# DEVELOPMENTS IN RUBBER RESEARCH

*By*

N. YOGARATNAM

Rubber did not make an impact on the World economy until the early twentieth century. Upto that time, a limited quantity of rubber that was required came exculsively from wild rubber, and mostly from it's original home, the Amazons. The discovery of valcanisation by Charles Goodyear and Thomas Hancock was the catalyst for the expansion in the use of natural rubber. Other improvements in the treatment and processing of rubber increased its application as in insultation of electric cables and wires. Dunlop's invention of pneumatic tyre represents perhaps the turning point in the history of natural rubber.

Henry Wickhams is credited with the transportation in 1876 of some 70,000 rubber seeds from Brazil to Kew Gardens. Within the next few years, young seedlings were brought to Ceylon and via Ceylon to Singapore to be planted. However only some 20 years later did rubber trees come to commercial cultivation in Ceylon. The complexities faced by those who are concerned with the enhancing of plantation rubber production by cultural means and the progress that has been made over the last 100 years or so, is very impressive.

Research into rubber production and processing was started in Ceylon in 1909, when a committee consisting of British plantation interests was formed, to provide advisory and research backing for the rapidly growing rubber planting industry, the planted area of which had then reached an extent of about 200,000 acres and the world NR consumption was 90,000 tonnes. Since that time it has grown to around 4 million tonnes.

In terms of research achievement, the RRI of Sri Lanka has contributed a great deal to the knowledge on the crop. Being the pioneers in Hevea breeding, RRI has over the years successfully developed a large number of high yielding clones, of those, RRIC 100,102 110 and 121 have given yields of over 2000 kg/ha/yr, under commercial conditions in, Sri Lanaka and in other countries and have come out at

the top of the list in international clone trials planted in Indonesia, Malaysia and Thailand. Also RRIC 100 series clones are more vigorous which enable these clearings to be brought into tapping at least one year earlier than other clones. The percentage of tappable trees at commencement of tapping is also high. These clones also show high tolerance to many leaf diseases. More recently, it has been possible to select 4 more promising clones from hand pollinated population of which 74–1943 has yielded 74.09 gm/tree/tapping compared only to 40.53 gm/tree tapping by clone RRIC 121 planted in the same small scale trial, recording 85% increase in yield.

Fertilizer recommendations for immature rubber were revised in 1980 taking into consideration improved efficiently of fertilizer utilization and greater economy thus effecting a saving of approximately Rs. 4,000/– per hectare during the immature period.

RRI formulates and provides computerised advisory service to commercial estates on fertilizers to mature rubber on the basis of soil and foliar survey. This method economises on the use of fertilizers, as only the required amount of N,P,K & Mg is applied, unlike the practice in the past when full mixture containing all four elements were applied to all fields irrespective of the requirements of the trees. The new technique not only reduced expenditure on fertilizers but also increased yields by eleminating the toxic effects of one or more elements by the application of an excess of it. Saving in the fertilizer bill recorded in each year is approximately 11.4 million in comparision with the previous programmes. Savings recorded over the past ten years is approximately Rs. 100 million.

Rubber Research Institute of Sri Lanka was the first Rubber Research Organisation to publish scientific research information and to make recommendations on the efficient use of urea as a nitrogenous fertilizer for rubber. The return per unit investment is approximately 40% over the previously followed fertilizer programme.

Use of Eppawela Rock phosphate has been recommended as the only source of phosphate for mature rubber from 1987. Foreign exchange saved is equivalent to approximately Rs. 22.8 million per year and the savings to the Rubber Industry in their fertilizer bills had been approximately Rs. 13.04 million per year. More research is being done to increase the efffciency of phosphate uptake by rubber from this product. Mulching had been shown to be effective in not only avoiding evapotranspiration rate, but also enhanceing growth of immature rubber trees, providing more nutrients and preventing run–off and soil erosion losses. It is therefore a good practice to mulch the soil at least around the base of the rubber tree, immediately after planting at least until the legume covers are fully established.

Improvements in nursery and planting techniques have helped to successfully establish rubber plants in the field thereby elimination losses caused by a

reduction in the stand of rubber. Techniques for multiplication of seedling issues in culture to produce a large number of planlets have been successfully developed With clonal material proliferation of buds has occurred.

Breeding and tosting of now *Hevea* cultivars which take 20 –25 years can now be reduced to about 15 years as methods have been developed using physiological parameters to select high yielding progeny in a breeding programme at a very early stage.

Years of research on plant pathology has made it possible to formulate low cost methods for control of all economically important diseases of rubber. White root disease which devastated 10% of the trees in 1977 has been now reduced to less than 5% by developing an intergrated approach on biolgical and cultural methods. This is a novel method whereby the conditions reqiured for rapid multiplication of antagonistc flora to tho pathogen has been developed.

It has been found that a leaf fall of less than 25% due to oidium leaf diseases does not cause a yield reduction. This has made it possible to totally eleminate the age old practice of application of sulphur to areas below 100 meters where the disease is generally mild. This finding has brought about a tremendous saving in the cost of application of sulphur. Further as a consequence of this, an indirect control of yet another disease Phytophthora panel disease of rubber has been achieved due to the reduction in pod set.

