,1	81.7	246	-9.2	10.3	190	1 6	8.0	2,383	—	100.0
1981	1,994	2,4	81.7	244	-0.8	10.0	202	6.3	8.3	2,440	2 4	100.0
1982	1,996	0,1	80.7	245	0.4	9.9	232	14.9	9.4	2,473	1,4	100.0
Average	—	1,6	81,2	—	-0.6	10.5	—	5.4	8.3	—	1.7	100.0

Source : Directorate - General of Estates.

TABLE: 4
Volume of Rubber Exports
by Kind
(In Thousands of Tons)

KIND OF RUBBER	1978		1979			1980			1981			1982			AVERAGE	
	Vol.	Share%	Vol.	Δ%	Share%	Vol.	Δ%	Share%	Vol.	Δ%	Share%	Vol.	Δ%	Share%	Δ%	Share%
CRUMB	568.8	66.0	571.6	0.5	66.4	658.3	15.2	67.4	563.5	-14.4	69.3	579.8	2.9	72.4	1.1	68.3
RSS	167.6	19.7	167.4	-0.1	19.4	191.8	14.6	19.7	163.6	-14.8	20.1	158.8	-2.9	19.8	-0.8	19.7
CREPE	67.7	7.9	72.2	6.6	8.4	60.8	-15.8	6.2	49.9	-17.9	6.2	21.9	-56.1	2.7	-20.8	6.3
LATEX	36.9	4.3	27.2	26.3	3.2	43.9	61.4	4.5	28.1	-36.0	3.5	36.9	31.3	4.6	7.6	4.0
OTHERS	20.5	2.4	22.6	10.2	2.6	21.3	-5.6	2.2	7.7	-63.8	0.9	4.0	-48.1	0.5	-26.8	1.7
TOTAL	861.5	100.0	861.0	-0.1	100.0	976.1	13.4	100.0	812.7	-16.7	100.	801.4	-1.4	100.0	-1.2	100.0

Source : Central Bureau of Statistics, Export Statistics.

it in a solution of phosphate acid or ammonia, and is then dried, sorted and eventually packed. From this processing of crumb rubber, rubber is obtained with technical specifications which, after testing in a laboratory, is known as Standard Indonesian Rubber (SIR).

The conditions that have to be fulfilled to obtain the SIR quality in conformity with the different degrees are as follows:

SPECIFICATIONS		QUALITIES				
		SIR-5L	SIR-5	SIR-10	SIR-20	SIS-50
Maximum dirt content	(%)	0.05	0.05	0.10	0.20	0.50
Maximum dust content	(%)	0.50	0.50	0.75	1.00	1.50
Maximum vaporizer content	(%)	1.00	1.00	1.00	1.00	1.00
Plasticity Retention Index Consummer limits minimum		60	60	50	40	30
Producer limits minimum		70	70	60	50	40
Comparative figure for Lovibond maximum		6	—	—	—	—

III. Exports of Natural Rubber

A. Volume

During the 1978–1982 period, the volume of Indonesia's exports of natural rubber declined by an average 1.2% a year, that is, from 861.5 thousand tons in 1978 to 801.4 thousand tons in 1982. This decline was due mainly to the fall in the export volume in 1981 and 1982 of 16.7% and 1.4% respectively.

Developments in the situation show that the largest volume of exports reached in this period occurred in 1980, with a volume of 976,1 thousand tons, while in the following years the decline already referred to took place.

Seen from the angle of the kind or rubber exported, it is evident that an average 68.3% of the total volume of rubber exported is crumb rubber, while the second largest volume of rubber exported is crumb rubber, while the second largest volume of exports is the RSS (Ribbed Smoked Sheet) rubber with an average 19.7% of the total volume, whilst the balance of exports is crepe, latex and other kinds such as gutta-percha, jeluton and finished rubber goods.

By country of destination, the greater part of Indonesia's exports of natural rubber, in the 1978–1982 period was sent to such countries as the United States of America and Singapore, and so it appears that developments in the following period will be greatly influenced by economic growth in these two importing countries. All developments in the volume of exports of Indonesia's natural rubber can be seen by kind in Table 4 below:

B. Value

During the period of 1978-1982, the value of Indonesia's exports of natural rubber declined by an average 6.2% a year, from US $ 715.5 million in 1978 to US $ 607.2 million in 1982.

During this period, the highest of exports achieved for natural rubber was in 1980, when the sum reached US$ 1,165.3 million.

In the total value of non-oil and gas exports from Indonesia, natural rubber exports have second place, coming after timber as producer of foreign exchange for the state.

In developments from 1978 to 1982, the rise or fall of the value of natural rubber exports was much influenced by the volume of exports and the prices current on world markets. The development of rubber prices on world markets these last few years has not been encouraging due to the economic recession that has overtaken the world, so that the world demand for natural rubber has fallen. Besides that, it appears that the marketing of Indonesia's natural rubber is limited to or controlled by just a few countries like the United States of America and Singapore as the largest consumers, followed by the Soviet Union, Japan, West Germany and other countries.

Tables 5 and 6 show complete developments in export values and prices for natural rubber.

Based on the figures of Table 5 in relation to developments in production for the same period, an average 92.56% of Indonesia's total production of natural rubber was exported to the United States of America, Singapore, the Soviet Union, Japan and West Germany, among other countries.

During the period of 1978 to 1982, the largest value of exports was that for the United States, covering an average of 36.5% a year of the total value of all Indonesia's exports of natural rubber. These exports to the United States displayed a fluctuating development, even though they

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Source : Directorate - General of Estates.

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Volume of Rubber Exports
by Kind
(In Thousands of Tons)

KIND OF RUBBER	1978		1979		1980			1981			1982			AVERAGE	
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Table : 5
Value of Rubber Exports by Country of Destination
1978-1982
(In US.$ Millions)

Country of Destination	1978		1979			1980			1981			1982			Average	
	Value	Share %	Value	Δ %	Share %	Value	Δ %	Share %	Value	Δ %	Share %	Value	Δ %	Share %	Δ %	Share %
U. S. A.	264.2	36.9	309.7	17.2	33.1	398.0	28.5	34.2	301.2	-24.3	36.0	256.5	-14.8	42.2	1.7	36.5
Singapore	292.1	40.8	397.2	36.0	42.4	447.4	12.6	38.4	286.7	-35.9	34.3	151.6	-47.1	25.2	- 8.6	36.2
Soviet Union	41.7	5.8	48.6	16.5	5.2	72.8	49.8	6.2	67.2	- 7.7	8.1	5.9	-91.2	1.0	- 8.2	5.2
Japan	22.4	3.1	33.6	50.0	3.6	43.6	48.8	3.7	31.0	-28.9	3.7	20.1	-35.2	3.3	8.7	3.5
West Germayy	16.1	2.2	29.3	82.0	3.1	40 2	37.2	3.5	20.7	-48.5	2.5	28.9	37.6	4.8	27.6	3 2
Others	80.0	11.2	118.4	48.0	12.6	163.3	37.9	14.0	129.0	-21.0	15.4	144.2	11 8	23.7	19 2	15.4
Total	716.5	100.0	936.8	30.7	100.0	1,165.3	24.4	100.0	835.8	-28.3	100.0	607.2	-27.4	100.0	- 0 2	100 0

Source : Central Bureau of Statistics, Export Statistics.

Table : 7
Volume of Rubber Imports by Kind
1978 - 1982
(In Thousands of Tons)

Kind of Rubber	1978		1979			1980			1981			1982			Average	
	Vol.	Share %	Vol.	Δ%	Share %	Vol.	Δ%	Share %	Vol.	Δ%	Share %	Vol.	Δ%	Share %	Δ%	Share %
Natural Rubber	1.2	4.5	1.2	—	3.8	2.0	66.7	4.7	2.5	25 0	5.3	0 5	-80.0	1.3	2.9	3 9
Synthetic Rubber	11.5	43.2	14.6	27.0	45.6	16.2	11.0	37.8	20.7	27.8	43.6	18.4	-11.1	46.0	13.7	43.3
Finished Goods	9.1	34 2	10.2	12.1	31.9	14.6	43.1	34.0	14.5	- 0.7	30.5	12.4	-14 5	31.0	10.0	32.3
Others	4.8	18.1	6.0	25.0	18.7	10.1	68.3	23.5	9.8	- 3.0	20.6	8.7	-11.2	21.7	19.8	20 5
Total	26.6	100.0	32.0	20.3	100.0	42.9	34 1	100.0	47.5	10.7	100.0	40.0	-15.8	100.0	12.3	100.0

S ource : Central Bureau of Statistics, Import Statistics

Table : 6

Prices of Natural Rubber (RSS) in New York
(In US. $ Cent/Pound)

Year	RSS-1	RSS-2	RSS-3	RSS-4
1978	54.00	53.25	42.50	52.00
1979	67.13	65.88	64.63	64.13
1980	68.50	65.50	64.00	63.00
1981	49.50	42.75	41.50	40.50
1982	42.50	40.75	40.00	39.25
1983*)	57.75	57.00	56.00	55.00

Source : Bank Indonesia, Weekly Report No. 1269, September '83.
Note : *) July 1983.

show an average increase of 1.7% a year. Viewing developments in the value of the exports to the United States from the angle of their share in the total value of Indonesia's exports of natural rubber, it can be seen that there is a tendency for a rise, especially as a consequence of the decline of exports to Singapore.

The second country of destination for the 1978-1982 period was Singapore, with the value of exports of natural rubber covering an average 36.2% of the total value of Indonesia's exports of natural rubber. But developments in the value in these exports to Singapore showed an average decline of 8.6% a year in consequence of the large fall in the value of exports to Singapore in 1981 and 1982. The highest value in the exports of natural rubber to Singapore from 1978 to 1982 occurred in 1980, when the value reached US$ 447.4 million.

The third country of destination for these exports was the Soviet Union, which, during the period of 1978-1982, received exports of natural rubber from Indonesia valued at an average 5.2 % a year of the total value of Indonesia's exports of natural rubber. Developments in the value of natural rubber exports to the Soviet Union fell by an average 8.2% a year, which was mainly the consequence of the very large decline of exports in 1982.

The fourth country of destination for exports of natural rubber was Japan, the value of which reached an average 3.5% a year of the total exports of Indonesia's natural rubber in the period 1978-1982. The developments in value of these exports to Japan shows an average increase of 8.7% a year, even though the value of natural rubber exports to this country suffered a decline in 1981 and 1982.

The fifth country of destination for the export of natural rubber was West Germany in the Period of 1978-1982, when the value of these exports covered an average 3.2% a year of the total value of Indonesia's exports of natural rubber. Developments in the value of natural rubber exports to west Germany showed an increase of an average 27.6% a year, except for 1981 when the value of the natural rubber exported to West Germany suffered a decline.

The other countries that are also recipients of Indonesia's exports of natural rubber are the United Kingdom, Netherlands, several East European countries and some others. The share of these countries in the total value of Indonesia's export of natural rubber was an average 15.4% a year for the period under discussion. Developments in the value of exports to these countries shows an average increase of 19.2% a year, with the exception of 1981, when the exports of natural rubber to these other countries fell, but later rose again in 1982.

IV. Rubber Imports

Besides being an exporter of natural rubber, Indonesia also imports rubber to meet its own domestic needs. Developments in the volume of rubber imported by Indonesia during the 1978-1982 period show an average increase of 12.3% a year, that is, from 26.6 thousand tons in 1978 to 40.0 thousand tons in 1982.

Of the kinds of rubber imported, the largest portion is in the form of synthetic rubber, the second being finished goods and the third being other kinds of rubber, with respective shares of 43.3%, 32.3% and 24.4% a year in the total volume of rubber imported by Indonesia.

Complete developments in the volume of rubber imported by Indonesia are shown by kind in Table 7.

Parallel to the developments in the volume of Indonesia's rubber imports, the value of rubber imported between 1978 and 1982 also showed an average increase of 23.2% a year, that is the value rose from US$ 37.5 million in 1978 to US$ 75.9 million in 1982.

By kind of rubber imported, the largest share in the value of imports is that for finished products, which covered 51.4% of the total value of rubber imported by Indonesia, whilst by volume this kind occupied second place, coming after synthetic rubber. Developments in the value of imported finished products rose by an average 19.7% a year, that is from US$ 20.5 million in 1978 to US$ 36.9 million in 1982.

Table : 5
Value of Rubber Exports by Country of Destination
1978-1982
(In US.$ Millions)

Country of Destination	1978		1979			1980			1981			1982			Average	
	Value	Share %	Value	Δ %	Share %	Value	Δ %	Share %	Value	Δ %	Share %	Value	Δ %	Share %	Δ %	Share %
U. S. A.	264.2	36.9	309.7	17.2	33.1	398.0	28.5	34.2	301.2	-24.3	36.0	256.5	-14.8	42.2	1.7	36.5
Singapore	292.1	40.8	397.2	36.0	42.4	447.4	12.6	38.4	286.7	-35.9	34.3	151.6	-47.1	25.2	- 8.6	36.2
Soviet Union	41.7	5.8	48.6	16.5	5.2	72.8	49.8	6.2	67.2	- 7.7	8.1	5.9	-91.2	1.0	- 8.2	5.2
Japan	22.4	3.1	33.6	50.0	3.6	43.6	48.8	3.7	31.0	-28.9	3.7	20.1	-35.2	3.3	8.7	3.5
West Germayy	16.1	2.2	29.3	82.0	3.1	40 2	37.2	3.5	20.7	-48.5	2.5	28.9	37.6	4.8	27.6	3 2
Others	80.0	11.2	118.4	48.0	12.6	163.3	37.9	14.0	129.0	-21.0	15.4	144.2	11 8	23.7	19 2	15.4
Total	716.5	100.0	936.8	30.7	100.0	1,165.3	24.4	100.0	835.8	-28.3	100.0	607.2	-27.4	100.0	- 0.2	100 0

Source : Central Bureau of Statistics, Export Statistics.

Table : 7
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1978 - 1982
(In Thousands of Tons)

Kind of Rubber	1978		1979			1980			1981			1982			Average	
	Vol.	Share %	Vol.	Δ%	Share %	Vol.	Δ%	Share %	Vol.	Δ%	Share %	Vol.	Δ%	Share %	Δ%	Share %
Natural Rubber	1.2	4.5	1.2	—	3.8	2.0	66.7	4.7	2.5	25 0	5.3	0 5	-80.0	1.3	2.9	3 9
Synthetic Rubber	11.5	43.2	14.6	27.0	45.6	16.2	11.0	37.8	20.7	27.8	43.6	18.4	-11.1	46.0	13.7	43.3
Finished Goods	9.1	34 2	10.2	12.1	31.9	14.6	43.1	34.0	14.5	- 0.7	30.5	12.4	-14 5	31.0	10.0	32.3
Others	4.8	18.1	6.0	25.0	18.7	10.1	68.3	23.5	9.8	- 3.0	20.6	8.7	-11.2	21.7	19.8	20 5
Total	26.6	100.0	32.0	20.3	100.0	42.9	34 1	100.0	47.5	10.7	100.0	40.0	-15.8	100 0	12.3	100.0

S ource : Central Bureau of Statistics, Import Statistics

Table : 6
Prices of Natural Rubber (RSS) in New York
(In US. $ Cent/Pound)

Year	RSS-1	RSS-2	RSS-3	RSS-4
1978	54.00	53.25	42.50	52.00
1979	67.13	65.88	64.63	64.13
1980	68.50	65.50	64.00	63.00
1981	49.50	42.75	41.50	40.50
1982	42.50	40.75	40.00	39.25
1983*)	57.75	57.00	56.00	55.00

Source : Bank Indonesia, Weekly Report No. 1269, September '83.
Note : *) July 1983.

show an average increase of 1.7% a year. Viewing developments in the value of the exports to the United States from the angle of their share in the total value of Indonesia's exports of natural rubber, it can be seen that there is a tendency for a rise, especially as a consequence of the decline of exports to Singapore.

