THE
RUBBER RESEARCH INSTITUTE OF SRI LANKA

ANNUAL REVIEW FOR 1973

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THE RUBBER RESEARCH INSTITUTE OF SRI LANKA

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(As at 31st December, 1973)

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Secretary to the Board

Mr. K. M. U. Jayanetty, B.A. (Lond.)

Lawyers

F. J. & G. de Saram, Proctors
P. O. Box 212, Colombo.

Auditors

Wickremasinghe & Co.
Chartered Accountants
Mackinon Building,
York Street, Colombo 1.

Bankers

Bank of Ceylon,
York Street, Colombo 1.

People's Bank, Matugama

Registered Office and Laboratories

Dartonfield, Agalawatta.

Smallholdings Department, Estate Advisory Department Economics Section and Board Office

74, Telawale Road,
Ratmalana,
Mt. Lavinia.

RUBBER RESEARCH INSTITUTE OF SRI LANKA

STAFF

(As at 31st December, 1973)

Director

O. S. Peries, B.Ag.Sci. (Melb.) Ph.D. (Bristol), M.I. Biol.

RESEARCH DEPARTMENTS

Botany

Head of Department

L. B. Chandrasekera, B.Sc. (Cey.), Dip.Ag.Sci. (Cantab.)

Botanist

R. Satchuthananthavale, B.Sc.(Madras), M.A.(Madras), Ph.D.(Sheffield)

Assistant Botanists

U. P. de S. Waidyanatha, B.Sc.(Cey.), M.Sc. (Cey.), Ph.D. (Lond.), D.I.C.

Mrs. A. C. I. Samaranayake, B.Sc. (Cey.), Ph.D. (Lond.)

Senior Technical Assistant

W. G. V. Fernando

Technical Assistants

I. Amarasinghe
J. G. de Mel
L. S. S. Pathiratne

Field Assistants

D. A. Brahakmana
D. R. Colonne
R. B. Gunaratne
S. Kodikara
W. A. T. Silva
U. K. D. Lewis
S. Wilbert

Genetics and Plant Breeding

Head of Department

D. M. Fernando, B.Sc. (Cey.), M.Sc. (McGill)

Assistant Geneticists

*N. E. M. Jayasekera, B.Sc.Ag. (Cey.), M.Sc. (Birm.)
*C. M. B. Ratnayake, B.Sc. (Cey.)

Technical Assistants

K. B. A. Karunasekera
P. Samaranayake
M. S. C. de Silva, L.I.R.I.

Senior Field Assistant	H. B. H. de Silva
Field Assistants	D. S. Gamage B. M. S. G. Peiris A. K. M. S. Senaratne W. A. C. Wijesinghe

Plant Pathology

Head of Department	O. S. Peries, B.Ag.Sci.(Melb.), Ph.D. (Bristol), M.I. Biol.
Plant Pathologist	Mrs. V. Satchuthananthavale, B.A. (Madras), M.Sc. (Madras), Ph.D. (Sheffield)
Assistant Plant Pathologists	A. de S. Liyanage, B.Sc.Ag. (Cey.), Ph.D. (Lond.) * G. W. Liyanage, B.Sc.Ag. (Cey.)
Technical Assistants	D. M. Danthanarayana L. Halangoda Z. E. Irugalbandara S. S. Jayasuriya S. A. R. D. Sebastian

Soils Chemistry

Head of Department	O. S. Peries, B.Ag.Sci. (Melb.), Ph.D. (Bristol), M.I. Biol.
Soils Chemist	C. G. Silva, B.Sc. (Cey.), M.S. (Hawaii)
Assistant Soils Chemist	* N. Yogaratnam, B.Sc.Ag. (Alhabad)
Experimental Officer	M. H. Sulaiman, B.Sc. (Cey.)
Senior Technical Assistant	T. Kanthasamy
Technical Assistants	B. P. M. Arsecularatne P. S. Gunasekera B. G. Jayawardena A. M. A. Perera H. A. Seemon F. P. W. Silva L. J. Wickremasinghe
Field Assistants	W. M. Abeysinghe A. D. M. Karunaratne M. A. Mendis K. S. A. C. Peries K. A. J. Wijenayake

