NATURAL RUBBER – EVOLVING CHALLENGES

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Introduction

The progress achieved by the Indian rubber plantation industry during the last few decades has been quite remarkable. In terms of growth in area, production and productivity, India has been ahead of the major natural rubber (NR) producing countries. Today, India is the fourth largest NR producer, accounting for 8.9 per cent of the global production and the country has the distinction of having the highest average yield per hectare – a manifestation of research based extension strategies leading to better technology adoption.

Production

The growth in rubber cultivation during the early phase of the industry, starting in 1902, was rather slow and by the year 1950-51 the area under rubber in India recorded 74915 ha with a production of 15800 tonnes, the productivity being in the range of 300 kg/ha/annum. The progress since then has been very impressive as is evident from Table 1, thanks to the various policies and programmes implemented by central / state governments and the Rubber Board with research support from the Rubber Research Institute of India. The relative share of the traditional rubber growing region comprising the state of Kerala and Kanyakumari district of Tamil Nadu was 98 per cent in 1950-51. But this has come down to 89 per cent in 1997-98 and this change has been mostly due to the promotional programme of the Rubber Board for introducing rubber cultivation in non-traditional areas, especially in the north-east. Now rubber is being successfully cultivated in Assam, Meghalaya, Tripura and other north-eastern states, Karnataka, Andaman and Nicobar Islands, Goa and Maharashtra. It has also been recently introduced in certain other states including Orissa. However, even today, Kerala enjoys a near monopoly position by having 85 per cent of the area occupied by the crop. A salient feature of the rubber plantation industry in the country at present is the dominance of the smallholding sector. Although the industry was dominated by the estate sector until early fifties, owing to subdivision and fragmentation of the estates, the share of smallholdings gradually increased. Also on account of the land ceiling legislation and the relatively better profitability of rubber, a large segment of small and marginal holdings shifted to rubber from other crops. Currently 86 per cent of the area and production of rubber in the country is contributed by smallholdings. It is also worth noting that the average size of a holding is less than half a hectare.

In spite of the small size of the holdings, the level of technology adoption in this sector has been quite appreciable. As a result of this the average productivity of rubber is higher than that in other major producing countries (Table 2). The current national average productivity is 1563 kg per ha. As the increase in productivity was coupled with expansion of area under the crop, there has been remarkable increase in production as well (Table 1). Though NR is processed into different marketable forms, in India, about 72 per cent is made as ribbed smoked sheet (RSS). Concentrated latex (11%) and technically specified rubber (10%) are the other two major forms of raw NR in the country.

Consumption

Apart from being the fourth largest producer of NR, India is the fourth largest NR consumer as well. Although the first rubber goods manufacturing unit in India was established in 1922, the real beginning of the industry took place only in 1930s when the International Rubber Regulation Agreement (INRA) came into force, restricting export of NR from main exporting countries. This made NR available at lower price for domestic consumption. Taking advantage of

this favourable situation a few overseas investors set up rubber goods manufacturing units in India. The dynamic growth of the industry since then resulted in a sustained growth in demand for raw NR and this had even outstripped the supply thereby placing the country into the status of a net importer since 1947 except for certain brief periods.

The tyre sector accounts for around 47 per cent of the NR consumption. It is also worth noting that about 80 per cent of this goes for the production of commercial vehicle tyres, pointing to the large dependence of NR consumption on the transport sector of the industry. The general rubber goods sector is characterised by the existence of a large number of small scale units. Unlike its production, consumption of NR and synthetic rubber (SR) is well distributed throughout the country.

Imports / Exports / Price

India has been a net importer of NR except for brief periods during the 1970s and 1990s. The volume of import and its share in the domestic consumption vary from year to year, as is shown in Table 3. Although after 1995-96 there was no import of NR against public notice, import continued against advance licence and special import licence. In 1997-98 as the growth in demand of NR declined to 1.8 per cent from the average of 8.1 per cent attained during 1992-97, NR became surplus for the first time since 1970s. Hence in 1998-99 government of India banned import of NR against advance licence.