The second country of destination for the 1978-1982 period was Singapore, with the value of exports of natural rubber covering an average 36.2% of the total value of Indonesia's exports of natural rubber. But developments in the value in these exports to Singapore showed an average decline of 8.6% a year in consequence of the large fall in the value of exports to Singapore in 1981 and 1982. The highest value in the exports of natural rubber to Singapore from 1978 to 1982 occurred in 1980, when the value reached US$ 447.4 million.

The third country of destination for these exports was the Soviet Union, which, during the period of 1978-1982, received exports of natural rubber from Indonesia valued at an average 5.2 % a year of the total value of Indonesia's exports of natural rubber. Developments in the value of natural rubber exports to the Soviet Union fell by an average 8.2% a year, which was mainly the consequence of the very large decline of exports in 1982.

The fourth country of destination for exports of natural rubber was Japan, the value of which reached an average 3.5% a year of the total exports of Indonesia's natural rubber in the period 1978-1982. The developments in value of these exports to Japan shows an average increase of 8.7% a year, even though the value of natural rubber exports to this country suffered a decline in 1981 and 1982.

The fifth country of destination for the export of natural rubber was West Germany in the Period of 1978-1982, when the value of these exports covered an average 3.2% a year of the total value of Indonesia's exports of natural rubber. Developments in the value of natural rubber exports to west Germany showed an increase of an average 27.6% a year, except for 1981 when the value of the natural rubber exported to West Germany suffered a decline.

The other countries that are also recipients of Indonesia's exports of natural rubber are the United Kingdom, Netherlands, several East European countries and some others. The share of these countries in the total value of Indonesia's export of natural rubber was an average 15.4% a year for the period under discussion. Developments in the value of exports to these countries shows an average increase of 19.2% a year, with the exception of 1981, when the exports of natural rubber to these other countries fell, but later rose again in 1982.

IV. Rubber Imports

Besides being an exporter of natural rubber, Indonesia also imports rubber to meet its own domestic needs. Developments in the volume of rubber imported by Indonesia during the 1978-1982 period show an average increase of 12.3% a year, that is, from 26.6 thousand tons in 1978 to 40.0 thousand tons in 1982.

Of the kinds of rubber imported, the largest portion is in the form of synthetic rubber, the second being finished goods and the third being other kinds of rubber, with respective shares of 43.3%, 32.3% and 24.4% a year in the total volume of rubber imported by Indonesia.

Complete developments in the volume of rubber imported by Indonesia are shown by kind in Table 7.

Parallel to the developments in the volume of Indonesia's rubber imports, the value of rubber imported between 1978 and 1982 also showed an average increase of 23.2% a year, that is the value rose from U.S$ 37.5 million in 1978 to US$ 75.9 million in 1982.

By kind of rubber imported, the largest share in the value of imports is that for finished products, which covered 51.4% of the total value of rubber imported by Indonesia, whilst by volume this kind occupied second place, coming after synthetic rubber. Developments in the value of imported finished products rose by an average 19.7% a year, that is from US$ 20.5 million in 1978 to US$ 36.9 million in 1982.

Table : 8
Value of Rubber Imports by Kind
1978 - 1982
(In US$ millions)

Kind of Rubber	1978		1979			1980			1981			1982			Average	
	Value	Share %	Value	Δ%	Share %	Value	Δ%	Share %	Value	Δ%	Share %	Value	Δ%	Share %	Δ%	Share %
Natural Rubber	0.4	1.0	0.3	-25.0	0.7	0.5	66.7	0.6	1.0	100.0	1.2	0.6	-40.0	0.8	25.4	0.9
Synthetic Rubber	9.7	25.9	13.8	42.3	29.2	19.2	39.1	24.9	26.1	35.9	30.7	23.3	-10.7	30.7	26.6	28.3
Finished Goods	20.5	34.7	23.7	15.6	50.5	40.9	72.6	53.1	42.6	4.2	50.1	36.9	-13.4	48.6	19.7	51.4
Others	6.9	18.4	9.1	31.9	19.4	16.5	81.3	21.4	15.3	7.3	18.0	15.1	- 1.3	19.9	26.1	19.4
Total	37.5	100.0	46.9	25.6	100.0	77.1	64.4	100.0	85.0	10.2	100.0	75.9	-10.7	100.0	23.2	100.0

Source : Central Bureau of Statistics, Import Statistics.

Table : 9
Domestic Consumption of Rubber*
1978 - 1982
(In Thousands of Tons)

Year	Production	Imports	Exports	Consumption	Δ%
1978	885.0	26.6	861.5	50.1	—
1979	964.0	32.0	861.0	135.0	169.5
1980	989.4	42.9	976.1	56.2	-58.4
1981	963.3	47.5	812.6	198.0	252.3
1982	861.0	40.0	801.4	99.6	-49.7
Average	—	—	—	107.8	78.4

Source : Directorate General of Estates, Central Bureau of Statistics, Export & Import Statistics.

* Consumption = Production + Imports – Exports.

The imports of synthetic rubber had the second largest share in the total value of Indonesia's rubber imports, coming after finished products and covering an average 28.3% a year of the total. Developments in the value of imports of synthetic rubber rose by an average 26.6% a year from US$ 9.7 million in 1978 to US$ 23.3 million in 1982.

Imports of other kinds of rubber, being natural rubber and other materials from rubber, had shares of respectively 0.9% and 19.4% a year in the total value of Indonesia's imports of rubber.

The greater part of the rubber Imported by Indonesia comes from industrial countries like Japan, the United States of America, West Germany, and from other countries like South Korea, Taiwan and Singapore, since these countries are the producers of synthetic rubber and of finished goods made of rubber.

Complete developments in the value of Indonesia's imports of rubber are shown in Table 7 below:

V. Domestic Consumption of Rubber

Developments in the domestic consumption of rubber in the 1978-1982 period show great fluctuation. Nevertheless, there has been an average increase of 78.4% a year, rising from 50.1 thousand tons in 1978 to 99.6 thousand tons in 1982.

The increased domestic demand for rubber is due to the increased demand for raw materials for the rubber processing and working industries such as the motor vehicle tyre and inner tube industry, the rubber goods industries supplying household needs, goods for offices, sports and other things. The domestic demand for goods made of rubber keeps on increasing, in keeping with the increasing prosperity of the public and the increased population.

From the angle of annual developments, the largest domestic consumption of rubber occurred in 1981 with a total of 198.8 thousand tons, which fell in 1982 to 99.6 thousand tons.

Complete developments in the domestic consumption of rubber can be seen in Table 9 below:

VI. Prospects For Natural Rubber

A. Production

There was a decline in the production of natural rubber in Indonesia of an average 0.4% a year during the 1978-1982 period, with production for 1982 standing at 861 thousand tons. On the other hand, the area of rubber plantation kept rising by an average 1.7% a year, which was due to the efforts to increase production through the programs for rejuvenation of crops and expansion of plantations for smallholders rubber, for private estates and also for the government-owned estates. It is estimated that the production of natural rubber in Indonesia in 1985 will reach 1,050 thousand tons and 1,313 thousand tons at the end of the 4th Five Year Plan (REPELITA IV)

B. Marketing

Exports of Indonesia's natural rubber on the average cover 92.56% of the entire production every year, with developments in the volume of exports suffering an average decline of 1.2% a year. Similarly, the value of exports also declined by an average 0.2% a year during the 1978-1982 period. Reductions in tha export of Indonesia's natural rubber occurred in 1981 and 1982, because, of the weakening of demand for natural rubber from the chief consumer countries such as the United States of America, Singapore and the Soviet Union due to the world economic recessions.

According to the International Rubber Study Group, the world consumption of natural rubber will be 3,600 thousand tons for 1983, which means a reduction by comparison with the 3,655 thousand tons in 1882, whilst it is estimated that world production of natural rubber will reach 3.640 thousand tons in 1983. Thus, in 1983, there will be a surplus in the world's supply of natural rubber. Nevertheless, it is estimated that, in the next few years, world consumption of natural rubber will increase, reaching 5,664 thousand tons in 1985.

Therefore, the export prospects for Indonesia's natural rubber depend upon the recovery of the economies of the chief natural rubber consumer countries of the world, as well as the influence of the abundant production of synthetic rubber. Some of the countries with quite large potentials as consumers of Indonesia's natural rubber are the United States of America, Japan and West Germany.

The domestic demand for rubber in the 1978-1982 period showed an increase due to the increased need for rubber by such rubber processing industries as the manufacturers of motor vehicles tyres and of household and office equipment. For several years to come, the domestic demand for rubber will keep on increasing parallel to the increasing prosperity of the population.

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Finished Goods	20.5	34.7	23.7	15.6	50.5	40.9	72.6	53.1	42.6	4.2	50.1	36.9	-13.4	48.6	19.7	51.4
Others	6.9	18.4	9.1	31.9	19.4	16.5	81.3	21.4	15.3	7.3	18.0	15.1	- 1.3	19.9	26.1	19.4
Total	37.5	100.0	46.9	25.6	100.0	77.1	64.4	100.0	85.0	10.2	100.0	75.9	-10.7	100.0	23.2	100.0

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The domestic demand for rubber in the 1978-1982 period showed an increase due to the increased need for rubber by such rubber processing industries as the manufacturers of motor vehicles tyres and of household and office equipment. For several years to come, the domestic demand for rubber will keep on increasing parallel to the increasing prosperity of the population.

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EFFICIENCY IN RESOURCE ALLOCATION: A STUDY OF SRI LANKAN RUBBER PLANTERS TO CHANGING MARKET CONDITIONS

S. RAMAMORTHI

This article is a study of Sri Lankan Rubber planters in view of the changing market conditions. In this article the author trys to analyse the various factors that determine the changing conditions of the market. The author is the Research Officer, Farm Management Study Centre, Department of Econometrics, University of Madras, Madras-600 005.

1. Introduction:

The reaction of the planters to volatile and fluctuating prices in the market oriented economies could be studied in two ways: (i) acreage; and (ii) output. In the recent years the relative supply of the output is also used as the dependent variable in the supply response studies.

Price being the major determining factor of the level of earnings, a positive relationship is expected between the price and area and output.[1] In peasant agriculture, the relevant factors such as price, profitability of other substitute crops, irrigation, etc., determine the extent of area.[2] Factors such as area, rainfall, price of other factor inputs, price of that commodity, etc., condition output.[3] The studies conducted by Nerlove and his successors reveal that previous years' or previous seasons' price also influence the output and area. Hence, they used price variable with a time lag according to the period or duration of crop

But, perennial crops such as rubber differ from peasant crops on the following grounds:[4]

a. long gestation period from planting to output,

b. a prolonged period of output following from the initial investment,

c. slow decline in productivity as the age increases,

d. removal of plants or abandonment, and replacement of the trees.

1. NERLOVE, Marc, "Estimates of the Elasticities of Supply of Selected Agricultural Commodities", Journal of Farm Economics, Vol XXXVIII, No. 2, March 1956, p. 496.

2 NARAIN, Dharam, "The Impact of Price Movements on Areas under Selected Crops in India-1900-39", Cambridge University Press, 1962, p. 10.

3 HEADY, E. O. & DILLON, J. L., "Agricultural Production Functions", Kalyani Publishers, Ludhiana, 1961, p. 203

4. HERATH, H. M. G., "A Study of Supply Response of Rubber in Sri Lanka", Unpublished M. A. Dissertation, Department of Economics, Australian National University, May 1975, p 16.

2. Earlier Studies:

In most of the studies done by Wharton, Chan and others output of supply was used as the dependent variable in their equations. Natural Rubber (NR) Perennial crop, the factors employed—such as labour equipment, etc. in the estates—are irreversible following the changes in price.[1] Secondly, the smallholders mostly depending on the income from rubber to meet their daily needs, will be in a position to maintain or increase their rubber output to get their usual income. Thirdly, any better maintenance of the plantations in the past to increase output responding to remunerative prices do not wear off completely in only one year, but spread over for 3-4 years.[2]

The relative supply approach to overcome the defects of using output as the dependent variable is really an improvement over the traditional approach. But the response or decision making process of the planters to produce various types of rubber or quality rubbers is restricted by the available technology and resources in producing other types of rubber. This is true in the case of Sri Lanka also.

Only in very few studies acreage is treated as the dependent variable. Rubber trees with a lifeterm of 35 to 40 years, its acreage cannot be altered often by the planters following the rise or fall in prices. The possibility of conversion of the substitute and peasant crop area under rubber is negligible in Sri Lanka due to the high population pressure on peasant land. Extension of NR area into the forest and virgin land is also limited due to the optimum utilisation of the available land. Intrusion into the area under substitute crops (such as tea, Coconut, etc) is also ruled out by the most needed agro-climatic conditions for planting rubber

1. GHOSHAL, Animesh, "The Price Responsiveness of Primary Producers: A Relative Supply Approach", American Journal of Agricultural Economics, Vol. 57, No. 1, Feb. 1975, P 118.

2. OLAYEMI, J. K. & OLAYIDE, S. O., "The Structure of Price Response in Nigerian Rubber Production: A Polynomial Lag Model", The Malayan Economic Review, Vol. XX, No. 2, Oct. 1975, p. 13

Hence, the use of replanted area under rubber will be an appropriate approach to assess the response or decision making process of the planters due to the following reasons. At the break-even point (where yield equals cost) the old rubber must be replanted each year inorder to maintain a constant average annual income at the given level of land area. Such a periodical replacement programme can maintain the average age of the plantations at a desired level and harness the full advantages of the genetically improved clones.

Inorder to shoulder the burden of the replanting cost of the planters, the Sri Lankan Government covers the replanted area by the Rubber Replanting Subsidy Act, No. 36 of 1953, under all the three size of holdings from 1953 onwards. Despite the subsidy paid to the replanted area, such an advantageous programme has been paid only little attention during the recent years due to the uneconomic conditions prevailing in the industry. This is evident from the following analysis.

3. Period Covered by the Study:

An attempt is made to assess the reaction of the planters in the longrun, over a period of 27 years from 1954 to 1980, using secondary data collected from the Rubber Control Department, Sri Lanka. A functional relationship has been tried taking replanted area (separately for each size of holding, i. e., small, medium and large holdings) as the dependent variable influenced by the three independent variables, viz., (a) replanted area t-1, (b) Colombo market price t-1, (c) amount of subsidy received for each size of holding.

4. Explanation of the Variables:

(a) Unlike in the case of annual or seasonal crops, planters could not suddenly switchover to other crops due to technological constraints such as the suitability of land to other crops, knowledge to plant other substitute crops, etc.[1] has been used as an independent variable assuming that more recent value of this variable on the dependent variable exert greater influence than remoter values.

(b) The RSS1 price in the Colombo market is considered as the most suitable representative price because all the other grade rubber prices are fixed on the basis of the RSS1. Due to the longrange operations involved in replanting the old rubber area, the price at t-1 will be the most appropriate one in this analysis assuming that the price in t-1 will have more impact than t-2 to t-n.