Rubber Chemistry

Head of Department	M. Nadarajah, B.Sc. (Cey.), M.Sc. (Birm.), A.I.R.I., F.I. Chem. (Cey.)
Rubber Chemist	S. W. Karunaratne, B.Sc. (Cey.), M.Sc. (Aston), A.R.I.C., A.N.C.R.T., A.I.R.I.
Assistant Rubber Chemists	* A. M. A. Amarapathy, B.Sc.(Cey.), M.Sc. (Aston)
	A. Coomaraswamy, B.Sc. (Cey.), Ph.D. (Aston)
	* M. R. N. Fernando, M.Sc. (Moscow), M.Sc. (Aston)
	* W. S. E. Fernando, B.Sc. (Cey.)
	R. Tharmalingam, B.Sc. (Cey.), Dip. Chem. Eng. (UC Lond.) M. Phil (Aston)
	G. Varatungarajan, B.Sc. (Cey.), M.Sc. (Aston), Ph.D. (Aston)
	P.A.J. Yapa, B.Sc. (Vidyodaya, Cey.), Ph. D. (Lond.)
Assistant Development Officer	D. S. Muthukuda
Assistant Specification Officer	* L. M. K. Tillakaratne, B.Sc. (Cey.), M.Sc. (Aston)
Experimental Officer	C. G. Balasingham, B.Sc. (Cey.)
Senior Technical Assistant	W. C. Dayaratne
Technical Assistants	A. S. Dekumpitiya
	W. D. Dharamasena
	L. S. C. Gunawardena
	P. P. Jayasinghe, L.I.R.I.
	S. Kasinathan, L.I. Biol.
	J. K. Kirubakaran, C. Eng.
	D. D. Medagama
	H. Narangoda, L.I.R.I.
	K. A. Piyadasa, L.I.R.I.
	K. P. N. de Silva
Specification Assistants	T. M. Ahamadeen
	D. R. Peiris
	M. D. C. Senaviratne
	W. A. S. Wijesekera

Rubber Processing Unit

(Officers seconded for service)

Project Manager	M. T. Veerabangsa
Divisional Advisory Officer	M. B. Dissanayake

Senior Technical Assistants	E. G.Mendis S. K. Samaraweera
Clerk	M. J. Abeysinghe

Statistical Section

Assistant Statistician	G. A. J. P. R. Gunasekera, B.Sc. (Cey.), Dip. Stat. (Vidyodaya, Cey.)
Technical Assistants	L. T. Peiris L. S. Weerasinghe

Estate Advisory Department

Head of Department	A. B. Dissanayake, B.Sc.Ag. (Cey.), B.A. (Cey.), M.Sc. (Cey.)
Assistant Advisory Officers	A. Dahanayake, B.Sc.Ag. (Cey.) R. A. Wijewansa, B.Sc.Ag. (Cey.)
Assistant Agricultural Economist	* G. R. Chandrasiri, B.Sc.(Cey.), M.Sc. (London)
Clerk/Typist	H. B. de Silva

Smallholdings Department

Chief Advisory Officer (Smallholdings)	H. H. Peiris
Deputy Chief Advisory Officer (Smallholdings)	R. P. M. de Zoysa, B.Sc.(Cey.), M.Sc. (Oregon)
Divisional Advisory Officers	K. I. Ariyaratne (Actg. D.A.O.S.) W. S. Dasanayake B. D. Pedrick D. R. Ranwala K. P. Siriwardena A. J. L. de Silva D. E. Weligodapola J. D. S. Wickremaratne D. R. Wijesuriya A. Wijesinghe
Office Assistant	R. A. Somadasa
Chief Clerk	C. Jayasinghe