Regulatory mechanisms and domestic price protection measures of the government of India have played a key role in realising a reasonably remunerative price for NR after 1940s. The minimum and maximum prices were occasionally revised on account of the changes in the cost of production. The economic reforms being introduced by the government of India since 1991 have started influencing the price of NR. The liberalised policies gave the country a relatively free access to the world market. Consequently the price movements in the world market started influencing the domestic price of NR. In 1996, as the global output of NR exceeded its consumption, the price nose-dived in 1997 and the Indian market also followed suit.

Synthetic rubber

India's rubber demand is characterised by a marked preference to NR in sharp contrast to the global pattern. The country consumes NR and SR in the ratio of 79:21 while the global pattern is 40:60. In India, as the price of SR is considerably higher than that of NR, so far there has been no competition between the two. The trend in the consumption of SR in the country is also given in Table 3. Apart from the different varieties of SR produced domestically, the Indian rubber goods manufacturing industry needs a few other special purpose SR, which is met by import.

Challenges and Responses of Globalisation

The major implications of the globalisation process are : (1) the growing process of market integration, and (2) the consequent elimination of tariff and non-tariff barriers to protection. At the operational level, it implies the survival of only those rubber producing countries with relative competitiveness in cost and quality in the long run. The response, though varied across countries, is unique in capitalising available opportunities for squeezing unit cost of production and exploring potential outlets for increasing the net income per unit area. The major underlying factor behind the response is the structure of the production sector characterised by the dominance of the smallholdings and the strategies adopted were expected to sustain the viability of rubber cultivation. In 1990s the critical issues confronting the NR producing countries in the context of increasing globalisation of economic activity are : (1) frequent fluctuations of free market prices, (2) dominance and structure of the synthetic rubber industry, (3) increase in supply of NR due to the entry of new producers and productivity improvements and finally (4) a steady increase in the cost of material inputs resulting in the erosion of relative profit margins.

A basically inward oriented NR production

sector in India is gradually being exposed to the world market as is evident from the recent trends in the government policy. A plausible implication of the open market policy is that in future there will be well defined limits for protection and the industry has to gear itself for responding to the challenges posed in the post-GATT scenario. Although the country occupies the enviable position of having the highest average productivity, the possibilities of cost reduction, diversification and value-addition are to be explored further earnestly for sustaining the viability of the NR production sector. While making efforts to improve the competitiveness of NR production the green image of natural rubber shall be further consolidated by ensuring a sustainable farming system and cleaner methods of processing the crop. Thus the main thrust for research for the next few decades shall be competitiveness with sustainability.

NR Production Sector

The major priority research areas in this sector are briefly outlined below : In the traditional rubber growing area emphasis shall be more on productivity enhancement rather than increasing production per se. With the available technology itself it is possible to increase yield levels even by 100%. It is worth pointing out that even today about 25% of rubber holdings yield only around 750 kg/ ha. Therefore, strategies for traditional area shall include :

* Productivity enhancement by bridging the technology gap
* Replanting
* Improving the economic viability of rubber holdings through intercropping/ multifarming, apiculture, rubber wood utilisation, etc.

Productivity enhancement could be achieved through the evolution of higher yielding clones, better methods of disease control, optimisation of stand per hectare and exploitation systems, better agronomic management and management of tapping panel dryness. In the non-traditional area identification of region specific clones and management of environmental stresses shall be given greater emphasis. Fundamental studies to break the yield barrier of *Hevea* could be rewarding in the long run. Basic studies on the mechanism of rubber production, identification and modification of the rate limiting processes in biosynthesis etc. could be included in an integrated multidisciplinary programme. Fundamental studies on tolerance to diseases and environmental stresses and that to TPD are considered very important. Understanding the basic mechanism of tolerance and susceptibility might lead to methods of imparting tolerance through high tech approaches including genetic engineering. Emphasis shall be given for evolving appropriate methods of transfer of technology to the farms.