(c) Taking into account the poor replanting by the planters following low prices soon after the World War II, cost involved in replanting, loss of income during the immature period and the recommendations of the Rubber Commission and the World Bank, the Government of Sri Lanka launched the Rubber Replanting Subsidy Scheme in 1953, after negotiating the Rubber-Rice Agreement with the People's Republic of China. Under this Replanting Scheme, uneconomic rubber holders were entitled to a slab-scale subsidy for replanting their lands with approved varieties of High Yielding clones. These graded scales of subsidies were revised upwards periodically and extended to new plantings in 1974. The rate of subsidy paid to the planters vary from size to size. To derive the total subsidy paid per acre for the aggregate replanted area, the weighted average technique is used. The ratio of replanted area to the total area for each size of holding has been used as weights to arrive at the aggregate replanting subsidy per acre.

1. BELL, P. F. & FAI, Jenet, "Markets, Middlemen and Technology: Agricultural Supply Response in the Dualistic Economies of Southeast Asia", in the Economies of Agriculture, Vol. 3, Wiley Eastern Ltd., New Delhi, 1975, P. 117.

5. Presentation of the Findings:

Separate functions were tried for small holders, medium estates, large estates and for the aggregate replanted area. But in all these equations using deflated net earnings as the fourth independent variable was not significant and that variable

Replanted Area = a + b Replanted Area t-1 + c NR Price t-1 + d Deflated Replanted Subsidy 't' + e

Small Holding:

$Y = -0.034 + 0.701 + 0.345 - 0.014$ $\quad F = 33.27 \quad DW = 2.06.$
$\quad\quad\quad (6.979)\ (3.434)\ (1.160)$

Medium Holdings:

$Y = -1.773 + 0.699 + 0.323 + 0.039$ $\quad F = 33.22 \quad DW = 1.09.$
$\quad\quad\quad (6.354)\ (2.962)\ (0.406)$

Largh Estates:

$Y = -0.241 + 0.522 + 0.448 + 0.008$ $\quad F = 19.72 \quad DW = 1.69$
$\quad\quad\quad (3.527)\ (3.290)\ (0.063)$

Aggregate Replanted Area:

$Y = -1.403 + 0.616 + 0.412 - 0.006$ $\quad F = 36.15 \quad DW = 1.36.$
$\quad\quad\quad (5.718)\ (3.920)\ (0.063)$

was deleted from the equation. The results are given below:

It is interesting to note that in all the four sets of equations the regression coefficient for the variable NRP_{t-1} has exhibited a positive relationship. This implies that the price variable which was declining over the period influenced the rate of replantation in the same direction. Among all the three classes of growers, the regression coefficient of NRP_{t-1} stood high for the large size estates (0.448) as they mainly controlled by foreign multinational (till 1976) and indulged in diversification to avoid losses.

The participation of the local investors in medium estates benefitted them with both the efficiency of the small holders and economies of scale of the large estates and by stabilising their position by replanting the area with H. Y. clones. The coefficient for small holders was the lowest (0.345) as they have to replant the old rubber periodically irrespective of the prevailing market price to maintain their level of income. However the value in the fourth function for the aggregate replanted area explains the impact of price over the total replanted area very significantly.

In the four sets of functions, negative sign is attributed to the variable RS_t for small holders and aggregate replanted area but 't' values are insignificant. For medium and large estates though the sign is positive the coefficients and the 't' values shown in the parenthas are not significant implying that the planters are influenced more by the price and not by the amount of subsidy. This is evident from the periodical revisions in the amount of subsidy as presented in Table No. 1. and it explains that the subsidy for the three sizes of holdings (small, medium and large) were Rs. 1000, Rs. 900, and Rs. 700 respectively in 1953. Later on the slabs got tilted towards the medium and large estates at the expense of the indigent and economically week small holders.

Response of Planters to the Replanting Subsidy 1953-1981

Period and Duration		Subsidy per Acre (Rs)	Instal-ments	% rise in Subsidy over previous period	Annual Replanting Acreage
	(1)	(2)	(3)	(4)	(5)
A	1953-61	a. 700	4	—	7988
	(9 years)	b. 900	4	—	5089
		c. 1000	5	—	5781
				Period A to B	
B.	1962-65	a. 1000	5	42.8	5959
	(4 years)	b. 1100	6	22.2	3302
		c. 1200	6	20.0	5719
				Period B to C	
C.	1966-74	a. 1400	5	40.0	5009
	(5 years)	b. 1500	6	36.3	1682
		c. 1500	6	25.0	3463
				Period C to B	
D.	1974-77	a. 2000	6	42.8	3627
	(4 years)	b. 2000	7	33.3	888
		c. 2000	7	33.3	1965
				Period D to E	
E.	1977-81	a. 3000	6	50.0	3567
	(4 years)	b. 3000	7	50.0	1744
		c. 3000	7	50.0	2616
				Period E to F	
F.	1981-	a. 7500	7	150.0	...
		b. 7500	7	150.0	...
		c. 7500	7	150.0	...

(a) Estates 100 acres and above; (b) Estates 10-100 acres; (c) Smallholdings below 10 acres.

Source: Calculated from the Administration Reports of the Rubber Controller; John Keel's Rubber Statistics and the Central Bank of Ceylon Annual Reports and Review of the Economy.

6. Conclusion:

To sum up, rubber being a perennial crop, the possibilities are less for switching over to the other substitute crops due to technological constraints, heavy investment in initial stages and long gestation period. But at the time of replanting, it is evident that the Sri Lankan rubber planters abstained from replanting their old rubber lands due to low prices for their rubber.

In pre-plantation days this was considered the practical way to obtain latex from the caucho tree.

THE DRAMA OF NATURAL RUBBER

IT was in 1877 that the English planter and entrepreneur Henry Wickham managed to collect a large quantity of seeds of the *Hevea brasiliensis* and ship them to England (not, it might be added, by smuggling them under the noses of the Brazilian authorities, but with their positive assistance).

It was just a few years ago that, under the auspices of the International Rubber Research and Development Board (and again with the aid of the Brazilian Government), an expedition was organised to collect many thousands of wild seeds of the same tree and plant material, to enlarge the world stock of genetic material and revitalise the breeding programmes of the rubber producing countries.

This provides a framework for a period in which the production of natural rubber was changed from entreprenurial random tapping of wild trees to highly scientific tapping of massive plantations. Methods changed from crude slashing or even felling of trees (advocated at the beginning of the period as the best means of extracting latex) to sophisticated techniques which not only do not damage the trees but actually stimulate latex yield.

At the same time, NR production switched dramatically from one side of the world to the other, from the Brazilian area around the Amazon, where the finest quality 'Para' rubber was obtained, to Southeast Asia, and particularly to Malaysia and Indonesia.

An important and far-reaching development during the century has been the growth of rubber-consuming industries in the rubber-producing countries, strongly encouraged by the national governments. Rubber products will increasingly be manufactured locally, close to the source of the rubber (synthetic rubber plants form part of the development programmes). And, while a part, certainly, will be consumed domestically,

The EUROPEAN RUBBER JOURNAL published from London celebrated one hundred years of its existence by bringing out an anniversary issue in June 1982. The articles featured in the anniversary issue provide a good deal of information on the history of rubber industry and as such a few of them are reproduced in this issue of the Rubber Board Bulletin. The following article on the "Drama of Natural Rubber" describes how the production of natural rubber was changed from entrepreneurial random tapping of wild trees to highly scientific tapping at massive plantations.

a significant part is also planned for export to earn much-needed 'hard' currency.

Monopolies end

In short, the hundred years of *ERJ* has seen the end of a series of monopolies: the monopoly of South America as a supplier, the monopoly of natural rubber as an industrial material, and the monopoly of the Western industrialised nations as providers of finished products to the rest of the world.

The next hundred years promise excitement of a different kind, as the rubber industry overcomes its economic and technical problems. The NR portion of it is becoming increasingly specialised while contributing to the development of the Third World countries, and probably winning back a few more points of the market share it lost to synthetic.

It is all very different from the description in *The India-Rubber and Gutta-Percha and Electrical Trades Journal* of June 3, 1885, on the current methods of buying rubber in Africa:

'On entering the dwelling, a large dining room presents itself with white-washed walls and floor holystoned as clean as the deck of a ship. In the centre stands a long deal table, with cane chairs and a comfortable sofa or two. A few engravings, a spy-glass and a stand of rifles embellish the walls ..

'Rubber, to deal more particularly with it, is brought in by native dealers, who have bought it from the native gatherers. The product is carried in mattels, or baskets, chiefly by women, for long distances in the interior, guarded by fighting men, each caravan being announced, when it is already five miles away, by the sounding of trumpets, the blowing of whistles, and the beating of tin pans ..

'The rubber .. having been weighed after due inspection, the buyer makes an offer for it, in three chief articles of trade .. namely, guns, gunpowder and cloth. "No fit," perhaps exclaims the "gentleman" (native middleman) as soon as he hears the offer, for a bargain is never struck by a black man in a hurry if he can help it. He generally believes that he is going to be cheated ..

At length, however, after successive attempts to obtain a little less than double, he generally holds a consultation with his clients (the rubber-gatherers, from the interior of the country), and as a result, the buyer perhaps makes some little concession, such for instance as the addition of a keg of powder, or a "long" of cloth, which increase is announced in a tone of voice that indicates no more will be given.

'After another talk, and when the buyer has been asked again for his "last mouth" and it is seen that nothing more is to be got, the "top" is asked for. The top, consisting perhaps of a soldier's coat and a bottle of gin having been decided upon, a "book," as all papers or documents are called by the natives, is given by the buyer for the amount agreed upon...

'It may be that only a fifth part of the number of guns offered is paid in guns, the balance being made up with brass rods, a certain number of which are equal in value, in the eyes of the natives, to a gun. Of, say, 40 kegs of powder, eight are given, the remainder being paid in cloth; and longs of cloth two-thirds are paid in cloth, the remaining third being paid in earthenware, knives, rings, etc ..

'A large caravan will take at least a week to buy and pay for. On the occasion of these sales before the departure of the natives they have a "high old time" at the station dancing and drinking, and in this way much of the results of their labours are left behind with the traders.'

Seedlings

The same issue of *IRJ*, however, contains a short report from what was then Ceylon, now Sri Lanka. They described some of the first products from the trees grown there from seedlings reared at Kew Gardens. These seedlings themselves derived from seeds and materials brought from South America eight years earlier. Dated March 20, 1885, from Henaratgoda, the report paints a picture vastly different from conditions in Africa:

Curing Para rubber in the Amazonian basin. Man to the left is smoking a large ball of 'fine' rubber, while the other is preparing 'negro-heads,' which are scraps of coagulated rubber collected from the bark of trees and collecting cups and compressed, unsmoked, into irregular masses

'The rubber harvest is over for this spell, and something has been learned, but not enough to decide the question of "Will it pay?" Individual trees have, in the course of two months, yielded over one pound, but others that have been operated on have not given an ounce, and some none at all. The result from 25 trees is 14 lbs perfectly clean, and its value in the European market must decide whether it will be worth while dealing further with it. One-half of the trees may be destroyed with advantage; the causes: stunted growth, scanty yield and low quality. The most productive trees are mostly those that have branched low and are not crowded—I should say 20 x 20 feet apart or 108 to the acre would be about the thing. On this occasion the single boy I employed in collecting has averaged somewhat under half a pound daily, but this first attempt has not been got into a regular system before the passing away of the proper season.'

It is a whole world away from the earlier report (by comparison, modern planting produces results tenfold higher 3,500 kg per hectare is the latest reported yield from the most modern strains developed in Malaysia from the successors to the original Kew Gardens seedlings) But the difference between today and the Ceylon report is really one of the scale only, and the poor production of the new trees in the climate of India and Ceylon placed grave doubt over the new crop in the minds of many planters.

Disappointment

From the seeds brought back by Wickham (which produced less than 3,000 seedlings) and about 1,000 seedlings brought back to Kew by Robert Cross (few of which survived), the majority were sent to Ceylon, with disappointing results. Fifty seedlings, however, were sent to Singapore in 1876 and 22 in 1877 and, although few survived, they provided basis for the modern industry.

First impressions, again, were not very favourable. Reports from Ceylon had no doubt discouraged planters, who were much more interested in profitable crops such as coffee. Nine seedlings were planted around the quarters of the British Resident in Kuala Kangsar, Perak, in 1877, and two other seedlings were planted in other locations.

It is likely that the Malayan experience would have proved the same as in Ceylon had not two factors played a role: a human enthusiast and a natural disaster.

Ridley the enthusiast

The human enthusiast was Henry Nicholas Ridley, who was Director of the Botanic Gardens, Singapore. His major contribution was, firstly, to develop a non-destructive technique for tapping the trees, by removing a paring of the bark from the cut, subsequently developed to successive paring away of the bark, which was also found to stimulate production of latex.

His second contribution was to encourage planters to invest in the new product (a battle which he fought not only against the hesitant planters but also in the face of determined opposition from the British Resident, Sir Frank Swettenham).

Even these efforts might not have been successful, however, had it not been for the disaster of a plague of caterpillars which attacked the local coffee crop in 1898 This forced even the most reluctant planters to look more closely at rubber, and already the few planters who had gone in for rubber were beginning to report encouraging sales The breakthrough came when, in 1904, F A Stephens (who with his partner F Mc Gillivray had interplanted 200 acres of coffee with coconut and rubber in 1897) exported rubber to the value of $4,000—a rather substantial sum at the time. This spurred many other planters into action.

Rapid development

Subsequent development of the industry was extremely rapid, as the using industries in the industrialised countries were suddenly boosted by the development of the motor car and the pneumatic tyre. In 1900, world shipments of NR totalled 44,131 tonnes, of which 27,784 came from South America, 15,526 from Africa and a mere 821 from Southeast Asia (all of it from Ceylon). In 1905, the Government of Malaya began recording statistics for rubber exports.

In 1910, the world total had increased to 94,034t, of which South America shipped 62,98 it, Africa 20,143t and Southeast Asia 11,000t, of which the Malayan portion was already 6,500t. From then on, the share of plantation-grown rubber (as opposed to wild rubber) in the total increased dramatically so that, by 1913, it was already nearly equal (at 53,400t plantation against 66,479 wild), according to the records.

Short-lived

The following year it went strongly ahead, to 75,700t plantation for 48,586t wild. Wild production received a small and short-lived boost from World War I but, by 1920, the total had fallen to 36,888 tonnes—the lowest of the century so far—against a massive 353,488 tonnes of plantation.

The decline of the rubber industry in South America and Africa, despite decisions by Western manufacturing companies to fund plantations there, is not entirely due to human error (though there was a fair amount of that, in hindsight). More significant, probably, was the disease known as South American Leaf Blight, which severely handicapped production.

Significant factor

But another significant factor is the structure and operation of

the various colonial systems and, in particular, the British administration in Malaya where, at the turn of the century, there was an established (if conservative) plantation industry - not wholly in British hand--and an active and enthusiastic system of botanical research and development.

Production of NR in Southeast Asia continued to grow: In 1913-14 the shipment from Ceylon and the Netherlands East Indies suddenly leapt into five figures, complementing the output of Malaya, and in 1916 the Dutch colonies went ahead of Ceylon as the No. 2 far Eastern producer, with 33,100t against 24,400t from Ceylon (and 96,000t from Malaya). Other Southeast Asian nations' production had grown to 6,600t.