Clerk-Translators	W. A. Perera
	I. L. Sirisena
Artist Clerk	M. J. P. Lusena
Clerks	R. E. Perera
	A. Wijesinghe
Junior Clerk/Typists	Mrs. L. J. C. Perera
	Miss Asuntha Seneviratne
Rubber Instructors	K. A. S. Abeygunawardena
	W. D. Abeysena
	D. L. Abeysinghe
	U. S. B. Alagoda
	M. D. Albert
	M. A. D. Ariyaratne
	M. Athauda
	S. D. Athukorala
	D. D. Dasanayake
	P. W. David
	K. D. Dharmasena
	H. R. Dias
	K. Ekanayake
	E. A. F. S. Fernando
	S. S. K. Fernando
	R. Gunadasa
	W. W. Gunasekera
	U. D. V. Gunasinghe
	R. K. Gunatilake
	G. Gunawardena
	B. de A. Gurusinghe
	R. B. Heendeniya
	T. B. Herath
	D. Hettiarachchi
	S. D. Hidellarachchi
	D. P. P. Jayakody
	T. W. Jayalath
	A. K. Jayatissa
	W. D. Jayawardena
	L. S. Kasthuriratne
	N. C. Katukurunda
	K. S. Kodikara
	D. D. Kothalawela
	E. N. Liyanage
	J. R. Malagala, L.I.R.I.
	W. E. W. de Mel
	P. R. Nonis
	D. Palihakkara
	P. P. S. Perera
	U. L. C. Perera

	M. P. V. P. S. Perera
	D. Podimahaththaya
	S. C. Rajasinghe
	R. M. B. Ranasinghe
	D. J. Ratnayake
	G. S. Ratnayake
	W. D. D. Rupasinghe
	J. Sumanasekera
	M. C. Samarasekera
	G. Senarath
	R. G. Siripala
	U. S. Somapala
	J. H. Swaris
	S. H. B. L. de Silva
	O. M. W. Tillakaratne
	S. A. Weerawarna
	K. W. N. B. Weragama
	C. Wickrematillake
	W. A. S. Wijesekera
	D. U. Wijesinghe
	V. Wijesinghe
	W. M. D. Wijesundera
	R. P. D. Wijewardena
	U. S. Wijeyapala
Rubber Instructor (Publicity Unit)	A. Suriyaarchchi
Mechanic	K. A. Siripala

Administration and Accounts Section

Chief Administrative Officer, and Secretary to the Board	K. M. U. Jayanetty. B.A. (Lond.)
Accountant	M. E. A. Peiris, Dip.Acc. (Cey.), A.C.M.A. (Lond.)
Assistant Administrative Officer	S. M. J. Neangoda, B.A.Econ. (Cey.)
Office Assistant	J. A. Attygalle
Accounting Assistant	E. P. D. Roberts, F.C.B.I. (Lond.)
Personal Assistant to the Director	P. Samarasinghe
Internal Audit Clerk	B. H. Withanachchi
Chief Clerk	W. D. Jayawansa

Establishment Clerk	D. G. Udawatte
Book-keeper	A. K. D. Amaradasa
Translator cum Typist	J. A. A. R. I. St. R. Perera
Foreign Order Clerk	K. G. A. K. Dharmawardena
Clerk/Typists	J. D. Gunaratne G. P. A. I. G. Pathirana T. H. Wijesena
Junior Clerk/Typists	Miss G. R. M. de Alwis Miss M. M. J. R. Cooray R. G. D. Sakaraja Miss W. Sellamuttu Miss R. S. Senaviratne L. Andrew Silva Mrs. I. Swaris Mrs. D. F. Thambawita
Accounts Clerks	R. L. Fernando A. L. Gunawardena K. D. D. Navaratne J. H. C. S. Perera A. L. Ratnayake N. C. de Silva
Store-keeper	D. P. W. Goonasekera
Stores Assistant	M. H. C. Ariyaratne
Cashier	D. C. A. D. B. de Silva
Clerk cum Typist (Board Office)	P. H. Senaviratne

Library

Librarian & Publications Officer	J. A. Amaraweera, B.Sc. (Vidyodaya, Cey.) 9
Library Clerk	D. C. Thambawita
Junior Clerk/Typist	Miss D. T. Baranasuriya

Works Section

Works Engineer	P. C. J. F. Keerthisinghe
Mechanical Foreman	M. M. Anderson

Building Foreman	W. S. I. Benjamin
Transport Assistant	B. D. Ponnamperuma
Clerk/Typist	D. D. D. Adikaram
Junior Clerk/Typist	N. Jayasekera
Workshop Charge-hand	W. D. Dharmawardena