With the objective of providing an income in particular to the small holders during the long immature period, crops such as banana, passionfruit and pineapple are now recommended as intercrops during the immature period.

In the four agro-climatic zones where rubber is grown, especially in the South west quadrant, there is a tremendous pressure for land and the unemployment rate is high. In the past, except for some intercropping during the immature phase, there had been no organised cropping systems and management practices for perennial crops It was therefore poroposed to adopt a farming systems approach to generate substantial income and reduce unemployment. Such a system would have environmental. benefits and can maximise land use. The noval approach will require readjusting the spacing of rubber plants to accommodate perennial crops to be grown in the inter row space on a permanent basis. The model which involve a stratified structure is ecologically sound as it would help to recreare forest conditions. Also, it is environmentally acceptable as litter accumulation due to leaf fall will help to build up the organic matter content of depleted soils and also prevent soil erosion.

Further, such a system will help to bring in an income during the long immature period and buffer against the price fluctuations and declines that may occur due to reasons beyond the control of the growers.

Rubber and Tea community system of cultivation has beneficial effects on productivity and also improves environmental effects in terms of soil and moisture consevation and increases soil organic levels. In this system of cultivation, rubber is plantedat a wider spacing of 40 ft. by 8 ft.

Although accurate information is lacking, the total rubber area is estimate to be about 199,000 ha. Small holders who constitute the private sector own 142,000 ha. which represents 72% of the total rubber area. In this sector, 93% of the holdings, covering an extent of 50% of the registered lands are less than 1.6 ha. The balance 50% of the registered land, making up only 70% of the holdings in between 1.6 to 20 ha. and is owned by small holders who are financially more stable. Extent less than 0.5 ha. and below 1 ha. occupy 50% and 80% of the holdings respectively. This shows that the rubber sector is dominated by a large number of "mini" small holders whose yield and income levels are well below the national average.

Furthermore, only few crops other than rubber could be grown in areas where rubber is already planted. It was therefore considered necessary to arrest the decline of income levels in this sector.

One way of achieving this is by increasing the productivity of their rubber lands by adopting proper agronomic practices. Adaptive Research Technology has a very important role to play in improving the productivity of the farming units.

As it has been realised that most of the RRI recommendations could not be implemented by the small holders due to various socio-economic problems, adaptive research programmes are now being implemented in small holder fields especially to solve small holder problems on regional basis.

The waste water emanating from Rubber processing factories have been causing serious environmental polution problems, particularly in the areas with inadequate water for processing and dilution of waste water. RRI has been working on this for quite sometime and has now developed a reactor type waste treatment system where the reactor is a Rotating Activated Belt which is biologically activated The advantageous of this system are enormous . The machine is cheap and can be assembled easily in a few days. Almost all its parts can be bought in a hardware shop. The belts can be run by a small motor. which takes very little energy The machine is also so simple that an unskilled labourer colud operate it. The bacteria do not emit noxious gases and the machine can be cleaned easily.

The Natural Resources Energy and Science Authority of Sri Lanka initiated a scheme of awards in 1982, with the concurrence of His Excellency the President, to honour scientists and technologists for their outstanding achievements in various fields of science. This National Award for Scinentific A hcievements for the year

1989 has been awarded to the Research Group of the Rubber Research Institute for their important scientific contribution to the rubber industry and their innovative products and processes developed by them involving the technology of rubber manufacture.

In the past, and to a large extent at present, the rubber producing countries were happy just to export the raw material. That approach is now being changed. The future for NR producing countries including Sri Lanaka must progressively enter into the manufacturing sector.

Thus a more planned and conscious direction should be given to integration of raw rubber production with rubber products manufacture. The wisdom of this attitude is self-evident. The raw material is necessarily cheaper at the source.

The types of rubber goods that can be manufactured are, tyres and wheels, inner tubes, valves and tyre covering bags, footwear and related components, latex dipped and extruded products, latex foam products, household products like gloves, water hoses, engineering products, automotive rubber parts adhesives, sealants and tapes, compounds and masterbatches, commercial pipes, hoses and tubes, sports goods, rollers and miscellaneous products like catheters, rubber bands etc.

The manufacture can however be extended and expanded if only the marketing strategy and efficiency can be improved. Even with some of the new specially rubbers there is unnecessary delay in the take–off. Thus for the future, we must think of sophisticated marketing strategies, with sustained follow-up action, guaranteed by efficient technical backup services. Research is therefore necessary to organise market surveys to promote products on an aggressive basis. The need is for organising an effective overseas marketing and sales service, by wide and effective advertisement. There is no reason why the indigenous product manufacturers should not look abroad for market expansion.

On the production front, the "name of the game" should be production efficiency. Opportunities for turning over new land for rubber cultivation are becoming increasingly limited. The need therefore is to extract the maximum quantity of rubber from the existing areas. Despite many years' work on tree breeding, average yields obtained – as low as 400 – 500 kg/ha/year in some areas – are far below the best achieved in some areas (over 1000 kg/ha/year) and even these are less than the potential. As far as trees already in the ground are concerned, the need is to optimize production by making use of well–known and proven methods. There is no doubt that if the full potential of these trees can be realised, future production could easily meet future demands at levels considered feasible on techno-economic grounds.