The 1920s and 1930s, however, underlined as never before the extreme vulnerability of a commodity industry when, in the space of just ten years (1920-30) the price of rubber slumped from £204.4 per tonne (1920) to £85.5 (1922), then rocketed up to £322.1 (1925) before collapsing to £54.5 at the end of the decade. The 1930s fared even worse, with prices falling to an all-time 'low' of £21 2 per tonne in 1932 and not reaching three figures again until 1939.

It was, of course, the vagaries of price during this period which encouraged Western countries to develop synthetic alternatives to NR. Bayer in 1906 had offered a prize to any chemist in its employment who could come up with a synthetic rubber, provided that the cost of a first class product was no more than DM 10 per kg. So began the scientific and technical race that still goes on today.

Temptation resisted

Du Pont, on launching neoprene, resisted the temptations to market it as an alternative to NR and pitched the price firmly in the speciality class at $1.05 per lb (at a time when the NR price had slumped to 3.5 cents on average). But it was strategic rather than commercial pressures which finally 'catalysed' the introduction of SR manufacture on a large scale. During World War I, the Germans had developed methyl rubbers (and were producing at the rate of 150 tonnes/month by the end of the war), but, with the end of hostilities, interest in SR waned.

The introduction of the Stevenson Plan by the British in 1925 to restrict production of NR and thus support higher prices, encouraged a number of chemical firms to reopen their files on SR, and probably marks the beginning of real commercial development of SR. It also underlines one of the enduring characteristics of the natural rubber industry until then: a sense of complacency on the part of the established planters, which was probably due to their inability to comprehend the real requirements of their industrial customers.

Dutch initiative

So, in 1916-17, the initiative in development passed to the Dutch planters in the former colonies of the East Indies, where the botanists Bodde, van Helten and Cramer developed the technique of bud-grafting in Sumatra. This technique used buds from proven high-yielding trees, grafted onto any young healthy seedling.

The British planters preferred, however, the policy of restricting production under the Stevenson Plan and the later International Rubber Regulation Committee (1934-38). So they had no real interest in replanting with high-yield stocks. The Dutch, however, who were under no such restriction, pushed their own production hard, achieving yields of 1,650 lbs/acre as early as 1928, in which year their production nearly equalled that of Malaya in the previous year. It was then that the British began to take them more seriously. *Rubber Journal* quoted a British tropical botanist as commenting: 'Although high yielding budgrafts were made available around 1917, only a minority of planters had become convinced of their value by 1937. It has taken as long to persuade them to substitute selected Heveas for mediocre trees as it took Ridley to plant Hevea rubber...' (From June 11, 1955, *Rubber Journal*.)

The years between the two wars were years in which the fundamental weakness of an industry based on plantations and commodity trading were clearly revealed. Even with some direct participation in plantations by large tyre companies (Dunlop established plantations in Malaya, Firestone in Liberia and Goodyear in Sumatra), there was no structure linking producers with users. Thus, with the exception of the Dutch research into bud-grafting, there was no research at the producing end and no real attempt to produce rubber as anything other than an agricultural product.

The advent of synthetic rubber changed all that, and the emergence of the producing countries as self-governing nations put the seal on the new mood in the natural rubber industry.

World War II intervenes

World War II, however, intervened and there followed a period when there was virtually no development of the industry. But, with the ending of the war, two key factors, competition from synthetic and national independence of the producers, were ready to react. British planters, returning briefly to Malaya, replanted many of their war-damaged plantations with bud-grafted trees and, under the leadership of Charles E T Mann, the Rubber Research Institute of Malaya took up the long-running genetic experiments which the Dutch had been forced to abandon. Two years after Mann died in 1961, there were experimental

trees capable of producing more than 3,000 pounds of rubber per acre.

More important for the immediate needs, however, was the growing movement towards better technical specifications. The enforced absence of NR from the Western industrial users had given them the experience of alternatives which (after some earlier problems) settled down to give predictable performance and consistent price.

NR, when it returned, was snapped up with enthusiasm by the Western buyers—but they were not any longer prepared to countenance its old tricks. The sheer restoration of supply, and the bounding return of Western industry to growth-rates of near-boom proportions, masked these underlying trends.

'Tailoring' of polymers

In reaction, the US synthetics industry—sold back to private industry at a price which all American Government reports say was at least equal to the original plant investment at 1942 dollar prices—was moving towards 'tailoring' of polymers to specific price/property profiles.

Neoprenes, nitriles and butyls all offered their own particular combinations of price and performance. In the 1950s came polyurethanes, throwing down a direct challenge to latex foam, and then the Ziegler/Natta breakthrough into stereospecific polymerisation. The NR share of the market began to look first limited, and then actually shrinking.

At the same time, independence movements in the producing countries began to achieve success. Britain granted self-government to India and to Sri Lanka. The former Dutch East Indies fought for and won their independence, and the former French colonies in Southeast Asia began their long and bitter struggle. In Malaya, at the cost of a prolonged jungle war, the British were able to hold back the tide of revolution and achieve a peaceful handover of power.

Throughout Southeast Asia, therefore, in a short space of time, natural rubber changed from being a crop grown by foreigners providing some local employment to an essential earner of foreign currency and a potential route to more general economic prosperity. As the largest producer, with now the strongest research and development background, Malaysia took the lead.

New image

During the past three decades natural rubber has undergone a complete change. Starting from improvements in presentation—to overcome the image of an agricultural product, inconsistent with the impurities and crudely packaged—NR has been developed as a technical industrial material. Where previously it was regarded as a general purpose material, current philosophy is to push it more and more towards treatment as a speciality and to capitalise on its still unique characteristics.

The development of radial tyres and their rapid growth has meant a growing market for NR, with its good hysteresis characteristics. But, not content with simply taking advantage of favourable trends, NR has been standardised, with a range of technically specified grades. The first such material—Standard Malaysian Rubber—has been introduced, and other producing nations are now beginning to follow suit.

Genetics of plants

The development has gone further, with extensive research on the genetics of the rubber plants, firstly with the objective of improving yields and in in particular of strengthening resistance to disease. (South American Leaf Blight—which virtually destroyed the Brazilian industry in the early years of the century—may be impossible in the Malaysian climate, in the opinion of some experts, but it still casts a menacing shadow.)

Combinations of NR with other materials, with epoxy resins or with thermoplastics such as polyethylenes, are also being developed, to produce grades with further special properties (including thermoplastic elastomers), and there is also the possibility of developing specific strains of trees which will produce polymers of specific useful properties.

The next century of natural rubber promises to be in every way dramatic as the previous one. □

JAPANESE HAVE "YEN" FOR FURNITURE

The Japanese have seemingly fallen in love with rubber wood furniture from Malaysia.

At a recent international furniture fair in Tokyo: the Malaysian furniture sold at an incredible pace-a major breakthrough considering the tough Japanese market. In fact, the Malaysian Timber Furniture Mission, present was at the fair, received $1.7 million in orders from Japanese buyers alone.

Encik Ambrin, marketing director of the Malaysian Timber Industry Board, says that that changing trends in Japan, especially among the country's younger generation have greatly contributed to the increased furniture market. He stated that the Japanese have been portrayed as people with a scarce amount of furniture and perhaps it is time for them to change their image

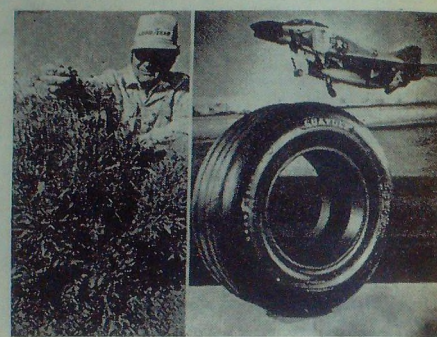
Guayule-waiting in the desert

Of some 2,000 plants known to contain rubber, only *Hevea*, a tropical tree, and guayule, a desert shrub, have been commercialised successfully. Of the two, *hevea* provides the world's entire supply of natural rubber; guayule has not been cultivated commercially for nearly 40 years.

There is no reason, say the proponents of guayule, why the shrub should be ignored. Its rubber is virtually identical to that of *hevea*; it grows in areas fit to grow very little else; it could bring large revenues to depressed areas; and it could prove strategically important, should the supply of *hevea* rubber from southeast Asia be cut off, as it was during World War II.

Yet every movement so far since the war to re-commercialise guayule has met with disappointment. All the good reasons for growing guayule have always been cancelled out by the one good reason for *not* growing it: *hevea* rubber has always been considerably cheaper. With the depressed state of the auto industry driving the per-pound price of *hevea* to 10-year lows, the market incentive to propagate guayule is almost nil.

Fortunately for guayule's defenders, the idea of growing guayule for defence purposes is gaining favour, particularly in the US. The US government's defence stockpiles of natural rubber are critically low at 120,000 tonnes (the nation's needs are estimated at 850,000 tonnes), and the Defence Department has announced plans to offer guaranteed loans to rubber companies in return for establishing guayule growing and processing programmes.



From desert to skies: Sixteen aircraft tyres have recently been made by Goodyear from guayule rubber cultivated at its own farm near Phoenix, Arizona. The tyres have been tested on US Navy planes such as the F-4.

'Nebulous' programme

Currently this programme is "nebulous," according to Dr Richard Wheaton, Chairman of the Staff Group of the US government's Joint Commission on Guayule. But if the rubber industry can be convinced, Wheaton adds, "the guayule effort could really take off."

The use of guayule rubber dates back to pre-Columbian times. Spanish explorers in 16th century Mexico told of Aztec natives playing games with guayule rubber balls. The Aztecs extracted the rubber by chewing the stems of the wild plants.

Commercial processing of guayule, however, did not commence until 1902, when a plant was established at Jimulco, Mexico. This was the dawn of the automotive age, and a group of American investors—including John D Rockefeller, Bernard Baruch, and Daniel Guggenheim—smelled a profitable new industry. Together in 1906 these investors put up $30m to form the Continental-Mexican Rubber Co.

By 1912, Mexico was exporting 7 million kilograms of guayule rubber to the US at $1.07 per kilo. Unfortunately, 1912 was the last boom year in Mexico for guayule. None of the processing companies practised cultivation, and there simply were not enough wild guayule factories to go around. Those plants that managed to stay open were closed by the Mexican Revolution.

The vestiges of a guayule industry were maintained by Continental-Mexican Rubber Company, which moved first to Arizona and then to California.

The industry received a boost in the 1920s, when Great Britain, using the leverage of its massive rubber plantations in Malaya, tried to control world supply and prices for *hevea*. The Great Depression, however, sent *hevea* prices tumbling to two cents per pound, and the guayule industry tumbled with them.

Nevertheless, guayule production did not cease altogether in the 1930s. Approximately 8,000 acres of guayule were planted in California's Salinas Valley between 1925 and 1931, and an extraction factory in Salinas produced more than 3m pounds of rubber between 1931 and 1941. This acreage and production proved invaluable when, in December 1941, the Japanese invasion of southeast Asia cut off more than 90 percent of the Allied forces' supply of natural rubber. It proved the basis for the US government's Emergency Rubber Project (ERP), initiated in February 1942. With more than 10,000 workers, scientists and technical experts working on the ERP, by August 1945 nearly 32,000 acres in three states were planted, producing 1 bn guayule seedlings and 3m pounds of rubber for the war effort.

Research in Australia

Similar efforts were undertaken in other countries. South Australia began guayule research in 1941, under the joint supervision of the Council for Scientific and Industrial Research and the Waite Agricultural Research Institute; and four guayule plants in Mexico processed 180 tonnes of shrub daily.

At the end of the war, it seemed for a time as if guayule might maintain its wartime prominence. More than 30 countries received guayule seeds in the 1940s and 1950s, with Spain and Turkey beginning large-scale production programmes. In 1946, the US Navy gave the Stanford Research Institute in California a contract for continuing research and development in guayule. A group of American investors announced plans to plant 10,000 acres of Western Australia with guayule in 1959, with a central factory capable of processing 10m pounds of rubber annually.

Unfortunately, none of these projects bore fruit. The renewed availability of *hevea* rubber, coupled with the boom in synthetic elastomers, caused interest in guayule to decline.

'The US tyre companies said they didn't need any domestic source of natural rubber', said Dr Hewitt Tysdal, a guayule expert with the California Department of Food and Agriculture, 'and that was that.' All guayule research plots extant at the time were burned or ploughed under, although the US Department of Agriculture saved some of the seeds.

The current rekindling of interest in guayule began in 1975, with a meeting at the National Academy of Sciences in Washington. The energy crisis had bagun by that time, and with it a precipitous increase in the cost of petroleum feedstocks for synthetic rubber. The panel that convened at the NAS meeting—including Tysdal, Dr Reed C Rollins of Harvard and Dr Noel D Vietmayer of NAS—compiled a study which was published in 1977 under the title 'Guayule: An Alternative Source of Natural Rubber.' That study, according to Tysdal, started the ball rolling again for guayule.

In 1978, the US Congress voted the native Latex Commercialisation and Economic Development Act into law, allocating $30m between 1979 and 1982 for guayule research and development. Nevertheless, Congress actually appropriated only $650,000 for guayule

Taking a relaxed look at the guayule rubber-producing shrub, this Goodyear technician shows off his shoe soles made from the same rubber.

research in 1979, and nothing at all in subsequent years.

Despite this, funds from the Agriculture and Commerce departments—$2.7m in 1980 alone—has kept US guayule research functioning at a high level

One particularly encouraging programme is for the breeding of high-yield guayule hybrids, done for the California Department of Food and Agriculture by Tysdal and Dr George P Hanson of the Los Angeles State and County Arboretum.

By crossing 30-foot, low-yielding plants with 2-foot, high-yielding Tysdal and Hanson obtained plants hybrids four to six feet tall, resistant to frost and disease, with an average potential yield of 12 percent rubber by weight when mature. We think we can double the yield quite easily in future generations of hybrids, Tysdal said, to about one ton of rubber per acre.

Impressive results in rubber and resin extraction are being made at the USDA Northern Regional Research Centre in Peoria, Illinois, under the direction of Dr Earl Hamerstrand. Hamerstrand's efforts, according to Richard Wheaton, constitute the first regular guayule processing in the US in many years.
Similar experiments are being performed at the Institute of Polymer Science of the University of Akron (Ohio), under the direction of Dr Donald McIntre.

Foreign agreements

Along with domestic research programmes, the US government has entered into agreements with foreign governments to exchange scientific and technological information on guayule. The longest standing of these agreements is with Mexico, which currently operates an extraction plant at Saltillo in Coahuila province. The Mexican government plans to build a larger plant soon; this plan is 'still in the engineering stage,' according to Richard Wheaton.

Earlier this year, the US government signed an agreement with the state of New South Wales in Australia. Under the agreement, the US and New South Wales will exchange guayule scientific research teams, beginning this autumn; the two governments will develop joint guayule projects, beginning next year; and the US will provide germ plasm for New South Wales' seed production programme.

While in Australia, the US guayule officials also held discussions for a similar agreement with the government of South Australia, and for a 'much broader' agreement with the Commonwealth Scientific and Industrial Research Organisation in Canberra.

All these developments portend for guayule a future which, though not exactly brilliant, is much more hopeful than 25 years ago. Guayule plants take 3-5 years to mature, and no one expects major production to begin sooner than the 1990s. Yet Richard Wheaton feels confident that the US could plant 1.5m acres of guayule, capable of providing one-fourth of the country's natural rubber needs, and that Mexico and Australia could become rubber exporting nations.