One of the important factors contributing to the cost of production of NR is the cost of harvesting (tapping). Any attempt to reduce cost of production shall aim at reducing tapping cost. This, coupled with the difficulty in getting skilled tappers in adequate numbers, call for research on low-frequency tapping systems. This will have the added benefit of lower incidence of tapping panel dryness, which at the present standards causes 15-25% of the trees to become totally unproductive. Law-frequency tapping systems calls for a fresh approach to management of tappers. Unless their wages are linked to productivity they may not be enthusiastic in implementing the system sincerely and this will ultimately lead to lower yields than what is actually possible. Other methods of cost reduction such as discriminatory fertiliser application, reduced use of plant protection chemicals, etc. shall be given more importance.

Development of NR based sustainable multiple farming systems assumes importance in order to strengthen the image of NR as an environmentally friendly commodity and also to ensure additional income to rubber growers. Studies in this area shall include intercropping with seasonal/annual crops such as banana, ginger, pineapple, medicinal plants, etc. and with perennial crops such as coffee, tea, etc. Multiple farming with timber species such as teak and animal husbandry and fish culture also could be

considered. It is worth pointing out that multiple farming has the advantage of better risk coverage, increased cumulative income and being ecologically sound.

Primary Processing

The basic objectives for research in this area are quality improvement, cost reduction and environment friendliness. In a highly competitive environment quality is the password by which we can have access to new markets and therefore, this aspect deserves due consideration along with efforts to reduce cost of processing. The growing concern for environment add new dimensions in primary processing of rubber and all efforts should be made to ensure cleaner processing so that the impact on environment is minimised.

In the case of sheet rubber although the processing conditions have been standardised, adoption of the recommended practices in small holdings is not up to the desired level. Therefore, attempts are to be made to popularise standard processing conditions in small holdings. The ever increasing cost of fuel is one of the factors favouring drying of sheet in the open sun. Efforts are to be made to develop integrated drying systems incorporating sun drying, solar heat collectors, biomass and biogas. One of the disadvantages of sheet rubber is the increase in viscosity during storage, necessitating premastication. In the case of block rubber this has been minimised by viscosity stabilisation through use of chemicals. Possibility of extending this to sheet rubber could be explored. With the introduction of ISO 9000 type of quality management systems in major rubber manufacturing industries the need for standardised raw materials is assuming greater importance. In India, sheet rubber being the major form of raw natural rubber, it is considered worth examining the possibility for introducing a technical specification system for the same.

For technically specified rubber quality improvement deserves primary attention. Considering the poor quality of raw material used for making TSR in India, it will be desirable if lower grades of sheets and latex coagulum are blended with scrap rubber in order to improve the quality of TSR. Consistency in quality also deserves greater attention. This could be achieved through proper blending and by a higher level of mechanisation in processing. Viscosity stabilisation also could be more popularly used as it is practiced in other rubber producing countries. Considering the importance of protein levels in rubber on engineering properties of rubber, a low protein grade of TSR, which could find more acceptability in the manufacture of electrical and other engineering components, could be developed. As allergic problems due to proteins in latex have already gained great importance, it is essential to strengthen research efforts to make low protein latex, which could be used in products such as examination and surgical gloves, condoms, etc. Although prevulcanised latex has been used in the industry for quite some time it has not become popular in India, although some limited attempts have been made in the past. The changes in quality during storage of prevulcanised latex have been a matter of concern and hence call for detailed investigations. The present effort to produce radiation vulcanised latex should be further strengthened considering the possibility for the same to be used as a starting material for producing nitrosoamine-free latex products.

Modification of NR

NR being produced by the rubber tree, its properties depend very much upon its molecular structure, which cannot be varied to suit the various requirements of the industry. In the case of synthetic polymers the molecular structure could be easily changed depending upon the end use requirement, which is a significant advantage of the synthetic material over its natural counterpart. In the case of natural polymers, therefore, physical and chemical modifications have been attempted in order to produce new materials. Many useful materials have been developed from natural rubber through physical and chemical modifications. This is an active area of research which, if pursued properly, could eventually lead

to very interesting results. In spite of the efforts made in this area, only a few modified forms of NR have become commercially important. Perhaps more attention is required for developing new uses for the modified forms of rubber.