ESTATES

Dartonfield Group

Estate Superintendent	S. de S. Daluwatte
Assistant Estate Superintendent	D. H. Ariyaratne
Office Assistant	A. C. Swaris
Chief Clerk	B. H. Rodrigo
Accounts Clerk	D. A. Rajapaksa
Junior Assistant Clerks	G. S. Doolwela G. A. Kannangara
Senior Field Assistant	L. P. de Mel
Factory Assistant	O. de Alwis
Estate Medical Assistants	M. C. Peiris G. J. A. Silva
Field Assistant	H. A. Haramanis
Field Officer	A. Jayasena
Assistant Rubber Maker	S. Hettiarachchi
School Teachers	Mrs. K. P. Gunawardena D. L. W. Lionel S. Nadarajah
Assistant Nursery Manager	L. H. Samaranayake

Kuruwita Sub Station

Visiting Superintendent	S. M. Dias
Senior Field Assistant	M. C. Perera

Graduates under the Graduate Trainees Scheme absorbed into the Institutes Service.

Miss D. Alvitigala, B.A. (Cey.)
Miss A. M. L. Angammana, B.A. (Vidyodaya, Cey.)
B. A. D. S. Balachandra, B.A. (Cey.)
Miss G. Caroline, B.A. (Cey.)
K. D. Chandradasa, B.A. (Cey.)
B. D. Cyril, B.A. (Cey.)
W. D. Gunadasa, B.A. (Vidyodaya, Cey.)
U. J. Hirimuthugoda, B.A. (Cey.)
A. Kalubowilage, B.A. (Vidyalankara, Cey.)
P. W. Karunaratne, B.A. (Cey.)
Miss J. N. Kumarasena, B.A. (Cey.)
W. Leelaratne, B.A. (Cey.)
Miss K. N. Peiris, B.A. (Cey.)
K. S. Peries, B.A. (Cey.)
Mrs. G. N. P. Perera, B.A. (Cey.)
L. T. Perera, B.A. (Vidyalankara, Cey.)
K. G. D. Piyasena, B.A. (Cey.)
S. D. Ranasinghe, B.A. (Cey.)
Miss C. W. Ranasinghe, B.A. (Cey.)
S. K. Silva, B.A. (Cey.)
Mrs. K. K. Jagoda, B.A. (Cey.)
T. C. Weerasinghe, B.A. (Vidyalankara, Cey.)
Miss W. Yasawathie, B.A. (Vidyodaya, Cey.)

* On Study leave overseas.

THE RUBBER RESEARCH INSTITUTE OF SRI LANKA

DIRECTOR'S REVIEW FOR 1973

By

O. S. Peries

General

The highlight of the year was undoubtedly the International Rubber Conference and Exhibition, held on 21-22 June 1973, at the Bandaranaike Memorial International Conference Hall. The Institute had the honour of being the first organisation to hold a conference at this Hall. The Conference was well attended by local participants and overseas visitors and it caused a dramatic revitalisation of the interest in the rubber industry in this country.

The Institute also started a new project, to carry the results of the latest research findings direct to the Smallholder, by holding Conferences at the village level. Four such Conferences were held during the year and the participation of the Smallholders at these meetings was most encouraging.

The price of rubber revived during the year as the Institute always foresaw. The present energy crisis has ensured that natural rubber (NR) will enjoy a high price in the foreseeable future. It is now up to the grower to cash in on the situation and plan for the future by judicious replanting, as the chances are that NR prices will reach peak levels in 1978-80.

Careful studies have shown that the world consumption of all rubbers by 1980 would be about 17 million tons and that, technoeconomically NR's share of this market should be about 42% or 7 million tons. This calls for a doubling of the annual growth rate of NR, which is about 4% at present. The formula for higher production is increased yields per acre per year, which can be achieved by replanting with high yielding clones and good husbandary. The target of 7 million tons may be difficult to achieve by 1980, but Sri Lanka must immediately set about replanting all its old uneconomic rubber and plant new areas with rubber, perhaps, those at present under uneconomic low country tea. Rubber must be given first choice, wherever the crop is a feasible proposition in the wet low country areas, as no other crop has such an assured future.