The market demand for guayule is not yet there. The defence demand for guayule—particularly as perceived by the Reagan Administration—is falling quickly into place. Whether defence concerns will be enough to bring guayule back into prominence remains to be seen. □

FURNITURE MAKERS TURNING TO RUBBER WOOD

Singapore furniture makers are turning more to Malaysian rubber wood because of its quality and stable prices.

Already a major importer of Malaysian rubber wood averaging some 4,500 tonnes a month, manufacturers here said they expected to buy more in the next few years.

The biggest importer, Hong Kong Teak Enterprises Pte Ltd, said 80 percent of its timber requirements is met by rubber wood compared with nothing in 1980.

Pine and ramin each account for 10 per cent of the remaining timber used in production.

The company imports about 3,200 tonnes of rubber wood from Malaysia a month of which 1,200 tonnes are sent to its two plants in Taiwan.

Another furniture manufacturer, Koda Woodcraft Pvt Ltd, recently imported a small quantity of rubber wood for trial production.

Its general manager, Mr James Koh, said the company has long-term plans to set up a joint venture plant in Johore to manufacture rubber wood components.

He attributed his company's switch to rubber wood to its very stable prices compared with ramin.

The story of rubber machinery

It was just more than 100 years ago-1879 to be exact-that Francis Shaw, then an engineer to one of the rubber industry's early pioneers, Charles Macintosh, founded Francis Shaw & Company Ltd on its current site in Manchester, England. ERJ thought it appropriate to invite one of the firm's directors, Harry D Giffin, to discuss the changes that have occurred over the past century in rubber machinery.

Although rubber is mentioned in *De Orbe Novo*, a book published in Latin in 1516, the European use of rubber and the production of the associated machinery really commenced in 1819 when Thomas Hancock in the UK started to make articles in rubber by cutting threads from raw rubber 'biscuits.' In order to use the off-cuts, he designed a machine to shred these pieces prior to remoulding them into blocks from which further threads could be cut. This machine consisted of a spiked drum. To Hancock's great surprise, he found that the machine did not produce shreds of rubber but a solid mass—the first masticator had been invented.

In the following year, a much larger horse-powered masticator was constructed and to this was added a pair of iron rollers in a frame—the first sheeting mill. The rubber was initially moulded into blocks from which threads and erasers could be cut. Subsequently, larger blocks were made and a sheet-slicing machine was designed to cut varying thicknesses from the blocks, so starting the 'cut-sheet' industry, with uses varying from tobacco pouches to waterproofing the hulls of wooden ships.

In 1823, Charle Macintosh, a manufacturer of chemicals, discovered that naphtha, one of the by-products of the new gas industry, was an excellent solvent for rubber. In order to exploit this discovery, he entered into partnership with a textile company which had a factory in Cambridge Street, Manchester, where Dunlop still has one of its GRG factories. Here he started production of proofed fabrics and soon found that a solution of masticated rubber had a low viscos ty and was easily spread. He formed an association with Hancock who invented a spreader (1837) which worked on very similar principles to those still in use. During this same period, equipment was also being developed in the US and The Roxbury India Rubber Company started to use a calender, invented and constructed by Chaffee in 1832 to produce proofed fabrics.

All the early articles produced from rubber suffered from the enormous disadvantage that they hardened in cold weather and became tacky when it was, warm. This unfortunate property was, however, soon to disappear because within a few months of each other, both Hancock (November 1843) and Charles Goodyear (June 1844) patented the vulcanisation process. In these two patents, mention is made of equipment such as mills, calenders and masticators for carrying out the mixing process and heated platens, heated rollers, hot-water vessels as means of providing the heat for vulcanisation—all methods which are still in use.

Steady progress

Probably the most prolific inventor of both equipment and processes in this early period was Hancock, who was by training an engineer and attributed much of his success to this fact. (It is intriguing to wonder if the development of the machines and processes in the industry would have followed the same path if Hancock had been a chemist. In these circumstances, he would perhaps have solved the problem of latex coagulating during transportation and based his work on a much wider use of latex.) In fact, this problem forced him to abandon his plans to use latex on a larger scale and led him to use his mechanical knowledge to progress the art along the lines of mechanical manipulation, with the emphasis on mastication, mechanical mixing, calendering, etc; an emphasis which remains to this day.

Following the discovery of vulcanisation, there was steady progress in the development of machinery rather than any dramatic advance. Typical was the introduction of screw extruders to replace ram extruders; Francis Shaw made one of the very early machines in 1881. This machine was, incidentally, in regular use until 1952—a striking example of the longevity of rubber processing machinery and the conservatism of some users. The chief products during this period were waterproofed footwear, clothing, travel goods, mechanical goods such as hoses, gaskets and washers; solid tyres and gutta percha-insulated telegraph cables.

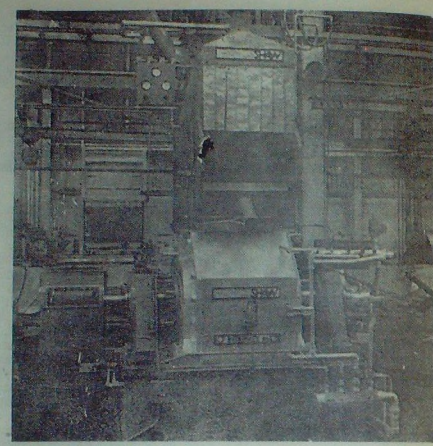
In 1888, an event occurred which was to have a profound influence on the whole rubber industry. John Boyd Dunlop, a veterinary surgeon, reinvented the pneumatic tyre (originally patented by RW Thompson in 1848). The main area of application was the bicycle and a variety of machines was produced to form and mould

cycle tyres. The most interesting of these was the Doughty vulcanising press for tyres, which carried half moulds on top and bottom-heated platens and had an expanding head on which the uncured tyre was fitted.

By 1920, further major changes occurred as a result of the impact of the growing automobile industry. The enormous increase in demand for rubber products, particularly tyres, provided the spur necessary to get effective production started on the rubber plantations in the Far East using the 'Wickham' seeds. These plantations needed equipment and during the 1920s and 30s, a wide range of rollers for washing, crepeing and sheeting were supplied. Catalogues from that period show that, in addition to supplying rubber and latex processing equipment to the plantations, Francis Shaw & Company Ltd supplied oil engines, electric generators, electric motors, belt transmission systems, water supply tanks and pumps and even steel-frame buildings in which to house the equipment.

A further factor which resulted in considerable machine development at this time was the adoption of a much more scientific approach to the formulation and processing of rubber compounds. In particular, it was discovered during World War I that carbon black was an excellent reinforcing agent This, together with the large growth in demand, made it essential to develop a cleaner and faster method of mixing than the traditional open mills.

Fernley H Banbury designed the first internal mixer in 1916, and, although there have been many improvements, the concept used in the Banbury mixer remains essentially the same today. In essence, there are two rotors turning at different speeds mounted in a chamber; the rotors and chamber can be temperature-controlled; each rotor has two or four relatively narrow blades which mix by smearing material on the chamber walls. Uniformity is achieved from the swirling action produced by the differential rotor speeds.



210 kg Batch weight Mixer

The other main mixing device in use today was developed in the early 1930s by Francis Shaw in co-operation with a customer. The aim was to create a machine which would reproduce the mixing action of a two-roll mill, The result was the Intermix, in which the rheology of mixing is completely different from that used in the Banbury. In the Intermix massive interlocking rotors are used with specially shaped flat-topped projections (nogs) which give uniform shear rates relative to the chamber walls, thus eliminating hot spots. The large rotors not only give a cooling surface 40 to 50 percent greater than in some other units, but also ensure that the compound stays in thin layers, so promoting effective and uniform cooling, The shape of the nogs ensures positive circulation around the chamber so that every small mass receives exactly the same mixing history.

As the demand for tyres built up during the inter-war period, there was a steady mechanisation of most tyre manufacturing processes with quite ingenious mechanical devices being used to build tyres. At the same time, the size of individual machines was being increased to cater for the rapidly growing volume of compound required by the tyre industry—an early example was the No. 27 Banbury which was first produced in 1920. Although most development effort undoubtedly went into producing machines for the tyre industry, there were significant developments in other areas. Typical examples were an automatic punch press for producing shoe soles and heels, and the Rotocure, which allowed continuous vulcanisation

of belting for conveyor and drive belts. Both of these machines exhibited the mechanical ingenuity which was a feature of these inter-war years.

Immediately after World War II, developments were aimed primarily at increasing output although, subsequently, emphasis was also placed on the need to limit direct labour costs. Typical examples of developments from this period are: continuous steam vulcanising for the production of cables, which reduced labour costs as well as greatly increasing output; the widespread introduction of dump extruders under mixers; the Bag-o-Matic, which was undoubtedly the most important development for the tyre industry as it provided, for the first time, a fully automatic machine for vulcanising tyres.

During the last 20 years, there has been a growing emphasis on improved quality of product by automating process control and eliminating operator-generated variances. The rapid development of the electronics industry has greatly aided this work.

Although some aspects of the rubber industry may still be regarded as an art, the much greater application of scientific principles is leading to the use of a great variety of techniques to cover quite small processing areas. The object is to ensure that the technique employed produces the exact effect required for optimum results. For instance, continuous vulcanisation of extrudates is now carried out using steam, hot air, glass microspheres (ballotini), molten salt, pressurised molten salt, high frequency (microwave) heating and high velocity heated inert gases. Although there is obviously some overlap, each method has been designed with the object of producing the best results for a particular application.

It would require a brave man to predict what *European Rubber Journal* will be reporting in 25 years' time and it would be foolhardy to try to foretell what will appear in the Bicentenary issue. There are, however, some trends which are now apparent and which will undoubtedly affect development over the next few years.

* The extreme competitiveness of the machinery market is forcing suppliers to redesign with the object of reducing manufacturing costs without altering the process concept or affecting the quality of the machine or the finished product.

* The same competitive spur is resulting in significant research work aimed at increasing the output from existing types of machine. Typical are extruders with revised barrel and screw configurations which can increase output by 50 or 60 percent. It must be admitted that these machines do not have the versatility of their predecessors.

* Completely new processing concepts are being investigated which will allow the same output and quality of product using machines which are inherently less expensive to produce.

* Methods of improving product quality are being investigated, examples are: changes to flow paths in mixers and extruders to achieve better dispersion; automatic setting of all parameters on extrusion lines; more accurate compound temperature control in extruders by the adoption of a more scientific method of monitoring and adjusting the rate at which heat is fed into and removed from the compound.

* Fundamental research into the way in which mixing takes place so that a new generation of machines can be designed to incorporate appropriate features.

* Changes in technique aimed at minimising power consumption—a necessity in view of the ever rising costs of power in an industry which is largely based on Hancock's original concept of mechanical manipulation.

From the point of view of the machinery maker these new developments are exciting. The only sad aspect is that they are being undertaken at a time when competition has reduced profits to a minimum so that any additional expenditure becomes a real burden. Good may, however, come out of evil, as the situation has given rise to serious discussion among machinery manufacturers regarding the possibility of co-operative research and development work. □

INDIA TO PRODUCE TEST TUBE PLANTS

Seven Indian Research Institutes are to conduct a countrywide special research programme using a new tissue culture technique covering selected fruits, species, flowers, trees, agricultural crops and medicinal plants.

The Indian Agricultural Research Institute (IARI) based in New Delhi has already reported to have achieved a breakthrough in multiplying disease resistant papaya saplings in its laboratory and is shortly expected to launch field trials. Papaya, which is rich in vitamins A and C, is one of the most popular fruits in India and has about 10,000 hectares under the crop and gives about 100 tons of fruits per hectare.

Tissue culture first discovered by a German Botanist is expected to offer large potential in circumventing various limitations such as pest and disease control normally encountered in the cultivation of crops.

RUBBER GOODS INDUSTRY IN INDIA

— OP JALAN

The text of this article is compiled from the relevant portions of the address delivered by Shri OP Jalan, President, All India Rubber Industries Association at the Annual General meeting of the Association held at Bombay on 28th June 1984. The author has endeavoured to cover at length the problems and prospects of the rubber industry viewed from the manufacturers' angle. Shri Jalan is a member of the Rubber Board, representing rubber goods manufacturing industry. The views expressed are entirely those of the author and the organisation he represents.

You may be aware that the rubber goods manufacturing industry which has a history of 60 years as on today, has, over 3,500 units comprising 15 automotive tyre units; over 80 DGTD units, about 2,500 small scale units and 1,000 tiny units. The industry manufactures over 35,000 rubber items Its annual turnover is over Rs. 2,500 crores. It pays about Rs. 600 crores as excise and customs duties and cess to the Government Exchequer and earns over Rs. 60 crores through exports. It employs over 2 lakh persons.

This Association, known as All India Rubber Industries Association (AIRIA,) represents. according to the yard-stick of rubber consumption, 85% of the rubber industry and has already completed 38 years of its service to the industry.

Since its establishment in 1945, it has steadily grown and as of today achieved a federal structure. It has, Head Office at Bombay, Regional Office at Calcutta and Branch Offices at New Delhi and Madras. Regional Committees have been formed to initiate activities and render services to members in different regions. The membership during the year 1983 has increased by 11%, since 1978 by 73.6% which shows the growing importance of the AIRIA.

During the year, apart from having technical-talks and gettogethers, through various sub-committees like Conveyor Belt Panel, Fan Belt/Belt panel, Editorial Committee, Technical Committee, etc., the Association conducted specific activities to extend services to the members in different fields. It has assigned a study to the National Council of Applied Economic Research (NCAER) on "Conveyor Belt Industry in India" and has scheduled publication of two monographs, one on safety and the other on testing. AIRIA is also a life member of Indian Rubber Manufacturers' Research Association whose contributions in the field of R & D are also significant

Economic Scenario

The economic changes that affect the developed economies of the world, have repercussions today on every developing country. The Indian economy, in this, has shown remarkable resilience, due to impressive progress in agriculture and highly diversified industrial base, in meeting the challenges of the international situation. On current estimates, the overall growth rate during 1983-84 may be six per cent.

Taking into account the complexities of promoting economic and social development, we are better equipped to develop our economy with our own resources, with large technically trained manpower, and newly emerging entrepreneurial class, which augurs well for the future. We have a gross saving rate of about 23% and an investment rate of 25% indicating the builtin resilience of the economy.

However, despite this, it is now being increasingly realised that drastic changes are required in the policy and approach to planning for effecting a dramatic break-through in the near future. Unless this is achieved, the investment rate will remain the same due to increasing population which is likely to go over 1,000 million by 2000 A. D and GNP growth rate will be around 3.5% perpetuating poverty and unemployment.

Economy in 1983

We have reached nearly self-sufficiency in foodgrains and have emerged as the fourth largest producer in the world. There is considerable scope in raising productivity through better management, for, agriculture still provides a source of employment to 73% of the population, as it did before independence.

We have certainly made great strides in industry achieving self-sufficiency in our requirements of most consumer products and even capital equipment. However, the annual growth rate of industrial

production, which was 7.5% in 1950s and 6.3% in 1960s has fallen to 4.7% since 1970 as against plan targets between 8% to 10%.

There are several reasons for deceleration in the rate of growth. Rapid expansion in industrial output cannot be achieved without adequate supplies at reasonable prices of basic raw materials and infra-structural inputs namely power, coal, rail transportation, etc. Deficiencies in these sectors have proved to be the main hurdles in the path of sustained industrial progress Although on the petroleum front we have done well, but the deteriorating industrial relation has great adverse impact on the industrial scene.