The two salient features of the Indian rubber products manufacturing sector are its inward mas kit orientation and dominance of dry rubber products. From the very beginning, this sub-sector had a supplementary role as it has been mainly catering to the requirements of the larger industrial base rather than focussing on exports of products with specific locational advantage. To a large extent, the captive internal market supplemented with the protectionist policies pursued by the government, contributed to the growth of the industry and today it is the seventh largest rubber products manufacturing country in the world. However, in the wake of globalisation coupled with significant reductions in tariff barriers by the government, this sub-sector has to prioritise its options for consolidating its position in the internal market and improving its favourable trade balances. The recent trend on foreign trade in rubber products indicate a substantial increase in imports compared to exports and in the process the trade surplus is getting narrowed down. A specific policy reorientation has to incorporate identification of products with specific locational advantages, markets, potential competitors and extent of value addition so as to retain the position of the industry having the effects of both import substitution and export.

Some of the research areas which deserve attention in this field are: polymer blends, compounding, composites based on rubber, engineering applications, testing / analysis and recycling. The consumption pattern of rubber in India is heavily in favour of NR unlike in most of the industrially developed countries. At the same time it is widely accepted that blending of synthetic rubbers with NR improves some of the properties such as wear resistance, ageing resistance, etc. Perhaps the possible deficit in NR supply in future could be more meaningfully met by using synthetic rubber either through import or through indigenous production.

Recycling is an area, which is very significant when we consider the impact of the rubber industry on the environment. Fortunately in India we have been recycling rubber products such as tyres in a much larger scale than it is practiced in most of the developed countries. However, the quality of recycling (retreading, for example) and that of the reclaimed rubber produced in India has to be improved significantly. This again calls for significant R&D input.

In conclusion, the very survival of the NR industry in the country depends on its ability to compete in the global market with respect to both cost and quality. While trying to make it more and more competitive, the environmental aspect of production and consumption of NR shall be given adequate importance to project the rubber as a green commodity *vis-à-vis* its synthetic counterparts.

Table 1. Area, production and productivity of NR in India

Year	Area(ha)	Production	Productivity (kg/ha)
1950-51	74915	15800	284
1955-56	86067	23730	353
1960-61	143905	25697	365
1965-66	186713	50530	448
1970-71	217198	92171	653
1975-76	235876	137750	772
1980-81	284166	153100	788
1985-86	382831	200465	898
1990-91	475083	329615	1076
1995-96	524075	506910	1422
1998-99	554000	605045x	1563

Table 2. Area, production and productivity of NR in major producing countries during 1997

Country	Area ('000 ha)	Production ('000 t)	Estimated productivity (kg/ha)
Thailand	1966	2033	1362
Indonesia	3516	1505	655
Malaysia*	1635	971	980
India	545	580	1540
China**	592	444	1089
Sri Lanka	158	106	857

Source : ANRPC, 1998 * Relates to 1996 ** Relates to 1995

Table 3. Production, consumption, import and export of NR and SR

Year	Production			Consumption			Import			Export
	ZNR	SR	Total	NR	SR	Total	NR	SR	Total	NR
1960-61	25697	-	25697	48148	7397	55545	23125	8097	31222	-
1965-66	50530	14741	65271	63765	21553	85318	16357	2735	19092	-
1970-71	92171	29791	121962	87237	33160	120397	2469	5014	7483	-
1975-76	137750	25119	162869	125692	32452	158144	-	6391	6391	-
1980-81	153100	25293	178393	173630	47050	220680	9250	17492	26742	-
1985-86	200465	34758	235223	237440	70035	307475	41431	39086	80517	-
1990-91	329615	57293	386908	364310	104735	469045	51942	51715	103657	-
1995-96	506910	68223	575133	525465	134085	659550	51635	71735	123370	1130
1998-99	605045	67590	672635	591545	156395	747940	26413	80580	106993	1840