Research

The work of the Research and Extension Departments is summarised below :

Botany

The first Ethrel experiments started in Sri Lanka are now three years old and the results so far have been very encouraging. On S/2, d/2, 100% tapping, with six bi-monthly applications of a 10% solution of Ethrel a year on Clone PB 86, the yields recorded up to the end of the third year have been well above those of the

unstimulated control plots. This indicates that with either reduced tapping intensities or with a lesser number of applications a year it should be possible to obtain yield increases over a longer period without adverse effects on trees.

Ethrel stimulation carried out on S/4, d/2 and S/3, d/2 tapping systems with six applications a year have yielded better than the unstimulated plots tapped at the standard intensity of 100% for the past two years. This is a trial which is likely to provide the necessary data for long term Ethrel stimulation in commercial estates.

A trial comparing tapping at 150% intensity with tapping at 100% intensity with Ethrel stimulation once every two months has indicated, during the two years 1972 and 1973, that higher yields could be obtained by tapping at 150% intensity rather than by Ethrel stimulation. This indicates that Ethrel stimulation may not be an economic substitute for the present practice of progressively intensifying tapping before replanting. This would mean that if Ethrel is to be used at all, it will have to be on a long term programme extending well beyond the last six years before replanting.

Application of Ethrel above the tapping cut has given equally good results as applications below the tapping cut. No obvious deleterious effects on trees by applications above the cut have been observed so far.

Trials have shown that, with the use of polythene rainguards, when tapping is possible every day of the year, the yields were depressed, indicating that enforced rest periods due to rain interference of tapping is beneficial. Investigations were next carried out on the use of a cheap rubber rainguard which permitted a reasonable increase in the number of tapping days, but where tapping was not possible during heavy rains. In Dartonfield 50 additional tapping days were possible in 1973, with the use of these rubber rainguards.

Clone RRIC 36 has proved to be the outstanding yielder in the fairly dry districts such as Matale and Kegalle. Clone PB 86 has taken second place with regard to yield. In a trial at Polgahawela, the first year yields in 1973 of clone RRIC 36 has been equal to that of RRIM 600 which is planted in the same trial.

Other newer clones which continue to show promise in the wet districts are :

NAB 15, RRIC 13, 48, 50, 89, 100, 101, AVROS 1734, PR 252, IRCI 2, and IRCI 9.

In two intercropping trials sited at Avissawella, where Passion fruit and Banana were interplanted among young rubber, the growth of rubber in interplanted plots shows an improvement over the control plots. The improved growth of rubber in the interplanted plots may possibly be due to the additional fertilizer used for the subsidiary crop. These results are in agreement with similar trials carried out in other countries.

Genetics & Plant Breeding

More experimental areas of the RRIC 100 series were opened on outside estates at five years of age. Yields above 700 kg/ha/yr were recorded from large scale replicated plots of RRIC 100, 101, 102 and 103, compared to a yield of 600 kg/ha/yr from RRIC 45.

Satisfactory growth and yield were also recorded from RRIC 103 at Moneragala and Matal.

Preliminary results from the RRIM Unit at Trinidad indicated the possibility of South American Leaf Blight (SALB) resistance in some of the hybrids synthesized in Sri Lanka, some of which are in tapping here for three years.

Plant Pathology

A new method of testing clones, at an early age, for resistance to Bark Rot has been developed. A number of clones have been screened. It has been found that clone RRIC 52 and clones bred from it show a certain degree of resistance to Bark Rot, whereas clone RRIC 45 appears to be susceptible to this disease, under the conditions of this test.

Preliminary studies on wound healing following Bark Rot, have shown that the method of treatment advocated by the Institute results in even callusing, whereas the callusing is irregular and uneven when the lesions are left untreated.

Considerable progress was made in the studies on the survival of *Fomes lignosus* in the soil and the effect of sulphur on *Fomes* control. Studies are now being conducted to assess the lowest dosage of sulphur required to control *Fomes*. The soil fungi present in the various rubber growing soils of Sri Lanka have been isolated, and many of these fungi have been identified by the Commonwealth Mycological Institute, U.K. It has been found that certain fungi, naturally present in the soil, causes more rapid decay of rubber wood than others. We are now trying to find out whether it is possible to encourage the growth of the rapid decay causing fungi under field conditions.