Rubber Industry—Retrospect

The Rubber Industry kept-up its increasing trend of growth rate during the year 1983-84 at 7.9% against the previous year's level of 4.4%. However, the average annual growth rate during the last 5 years has been 5.23%.

During the year 1983, production of rubber goods increased in both the sectors—tyre as well as non-tyre. The production of automotive tyres in 1983 increased to 9.46 million numbers as against 8.94 million numbers in 1982—an increase of 5.82%. In non-tyre sector, cycle tyre production, during 1983, was 30 million numbers as against 21 million numbers in 1982—an increase of 7.14%. There was increase in production of other rubber products like hoses, V-belts, fan belts and other industrial and consumer products. However, due to shortage of raw materials coupled with high rise in their costs, the installed capacities both in the tyre and non-tyre sectors could not be utilised to their optimum levels.

Consumption/Production Trends of New Rubbers

The consumption of new rubbers, the parameter with which the industry's growth-rate is measured, increased from 2,45,145 tonnes in 1982-83 to 2,64,505 tonnes in 1983-84. In this, consumption of natural rubber crossed two lakh tonnes mark reaching a figure of 2,09,480 tonnes in 1983-84. The overall consumption of synthetic rubber also increased from 49,600 tonnes to 55,025 tonnes.

As against this, the production of new rubbers during 1982-83 failed to keep pace with its consumption. As against 7.9% increase in consumption, the production increased only by 5.50% from 1,96,140 tonnes to 2,07,585 tonnes. The deficit of new rubbers which was 29,739 tonnes in 1979-80 increased in 1983-84 to 56,920 tonnes mainly consisting of natural rubber. But the imports of natural rubber effected during the year were highly inadequate to meet the deficit; consequently, the scarcity of rubber continued and prices shot-up to higher levels.

Besides this, two plants of synthetic rubbers operated at slightly above half their capacities adding to the shortages of new rubbers.

Natural Rubber—Basic Raw Material

Since about 1978, the rubber industry has been facing uncertainty regarding its basic raw material—natural rubber-due to increasing shortages and continuous rise in its prices. It is unfortunate that a vital raw material such as natural rubber, which accounts for 80% of the total new rubber requirements of the industry, is still today treated in a manner devoid of pragmatism and long-term approach, by resorting to the measures like inadequate *ad hoc* imports to meet shortages which have no positive impact either on availability of natural rubber or its prices.

If want of decision on rubber imports aggravated the crisis in 1978, the delayed imports and haphazard distribution by the STC added fuel to the fire in 1979. The meagre imports of 1,000 tonnes of rubber was the cause of critical situation in 1980, the fall in production and unplanned imports in 1981 added to the plight of the industry. While lack of co-ordination and delay amongst various departments in 1982, left the industry high and dry, in 1983 it was suspension of distribution of imported rubber, delay in further authorisation of import and its execution by the STC and delay in granting reduction in customs duty on natural rubber, that put the industry in a quandary.

Availability and High Prices of Natural Rubber

Rubber import is viewed with a sense of suspicion by our friends in the plantation sector. I would like to assure them on behalf of the rubber industry that the manufacturing industry is not interested in importing even a kilo of rubber, if our plantation industry can produce the quantity we need at home. However, at the same time rubber industry can not be left to starve for its requirements of natural rubber and cannot be allowed to be exploited by high prices at home.

Although assurances were given by the Government that rubber imports would be authorised to the extent of deficit between demand and supply, but, in practice, every year for one reason or the other, imports and subsequent supply, remained inadequate and prices went on scaling new heights.

Let us take a look at the prices first. The average RMA-1 price ex-Kottayam has increased from Rs. 934 per quintal in 1978 to Rs. 1,753 per quintal in 1983, thereby representing an increase of over 87% in five years. In August 1983, it reached all time high level at Rs. 1,937 per quintal ex-Kottayam. Even during the peak rubber production period in the last

Year	Average RMA-1 Price at Kottayam Rs. per quintal	%increase over corresponding period of previous year	%increase over 1978
1977	673	—	—
1978	934	38.78	—
1979	1,071	14 67	14.67
1980	1,211	13.07	29 66
1981	1,493	23 29	59.85
1982	1,554	4.09	66.38
1983	1,753	12.81	87.69
1983 (August)	1,937	16 76	107.39
1983 (last quarter)	1,825	30.64	95.40

quarter of 1983, the ruling price was Rs. 1,825 per quintal against Rs. 1,397 per quintal last year during the same period—an increase of above 30%. Even at present the RMA-1 price is ruling at around Rs. 1,825 a quintal Ex-Kottayam. Table comprising the average prices since 1977 is given above:

Now, let us take a look at the availability. At the end of the year, April 1983 to March 1984, the final deficit of natural rubber stood at 43,000 tonnes against which only 32,000 tonnes were imported and distributed by the STC. In spite of repeated representations by the manufacturing industry, further authorisation of imports was delayed. Even when, a quantity of further 14,000 tonnes was authorised for import and distribution before March 1984, the same was actually not imported and distributed by STC during the lean tapping season of Feb.-March 1984, leaving a huge deficit uncovered and the industry to its fate to face the unprecedented rise in the price of natural rubber.

This apart, except for a couple of months, throughout the year, the stock position was quite disturbing. As against the accepted stock norms of 3 months' average consumption (although the industry has been advocating for 4 months' average consumption), the stock fluctuated between 7 to 10 weeks average consumption, further adding to the spiral of rising prices.

Deficit During 1984-85

As imports have now become indispensable—the fact that can only be denied at our own peril—due to growing deficit, and that measures be taken in time to plan out imports in advance, the Association has already submitted the following estimates, which indicate a deficit of 62,500 tonnes, including 3 months' stock requirements to be covered by March 1985.

Future Trend—Seventh Plan Period

Recently the Government has constituted a Working Group to prepare projections for the Seventh Five-Year Plan for the rubber industry under the Chairmanship of the Secretary, Ministry of Industry. The Association has already submitted its estimates for demand, supply and deficit of new rubbers based on past performance of the industry, covering the period not only of the Seventh Five-Year Plan but also upto the end of the century, i. e., 2000 A D., which reveal that there is going to be a deficit of about one lakh tonnes of natural rubber by the end of the Seventh Five-Year Plan period, i.e., by 1989-90 and 3,36,000 tonnes by the end of the century. The deficit of synthetic rubbers will go upto 45,000 tonnes and 86,000 tonnes during the same periods.

MEASURES

From the facts presented here, it is evident that policy of *ad hoc* rubber imports have failed miserably, and that long-term pragmatic measures, coupled with integrated rubber policy, are not only essential but inevitable, for, no industry can operate under the clouds of uncertainty, on year to year basis, in absence of definite future programme either for production of goods or for the raw materials needed by it.

Estimates of Natural Rubber—1984-85

		Tonnes
Demand:		
1.	Consumption during 1984-85 ...	2,30,000
2.	Stock reserve equivalent to 3 months' consumption	57,500
	Total Demand (A)	2,87,500
Supply:		
3.	Estimated Maximum carryover stock as on 1-4-1984	45,000
4.	Estimated production during 1984-85 ...	1,80,000
	Total Supply (B)...	2,25,000
Deficit:		
5.	Likely Deficit (A-B)	62,500
	Less: Quantity being imported against import authorisation for 1983-84	12,000
	Balance Deficit	50,500

Demand, Supply & Deficit of Natural & Synthetic Rubber

(Metric Tonnes)

		1989-90	1994-95	1999-2000
A. *Demand:*				
Natural Rubber		299,175	419,605	588,520
Synthetic Rubber		94,475	132,510	185,850
	Total	393,650	552,115	774,370
B. *Supply:*				
Natural Rubber		197,150	223,050	252,360
Synthetic Rubber		49,440	70,150	99,550
	Total	246,590	293,200	351,910
C. *Deficit:*				
Natural Rubber		102,025	196,555	336,160
Synthetic Rubber		45,035	62,360	86,300
	Total	147,060	258,915	422,460

To overcome the present critical situation. as also to take care of mounting deficits in future, the Association has time and again suggested several measures, which I would reiterate in brief, with an earnest appeal to the Government to dispense with *ad hocism* and formulate a definite policy as regards prices and supplies of rubber to pl ce the industry on an even keel.

Immediate Measures

1. Considering the deficit of 62,500 tonnes of natural rubber during the year 1984-85, the STC, be immediately authorised to arrange for rubber imports of at leat 40,000 tonnes for distribution during the lean rubber production period, i.e., before August 1984 and the balance imports be effected, in time, for distribution during February-March 1985.

2. Considering the fact, that the international price of natural rubber has moved up to Rs. 12/- per kg., the overall customs duty of 81.5% on natural rubber was reduced to 35% earlier in the year. This was subsequently further reduced from 35% to 25% with the active support of Shri Tiwariji and his ministry. But this reduction is not adequate enough as, still allotment price of STC amounts to Rs. 17/- a kg., thus supporting the local prices to remain at an unreasonably high level. As such, I earnestly urge for the complete waiver of the customs duty on natural rubber to enable the STC to offer the rubber at a reasonable price.

3. The recent decision of the Government to ensure that the allotment price of imported rubber is maintained at par with the domestic price and to achieve that, to apply the component of import duty, as an effective lever, to strike a balance between the price of imported and domestic rubber, is a dangerous step, as, that will lead to artificial price hike and consequent disastrous effects on the rubber industry. I, therefore, strongly plead that the allotment price of imported rubber should not be in any way linked with the prevailing domestic price, but should be fixed at a reasonable level which the Government may deem fit for supply of imported rubber to the industry.

4. To improve the rapport between the STC and the industry, a representative of the industry be nominated on the STC's Advisory Committee and the Pricing Committee.

Short-Term Measures

Now, I shall spell out few short-term measures that can meet the exigencies of the pressing needs of the day, before well-knit policy is evolved.

(i) All concerned with the rubber industry every year submit their estimates of demand, supply and deficit, which vary from each other and confuse the issue causi-g unnecessary delays at various stages in the arrangements for imports. To avoid such delays and the resulting uncertainty, the Government should evolve a simple system for quickly arriving at the deficit after due consideration of the views of all concerned, so that once the deficit for the year is established, plans are made in advance for imports to bridge the gap. In this, estimates of demand, recommended by the DGTD, be accepted on behalf of the industry.

(ii) Rubber imports are canalised through STC, but, no benefits have accrued either to the country or to the industry. The STC has always offered imported rubber at a price higher than local prices. In view of this the industry be allowed to directly import rubber, duty-free.

(iii) During the last six years, 1,53,000 tonnes of natural rubber have been imported, but it has failed to bring any stability to its price and availability. There is a need to maintain adequate buffer stocks in the country financed from the cess collected by the Rubber Board from the rubber industry. These stocks be supported by a minimum and a maximum price mechanism, within which prices should be allowed to fluctuate. As and when prices go beyond these limits, there will either be releases from the stock or additions to it through imports to achieve price stability with adequate availability.

(iv) The two synthetic rubber plants, which are working

slightly above half their capacities be impressed upon to utilise their full capacities in order to reduce the overall shortages of rubber.

(v) The cess on natural rubber be revised downward to reduce the financial strain on the rubber industry.

Long-Term Measures

Apart from the short-term measures, there are long-term measures, which I would enumerate, urging the Government to take them simultaneously, in order to place the industry on a sound footing.

(i) As natural rubber has a gestation period of seven years, any delay in embarking upon a massive new plantation scheme would only prolong further our dependence on imports. The State of Kerala produces over 92% of natural rubber, where at present, there is little scope for expansion, as, availability of land for rubber cultivation is posing a serious problem. Under the circumstances, the Government should forthwith undertake programme of rubber plantations on war-footing in other States like Maharashtra, Goa, Karnataka, Tamil Nadu, Tripura, Mizoram, Arunachal Pradesh etc., where land and climate are suitable for cultivation of rubber. While considering the new plantations in new areas, the private sector undertakings should be given an opportunity to enter into this field alongwith the public sector undertaking or even jointly. Assistance by way of making suitable lands available for rubber plantations shall have to be considered alongwith long-term loans and until the gestation period of seven years is over when the plantation starts yielding revenue, there should be a moratorium on repayment of loan.

(ii) Since the enactment of the Rubber Act in 1947-48 until 1972-73 the deficit between demand and supply was arrived at on the basis of stock norms equivalent to four months' average consumption Unfortunately, these stock norms were reduced to three months' average consumption at the instance of the plantation sector and since then it could be seen that the prices are on the rise. Even though three months' stock norms are in force, the stocks are always less than 2 to 2½ months' average consumption In view of this, I urge the Government to revert back to the stock norms of four months' average consumption to stabilise natural rubber prices at reasonable level.

(iii) In view of the changed situation during the last 30 years, the Rubber Board be restructured so as to give parity of representation between producers and consumers, as, at present, it is heavily in favour of plantation sector with only minority representation from the rubber consuming industry.

OTHER RAW MATERIALS

Synthetic Rubbers

Besides the problems of natural rubber, the industry is also faced with difficulties due to inadequate supplies and high prices of synthetic rubbers viz., SBR and PBR. The capacity utilisation of synthetic rubber plants, one at Bareily and the other at Baroda is around 50% of the installed capacity, and as a result the supplies continue to remain inadequate. This apart, very recently, both the manufactures of synthetic rubbers have further increased their prices by about 10% With this increase, the indigenous prices of synthetic rubber (SBR) are more than double the prices prevailing in the international market. In addition to this, the customs duty on styrene butadience rubber is as high as 122%.

It is unfortunate that though the capacity is available in the country, it is not fully utilised. If the material is produced at full capacity at these two plants and made available in good quality at a reasonable price, the rubber industry would consume the entire quantity, which would also greatly ease the critical situation of natural rubber and would reduce to some extent the outflow of precious foreign exchange It is felt that the Government should impress upon both these producers to produce to their full capacities and offer the material to the industry at a reasonable price.

In view of the increasing demand for rubder, it is imperative that efforts are made to increase availability of synthetic rubbers. This apart, at present the ratio of consumption of natural rubber to synthetic rubber is 80:20, whereas in industrially advanced countries, it is the reverse, which shows ample scope for increasing consumption of synthetic rubber in India In view of this, a third synthetic rubber plant may be sanctioned immediately for the manufacture of minimum 50,000 tonnes.

Special Purpose Synthetic Rubber

This apart, the exorbitant customs duty ranging from 88.7% to over 200% on spacial purpose synthetic rubbers including butyl rubber, is yet another constraint on the industry. There is no indigenous production of these rubbers at present and not likely to come up in the near future, as such there does not arise any question of protection to indigenous industry, hence, these rubbers be allowed to be imported duty-free or at a nominal rate of duty This would give economic advantage as also will keep the rubber industry abreast of the latest developments in usage of synthetic rubbers.

Nylon Tyre Cord

The shortage of Nylon tyre yarn, yet another input, gives moment of anxiety to the industry, particularly to the tyre sector.

This shortage has been aggravated since November last due to lock-out at one of the plants manufacturing this raw material. The minimum shortfall in 1984 is expected to be of the order of 5,000 tonnes, which will have to be met through imports. But the prohibitive rate of about 200% import duty has made it extremely difficult for the tyre industry to import any material It is strongly felt that unless the customs duty on nylon tyre yarn is suitably reduced and protective duty of Rs. 11/- a kg withdrawn, the tyre industry will continue to face the difficulties detrimental to its growth.

Exports of Rubber Goods

During the last five years, the export of rubber goods has shown increasing trend in spite of several handicaps like high prices of essential raw materials, etc. The export, which was of the order of Rs. 403 million in 1981-82 and Rs. 501 million in 1982-83, has reached a figure of 608 million during 1983-84, an increase of 21.36% in one year. It is heartening to note that the exports of non-tyre sector accounts for the major portion of these exports which amounted to Rs. 450 million against tyre exports of Rs. 158 million. The export target for 1984-85 is Rs. 755 million. This makes it evident that so far as the quality is concerned, Indian rubber products compete well with rubber goods manufactured in any of the advanced countries. The overall performance of rubber goods exports is heartening and if better facilities and pragmatic incentives are given to the industry, backed by supply of essential raw materials at the international price, it has potential to make in-roads in new markets as well as expand its exports in traditional areas. The following specific measures are requested for promoting exports:

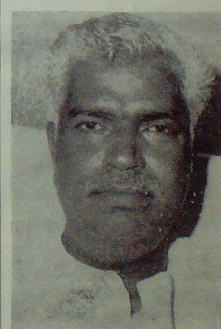
- Upward revision of CCS rate.
- Enhancement of the time period for packing credit from 90 to 180 days.
- Need for inclusion of rubber products in Group B of Annexure-4 of RBI Exchange Control Manual for extension of the Export Credit facilities to overseas buyers upto 365 days.
- Dispensing with norms for sanction of residual duty drawback for auto tyres and tubes.
- Need for giving special weightage for inclusion of rubber products in special trade/credit agreements by Government of India and EXIM Bank.

Prices of Rubber Products

Recently there has been lot of criticism in the Press regarding price revision by the tyre industry. I would like to put the record straight by placing some of the facts before you. The tyre industry maintained the prices of tyres at pre-September 1981 level till April 1983, in spite of alround escalation in the cost of inputs and tax rates, totalling more than 20%. In May 1983, the truck tyre prices were increased by 10% and other tyres by 5%. However, on the advice of the Government, the industry rolled back the prices to pre-September 1981 level, with an assurance from the Government that the Bureau of Industrial Costs and Prices will submit their study report in a month's time. It is understood that BICP examined the matter and submitted its report in August 1983 to the Government confirming that there has been a substantial increase in the cost of tyre manufacture. Unable to bear the spiral of increase in prices of essential raw materials, the tyre industry increased the selling prices of truck tyres ranging from 6.8% to 9.5% in January/February 1984, in order to some extent the heavy burden of cost increase of 20%. Under the circumstances, the criticism on tyre industry for marginally raising its prices, is unjustified. You will appreciate that no industry can sustain and survive the constraints of increasing cost of its inputs from year to year.

Further, it should be noted that non-tyre sector in rubber industry accounts for 45% of rubber consumption. This sector too, comprising of thousands of medium, small and tiny units, is in no position to increase its prices and the high input cost is threatening the existence of hundreds of such manufacturers As such, several self-employed persons and small entrepreneurs are facing adverse financial conditions, and they may be forced out of the industry due to uneconomic environments, unless serious steps are taken to protect their interests by timely supply of the basic raw materials at reasonable price. □

Monipally
Vice Chairman



Shri K Joseph Monipally was declared elected unanimously as Vice Chairman of the Rubber Board for one year from 2-6-1984.

slightly above half their capacities be impressed upon to utilise their full capacities in order to reduce the overall shortages of rubber.

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Long-Term Measures

Apart from the short-term measures, there are long-term measures, which I would enumerate, urging the Government to take them simultaneously, in order to place the industry on a sound footing.

(i) As natural rubber has a gestation period of seven years, any delay in embarking upon a massive new plantation scheme would only prolong further our dependence on imports. The State of Kerala produces over 92% of natural rubber, where at present, there is little scope for expansion, as, availability of land for rubber cultivation is posing a serious problem. Under the circumstances, the Government should forthwith undertake programme of rubber plantations on war-footing in other States like Maharashtra, Goa, Karnataka, Tamil Nadu, Tripura, Mizoram, Arunachal Pradesh etc., where land and climate are suitable for cultivation of rubber. While considering the new plantations in new areas, the private sector undertakings should be given an opportunity to enter into this field alongwith the public sector undertaking or even jointly. Assistance by way of making suitable lands available for rubber plantations shall have to be considered alongwith long-term loans and until the gestation period of seven years is over when the plantation starts yielding revenue, there should be a moratorium on repayment of loan.

(ii) Since the enactment of the Rubber Act in 1947-48 until 1972-73 the deficit between demand and supply was arrived at on the basis of stock norms equivalent to four months' average consumption Unfortunately, these stock norms were reduced to three months' average consumption at the instance of the plantation sector and since then it could be seen that the prices are on the rise. Even though three months' stock norms are in force, the stocks are always less than 2 to 2½ months' average consumption In view of this, I urge the Government to revert back to the stock norms of four months' average consumption to stabilise natural rubber prices at reasonable level.

(iii) In view of the changed situation during the last 30 years, the Rubber Board be restructured so as to give parity of representation between producers and consumers, as, at present, it is heavily in favour of plantation sector with only minority representation from the rubber consuming industry.

OTHER RAW MATERIALS

Synthetic Rubbers

Besides the problems of natural rubber, the industry is also faced with difficulties due to inadequate supplies and high prices of synthetic rubbers viz., SBR and PBR. The capacity utilisation of synthetic rubber plants, one at Bareily and the other at Baroda is around 50% of the installed capacity, and as a result the supplies continue to remain inadequate. This apart, very recently, both the manufactures of synthetic rubbers have further increased their prices by about 10% With this increase, the indigenous prices of synthetic rubber (SBR) are more than double the prices prevailing in the international market. In addition to this, the customs duty on styrene butadience rubber is as high as 122%.

It is unfortunate that though the capacity is available in the country, it is not fully utilised. If the material is produced at full capacity at these two plants and made available in good quality at a reasonable price, the rubber industry would consume the entire quantity, which would also greatly ease the critical situation of natural rubber and would reduce to some extent the outflow of precious foreign exchange It is felt that the Government should impress upon both these producers to produce to their full capacities and offer the material to the industry at a reasonable price.

In view of the increasing demand for rubber, it is imperative that efforts are made to increase availability of synthetic rubbers. This apart, at present the ratio of consumption of natural rubber to synthetic rubber is 80:20, whereas in industrially advanced countries, it is the reverse, which shows ample scope for increasing consumption of synthetic rubber in India In view of this, a third synthetic rubber plant may be sanctioned immediately for the manufacture of minimum 50,000 tonnes.

Special Purpcse Synthetic Rubber

This apart, the exorbitant customs duty ranging from 88.7% to over 200% on spacial purpose synthetic rubbers including butyl rubber, is yet another constraint on the industry. There is no indigenous production of these rubbers at present and not likely to come up in the near future, as such there does not arise any question of protection to indigenous industry, hence, these rubbers be allowed to be imported duty-free or at a nominal rate of duty This would give economic advantage as also will keep the rubber industry abreast of the latest developments in usage of synthetic rubbers.

Nylon Tyre Cord

The shortage of Nylon tyre yarn, yet another input, gives moment of anxiety to the industry, particularly to the tyre sector.

This shortage has been aggravated since November last due to lock-out at one of the plants manufacturing this raw material. The minimum shortfall in 1984 is expected to be of the order of 5,000 tonnes, which will have to be met through imports. But the prohibitive rate of about 200% import duty has made it extremely difficult for the tyre industry to import any material It is strongly felt that unless the customs duty on nylon tyre yarn is suitably reduced and protective duty of Rs. 11/- a kg withdrawn, the tyre industry will continue to face the difficulties detrimental to its growth.

Exports of Rubber Goods

During the last five years, the export of rubber goods has shown increasing trend in spite of several handicaps like high prices of essential raw materials, etc. The export, which was of the order of Rs. 403 million in 1981-82 and Rs. 501 million in 1982-83, has reached a figure of 608 million during 1983-84, an increase of 21.36% in one year. It is heartening to note that the exports of non-tyre sector accounts for the major portion of these exports which amounted to Rs. 450 million against tyre exports of Rs. 158 million. The export target for 1984-85 is Rs. 755 million. This makes it evident that so far as the quality is concerned, Indian rubber products compete well with rubber goods manufactured in any of the advanced countries. The overall performance of rubber goods exports is heartening and if better facilities and pragmatic incentives are given to the industry, backed by supply of essential raw materials at the international price, it has potential to make in-roads in new markets as well as expand its exports in traditional areas. The following specific measures are requested for promoting exports:

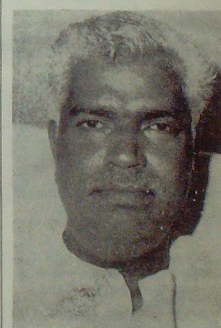
- Upward revision of CCS rate.
- Enhancement of the time period for packing credit from 90 to 180 days.
- Need for inclusion of rubber products in Group B of Annexure-4 of RBI Exchange Control Manual for extension of the Export Credit facilities to overseas buyers upto 365 days.
- Dispensing with norms for sanction of residual duty drawback for auto tyres and tubes.
- Need for giving special weightage for inclusion of rubber products in special trade/credit agreements by Government of India and EXIM Bank.

Prices of Rubber Products

Recently there has been lot of criticism in the Press regarding price revision by the tyre industry. I would like to put the record straight by placing some of the facts before you. The tyre industry maintained the prices of tyres at pre-September 1981 level till April 1983, in spite of alround escalation in the cost of inputs and tax rates, totalling more than 20%. In May 1983, the truck tyre prices were increased by 10% and other tyres by 5%. However, on the advice of the Government, the industry rolled back the prices to pre-September 1981 level, with an assurance from the Government that the Bureau of Industrial Costs and Prices will submit their study report in a month's time. It is understood that BICP examined the matter and submitted its report in August 1983 to the Government confirming that there has been a substantial increase in the cost of tyre manufacture. Unable to bear the spiral of increase in prices of essential raw materials, the tyre industry increased the selling prices of truck tyres ranging from 6.8% to 9.5% in January/February 1984, in order to mitigate to some extent the heavy burden of cost increase of 20%. Under the circumstances, the criticism on tyre industry for marginally raising its prices, is unjustified. You will appreciate that no industry can sustain and survive the constraints of increasing cost of its inputs from year to year.

Further, it should be noted that non-tyre sector in rubber industry accounts for 45% of rubber consumption. This sector too, comprising of thousands of medium, small and tiny units, is in no position to increase its prices and the high input cost is threatening the existence of hundreds of such manufacturers As such, several self-employed persons and small entrepreneurs are facing adverse financial conditions, and they may be forced out of the industry due to uneconomic environments, unless serious steps are taken to protect their interests by timely supply of the basic raw materials at reasonable price. □

Monipally
Vice Chairman



Shri K Joseph Monipally was declared elected unanimously as Vice Chairman of the Rubber Board for one year from 2-6-1984.

(Contiuned from page 4)

occur by parasexual means and results in new cells containing the nuclear genomes of both. Mouse-human or hamster-human hybrid cellf are selectively recovered using HAT (Hypoxanthine Aminopterin-Thymidine) technique. By this technique, conditions are created under which only the hybrid cells are capable of synthesising DNA and thus increase in number by cell division. The mouse-human hybrid cells preferentially loose human chromosomes. Ultimately a mixture of cells containing a full complement of mouse chromosomes and a few human chromosomes results.

The production of plant protoplasts. their fusion and regeneration to yield hybrids is one of the most exciting developments in tissue culture. In somatic hybridization, no reduction division that naturally takes place during game to genesis in sexual reproduction, is involved. Thus the fusion of two diploid cells result in tetraploid plants. In the case of Lolium-Festuca hybrid, somatic hybridization is especially useful, because after sexual hybridization, the diploid hybrids are infertile and chromosome doubling by colchicine treatment is often impossible. In sexual hybridization, the cytoplasmic contribution from the male parent is usually very slight. But in somatic hybridization, more or less equal cytoplasmic contribution from both parents occurs. Thus the cytoplasmic mix obtained from protoplast fusion is novel.

Protoplast regeneration has so far been obtained only with a few varieties of species. But extensive work is being done in this field with sexually incompatible species and applying recombinant DNA technology in plants. In vitro production of hybrids was achieved in the case of tobacco-petunia and potatotomato hybrids.

The progress made in the field of modern genetics and bio-technology in the last two decades has resulted in fascinating possibilities for plant and animal improvement, medical diagnosis, control of diseases, manufacturing a number of economic products like medicines and vaccines, breaking toxic pollutants in the enviornment and so on. Genetic engineering involves a wide range of techniques, the most important of which is splicing and combining genetic material derived from different organisms to produce a 'recombinant gene'. Basically the gene splicing technique involves insertion of a foreign gene for a desired trait into an organism. The steps in the process are (i) the DNA is isolated from the nucleus and (ii) subjected to treatment with certain enzymes called 'restriction enzymes', which have the property of cutting the DNA strand at specific base sequences. The smaller DNA segment of a virus is subjected to similar treatment. The segment of DNA or plasmid is capable of replication and can invade other microorganisms, inside which it reproduces at a fast rate, When the DNA segments derived from the two source are mixed together, pairing of the single stranded DNA takes place, resulting in the recombinant DNA called 'cloned gene'. The entire procedure is' called 'cloning'. By further treatment with special enzymes,the discontinuous parts in the recombinant DNA may be closed. Observations from experimental studies reveal that such gene transferes are effective. A gene from Salmonella, which is resistant to streptomycin was incorporated into a plasmid and was added to *Escherechia Coli*, which occurs in the human intestine. When streptomycin was administered only those *E.Coli* containing the gene for streptomycin resistance survived.

Genetic engineering has great significance in medical sciences also. Several health care products like insulin, interferon and growth hormones produced in biological factories have now arrived in market. Until recently insulin was extracted from the pancreas of slaughtered pigs and cattle. Human insulin, under the trade name 'Humulin' is one of the first products commercially manufactured using genetic engineering techniques. It is pure and specific, in addition to causing only lesser side effects.

Recently, it has been discovered that a group of genes, called 'oncogenes' are responsibile for causing cancer. Twelve oncogenes have been recognized in man and these genes when transferred to a different site due to chromosome rearrangement, induces excess cell division. Scientists believe that these genes are possibly introduced into the human system by certain virus.

Interferon is an antiviral hormone in man and possesses antitumor properties. Human genes for interferon, when transferred into bacteria and yeast, yield a pure and specific product. Through microbial manipulations interferons are being produced in large quantities. Early in 1981 the Gen Tech Co., U. S., succeeded in inducing yeast cells to make interferon for the first time.

Discovery of 'hybridoma' technique, ie developing hybrid cells by chemically mediated fusion to continuously yield highly specific antibodies called monoclonal antibodies is another recent genetic advance. According to G P Talwar, Director of the national immunology Centre, using a single injection of such antibodies, protection against pregnancy of several months could be conferred. The improved antipregnancy vaccine is simple and is aimed at producing immune response towards one of the important

hormones in the reproductive system.

In animal breeding, techniques of gene transfer have shown great prospects. Scientists are working on test-tube breeding, cloning and embryo engineering to evolve cows that consume less and yield more milk. The embryo transfer technique involves picking out embryos from high yielding cows, freezing them in liquid nitrogen and later implanting them in unproductive foster mothers to get high-quality calves.

Sex prediction, before a calf is born, is becoming a definite possibility. Synthetic veterinary vaccines, using gene splicing technique, like the vaccines produced by bacteria against the deadly cattle disease of foot and mouth infection which is a dangerous diarrhoeal disease of piglets, have already been produced.

Genetic principles could also be used to deal with pests and thus boost agricultural production. Certain juvenile hormones supplied would prevent the insect from completing its life cycle and certain other hormones would confuse the reproductive efforts of the insects. Similarly a large number of male insect pests could be sterilized using chemicals or radiation to reduce the population.

A surprising finding made recently is that animal and human genes contain what appears to be nonfunctional material which occurs between the segments of DNA that serve as coded genetic material. These pieces of DNA are called 'introns' to distinguish them from code carrying segments called 'exons.' The introns have to be spliced out if gene transfer is to be effective. This problem has given a new impetus to understand the chemistry of splicing genes.

Apart from the two major fields viz tissue culture and genetic engineering discussed in this report, a large number of other areas of modern genetics such as cytogenetics, mutation breeding, genetics of host-pathogen relationship, animal breeding, forest tree breeding, genetics photosynthesis and nitrogen fixation were also covered in the congress. Certain social and ethical issues arising out of the developments in modern genetics also attached discussion. The congress brought together 2500 scientists from 50 countries. The whole range of research activities in the new genetic technology together with their practical applications in the global level were discussed. The congress enabled the Indian participants to take a critical stock of work done at home in the various fields of modern genetics and opened a window to the revolutionary advances in these fields abroad. □

INRO SETS UP RENEGOTIATION PANEL: RUBBER PACT

The International Natural Rubber Organisation (INRO) council has decided to renegotiate the International Natural Rubber Agreement(INRA) and set up a committee to prepare for the process.

The committee, which will be open to all 32 INRO members, will hold its first meeting from November 12 to 16 in Kuala Lumpur, the council said in a statement at the end of its three-day eighth session.

It will prepare the structure, organisation and basic documentation for the negotiating conference and act as a forum for preliminary presentation of members views on renegotiation, the council added.

The five-year international rubber agreement, which aims at maintaining international rubber price stability and balance between supply and demand came into force in late 1980 and expires next year.

Producer members of INRO, led by Malaysia, pushed for a council decision in favour of a renegotiation of the pact at this council session, council sources said. Major consumer members, while agreeing to renegotiate the pact, had also proposed at this session to gain council agreement in principle to extend it, they said. Under the pact extension is allowed for up to two years.

Members had argued that renegotiation of the pact could stretch over its expiry date in October next year and agreement to extend it could prove to be useful in the future, the sources said.

However, producers led by Malaysia had rejected the proposal after many rounds of talks with consumers, they added.

Renegotiation of the pact will be carried out under the auspices of the United Nations Conference on Trade and Development (UNCTAD) in Geneva. The council said Greece had ratified the pact and would deposit its instrument of accession with the United Nations shortly.

It added that members would receive a refund of a substantial portion of their net contributions which were in excess of funds required to support INRO buffer stock operations. Council sources estimated that some 50 mln dlrs in contributions from members were in excess and refunds would be from this sum.

The council also approved an additional warehouse in Malayasia for storing rubber from its buffer stock. INRO has a total of about 270,000 tonnes in the buffer stock.

Gordon Jones of the United States was elected the new INRO Chairman to succeed fellow American Robert Pastorino who resigned after being transferred by his government to a new position.

The next INRO council session will be held from November 5 to 9.

NEWS IN PICTURE

SANGMA IN RUBBER BOARD

Welcome to the Hon'ble Dy. Minister of Commerce Shri Purno A Sangma. Shri PJ Thomas Chairman, Rubber Board received the Minister on his arrival at the Rubber Research Institute of India.

Hon'ble Dy. Minister of Commerce Shri Purno A Sangma visited Rubber Board and Rubber Research Institute of India on 3rd June 1984. He also inaugurated the 101st meeting of the Rubber Board on the same day. Shri PJ Thomas, Chairman, Rubber Board presided. Inaugurating the 101st meeting of the Board Shri Sangma assured that on achieving self-sufficiency in respect of the indigenous production of natural rubber, there will be a total ban on the import. Import will be permitted only when there is acute shortage of rubber in the market, he added.

Shri P Mukundan Menon, Rubber Production Commissioner garlanding

Shri Sangma and Shri PJ Thomas

to them that the Government is not interested in importing even an ounce of rubber from abroad if our plantation industry can produce the quantity we need at home. Rubber imports would be stopped completely the moment we attain self-sufficiency. Till that time we cannot afford to leave the goods industry to starve for raw rubber. While deciding upon the price factor the Government of India has made it a policy to ensure that the price of imported rubber is maintained at par with the domestic price".

"A remunerative price for the produce is the largest single stimulus that encourages the producer to involve more intimately in his vocation. Therefore, I would remind my friends in the rubber goods industry to be alert to see that the morale of the rubber producer is always kept high." Past experience show that any departure from this could do enough damage to production and productivity".

"Natural rubber in this country has very bright days ahead. The producers here are lucky because there is an assured market for their produce. The rubber goods industry in India

Following are the excerpts from his speech :

"I am given to understand that rubber import, though effected taking into account the actual needs of the rubber goods industry, is viewed with a sense of suspicion by friends in the producing sector. I would like to make it amply clear

Visiting the Research Divisions. Shri PK Narayanan, Public Relations Officer, Dr. MR Sethuraj, Director, Shri Sangma and Shri V Bhaskara Pillay Secretary.

has enough capacity to consume more than what is produced at home. They have set ambitious plans of growth. During the 80's we will be witnessing a revolution in automobile production. More automobiles means more tyres and more tyres means more rubber. Alongside many new uses are discovered for rubber. This situation calls for an all out effort to prepare for bumper production of natural rubber. While appealing, for enhancing production, I would urge in the same voice that

Inauguration of the 101st meeting of the Board. Shri P Mukundan Menon, Shri BK Nair MP, Shri Sangma and Shri PJ Thomas

the competitive nature of the produce in respect of price, quality and presentation is also equally important".

A chat with the press men in Kottayam.

5th May 1984. The officials of the Rubber Board Regional office Ernakulam were present for the inaugural tapping. Regular tapping will be carried out in the mini garden under the auspices of the Rubber Research Laboratory of Dunlop India Ltd as part of a research study

MINI GARDEN

Dunlop India Limited has a mini garden of rubber trees with five rubber trees attached to their Cochin Office. All the five trees have attained tappable girth and the inaugural tapping was arranged on

Bright outlook for rubber market

The Malaysian Rubber Exchange and Licensing Board (MRELB) says the outlook for the rubber market will continue to be bright as the demand for motor vehicles is expected to grow further.

In its latest rubber market review, the MRELB adds car sales in the United States and Japan increased significantly in February and March this year.

West Germany had also reported strong demand for cars.

As an indication of the economic recovery, the MRELB quotes the International Monetary Fund experts forecast that industrial countries would achieve a growth of 3.6 per cent this year compared to 2.3 per cent last year

Singapore brokers had also said there continued to be sufficient physical enquiry from overseas.

Buying representatives of major tyre manufactures had indicated that they have to buy more natural rubber this year due to the anticipated growth of tyre demand.

Major rubber traders and State representatives of Eastern European countries interviewed by the MRELB had also expressed confidence that demand for natural rubber would increase in the coming months.

On the market condition, in March the MRELB says the sentiment was easier due to lack of fundamental factors and slack activities in the physical offtake.

The heavy speculative selling in the Tokyo rubber market which was under currency influence and an increase in Japanese NR stocks undermined the market situation.

Persistent nearby selling on technical reasons and a sluggish demand for RSS 1 triggered prices to drop to a new low last seen at mid-June 1983.

The unexpected higher supply of NR resulting from a delay in "wintering" also worsened the situation while traders in London reported that prices were pressured down due to the plentiful availability of the commodity.

The MRELB says that the unusually wet weather in March had delayed and reduced the "wintering" effects, resulting in an unexpected higher production.

This was aggravated by the seasonally lower demand by consumers who made higher purchases prior to the "wintering" low production period.

However, the MRELB feels that the current low spell in the rubber market was due to a "technical squeeze on the longs in futures" judging from the comparatively small turnover associated with large price swings at 15 cents/kg in March alone.

The technical squeeze was further evidenced by the unusual large premiums enjoyed by the forward month positions, a maximum of eight cents for one month and 11 cents for two months.

The MRELB explains that the narrowing of price differentials between lower grades, particularly RSS 2 with RSS 1 only at 0.5 cents at one stage, further lent support to the technical squeeze theory.

In addition, the weakening of the US dollar also made standard Indonesian Rubber

(SIR) too cheap when SIR 20 was selling at eight to 10 cents discount to SMR 20. The MRELB adds that while the slight decrease in demand during the current "wintering" period was considered to be seasonal and quite normal, the market seemed to be consolidating. The decline, should be considered as temporary for it believes that strong fundamentals should eventually prevail.

NEW PUBLIC POSTURE FOR THE IRSG

The International Rubber Study Group, under the guidance of its new secretary-general, John Carr, is crawling out from under its shell and aiming to become more responsive to the industry's needs.

In an interview at the London headquarters of the 40-year-old, intergovernmental organisation, Carr said the group has added "a vital new arm"—an Industrial Advisory Panel, the 20 members of which are statistical experts representing every major sector of the global rubber industry. The IAP will give the study group access to a body of expert opinion which should put it more closely in touch with the problems and needs of the industry itself, Carr said.

The panel has been formed "for the public good," added IRSG Statistician Philip Watson, who noted that the IAP had already begun functioning in December, when a couple of its members provided advise on a general query from one of the study group's 27 member nations.

Carr explained that the nucleus of the panel consists of several members of the study group's decade-old, 16 member Committee of Expert Rubber Statisticians, whose primary job is to convene before each annual IRSG meeting to agree on the group's official yearly figures and projections. The committee will continue to exist and perform that function, said Carr, who obviously is delighted with the membership of the newly formed IAP.

He said that nearly everyone he wanted on the panel has agreed to come aboard. The list includes representatives from Japan's Bridgestone Tire & Rubber Co., America's Shell Chemical Co:, France's Michelin, West Germany's Continental Gummi-Werke AG, and England's BTR plc. It also includes some key natural rubber representatives from Southeast Asia, Carr said. The panel's composition is "much stronger and geographically diverse" than the four or five Ad Hoc Advisory Panels which the study group has called in the past, he added.

Existence of the new panel "will make our work of real value—more practical and less academic," Carr said.

One other area in which the new secretary-general is making his presence felt is in the public image of the IRSG. As a 30-year veteran of the British rubber industry and the former managing director of pirelli Ltd in the UK (from 1978 through 1982), the 57 year-old Carr has been accustomed to dealing independently with the press. The IRSG's attitude on such matters—as might be expected with any such international, government financed body—has traditionally been low-key and extremely conservative. The stark contrast came as a rude shock to Carr when he succeeded Dr Leslie Bateman as secretary-general of the IRSG last July 1.

As a result, last autumn he reqested, and received, permission from his superiors, the IRSG Executive Committee, to have greater freedom in dealing with press and publicity matters, and to generally attempt to raise the profile of the group worldwide. This effort is taking many forms: In addition to granting interviews to the press (which previously was very uncommon), he said he is planning to step up marketing and publicity of the group's own publications (such as the *International Rubber Digest*, *Rubber Statistical Bulletin*, and the IRSG Assembly Forum proceedings).

He also returned Dec. 7 from a month-long, whirlwind tour of Malaysia, Thailand, Singapore, Indonesia and Sri Lanka, during which he sat in on the International Natural Rubber Organization's 7th council session in Kuala Lumpur, visited NR plantations and manufacturing sites, and met many key industry officials.

Carr emphasised that while he appreciates the value of public relations, he has no intention of assuming anything but a neutral stance—at least as long as he's speaking as a representative of the IRSG. "I would avoid positively being controversial" said Carr, who considers the neutrality of the study group to be essential.

He referred back to the mid-1970s, when the need for the IRSG's existence was thrown into question with the establishment of UNCTAD, the United Nations Conference on Trade and Development. The subsequent formation of the International Natural Rubber Organization, which was seen by many rubber-consuming countries as primarily a vehicle for protecting the interests of the NR producers, prompted some consumers to push for the

strengthening of the IRSG as a body to protect their own interests.

The IRSG, after much discussion, decided "to remain a bit above the fray," Carr recounted, "and to be concerned truly with the industry as a whole. Without its neutrality, I don't think the group would be able to exist very long in its present form."

This stance is especially vital since the study group describes its primary function as being a "bridge between synthetic and natural rubber producers," as well as a link between producers and consumers. Statistical work is the heart of the IRSG, according to the group's charter, and the role it plays in keeping statistics accurate and member governments informed on global supply and demand of rubber is one of its most important functions.

And, if John Carr has his way, this role will not only continue, but will be expanded—through the Industrial Advisory Panel—to better serve industry as well as government.

NEW SMR SCHEME ON THE WAY

A new Standard Malaysian Rubber (SMR) scheme capable of meeting the changing consumer requirements is to be introduced, Primary Industries Minister Datuk Paul Leong announced recently.

The scheme will be launched after discussions with consumers on the new specifications for rubber.

Discussions will also be held with Malaysian rubber producers before the implementation of the scheme to determine their capabilities in rubber production.

Datuk Leong was speaking to officers of the Malaysian Rubber Research and Development Board's technical advisory services who gathered for a one-week familiarisation course on the latest developments in the rubber industry.

Feedback

He added that his Ministry was setting up a data bank on the techno economic and market information of all aspects of the rubber industry.

Technical information must be inter-linked with economic and market information to enable the policy-makers, planners or implementors to comprehend the full spectrum of the rubber scene and respond to the current and future demand for rubber.

"The technical information and feedback from the technical advisory services must be complemented and supported by the full range of economic and market information that are of pertinence.

This will bring together, promptly and comprehensively, techno-economic indicators and changes which will enable us to gauge the rubber industry at any one time and respond not only to current changes but also to anticipate future developments with greater clarity."

RECORD NR SHORTAGE FORECAST

A world shortage of natural rubber that could make a record shortfall of 50,000 tonnes in the eighties is forecast by the World Bank, a view that is shared by Goodyear Tyre and Rubber, the world's largest NR consumer.

Commenting on the Bank's assessment, IB Thomsen, Goodyear's executive vice-president, said that increased productivity of NR through better silvicultural practices and improved clones would hold the long term competitiveness of NR against the synthetics. So far as Thomsen is concerned, any relaxation of SR prices through the present oil glut is only temporary and the finite nature of the oil feedstocks will bring a permanent hardening of prices.

The expected shortage of NR will be aggravated by the current boom in automobile production in the USA, which is expected to rise by 1.5 million units to 7 million this year and include a much larger proportion of "full-sized" cars than hitherto. The construction of the automobiles will absorb much more rubber than before and also the steep rise in demand for radial tyres in the USA will require more NR.

A shortfall in NR is not uncommon, the deficit being made up by release from commercial and national stockpiles built up in the surplus years. However, the stockpiles cannot sustain a shortfall of 500,000 tonnes without reducing strategic reserves to almost nil. At the end of 1982 world commercial stockpiles were estimated by the International Rubber Study Group to be around 855,000 tonnes, not includlng the US Government stockpile of around 122,000 tonnes. ❑