Three types of fungi have been isolated from decaying rubber wood. *Fomes* grows over the first type, the second type stops the growth of *Fomes* and the third type not only stops the growth of the pathogen, but grows over it, producing thick hyphae. It is now necessary to find out whether the fungi antagonistic to *Fomes* can be encouraged to grow on rubber stumps and other wood, thereby preventing *Fomes* from colonising them.

Soils Chemistry

Thirty estates were selected for a study of the relationship between commercial production and soil, weather, management and other factors. Only seven of these estates were studied in detail this year, because the large acreage involved requires heavy investment in staff and other inputs.

A programme for the recommendation of fertilizers, based on soil and follar analyses, was initiated over an extent of 2000 acres of mature rubber in the Kalutara District. The work on this project was completed on schedule and it has been decided to increase the acreage under this programme to 30,000 acres in 1974.

A poly bag experiment to test the possibility of using apatite as a source of phosphorus, showed that the local apatite may not be as suitable as the imported rock-phosphate for this purpose.

Rubber Chemistry

Pure Research on the biochemical side was aimed at further work on non rubber constituents in latex, mainly phenolic compounds which cause discolourations of rubber in the presence of thiols. Pure research on rubber seed oil is another line of investigation reported in the review. Purification of rubber seed oil was successfully carried out with Fuller's earth and xylyl mercaptan. Papain was tested further as a coagulant for NR latex. Preparation of cellulose from rubber wood was looked into mainly to explore the possibilities of grafting cellulose from rubber wood on to rubber (in latex form). Procedures for the isolation of cellulose were carefully scrutinised. Attempts were made to prepare NR derivatives by new techniques.

On the Applied Research and Technology aspects, innovation in block rubber production such as the production of block rubber *via* the GPC route and the production of block rubber from conventional crepe rubber are being carefully studied. Use of NR/ Bitumen mixes for road surfacing, use of NR latex/cement mixes for damaged industrial flooring, use of NR latex for both general purpose and special purpose adhesives, based on new formulations, have been tested.

Use of leather waste as a substitute for high styrene resin and also as a filler in rubber compounding was carried out successfully and a patent has been filed on this new technique. First fraction NR proved to be a satisfactory raw material for the production of stereo rubber.

Analysis of data obtained over a year from a number of recommended clones has shown that the most significant response due to Ethrel stimulation is in the increase in nitrogen levels of stimulated latex coagula. Discolouration of crepe rubber produced from Ethrel stimulated areas is suspected and an experiment was designed towards the end of the year to get more information.

Extension Services

The two Extension Departments continued to give an efficient advisory service to all sections of the rubber planting industry. The Rubber Research Board has decided to amalgamate the Estates Advisory and the Smallholdings Departments so as to create a unified and integrated extension service to rubber growers. This will result in better utilisation of the time of the various grades of officers, closer supervision of their work and a speedier service to all rubber growers.

The Economic Research Unit, attached to the extension services, has carried out a series of surveys including : (a) the economics of rubber production in smallholdings, (b) income levels, availability and utilisation of time saved and employment opportunities for smallholders in the Mawanella area, who sell their latex to the New Process Rubber Unit.

The Smallholdings Department continued to do extremely good work on the setting up of Group Processing Centres for Smallholders to produce RSS. The target by the end of 1974 is 100 such centres and the Department is confident of achieving this target in spite of various drawbacks such as difficulties in transport and obtaining buil-

ding materials. The Department is also carrying out a survey on the economics of Group Processing Centres (GPC).

Staff

The Director, the Heads of Departments and all the Senior and Intermediate Staff Officers of the Institute were on duty throughout the year.

Mr. M. Nadarajah, Head of Rubber Chemistry Department, left for Malaysia in October on a FAO Fellowship to work for 4 months at the Rubber Research Institute of Malaysia.

Messrs. W. S. E. Fernando, C. M. B. Ratnayake and G. W. Liyanage, left for the U.K. in September to join Aston University, Birmingham, East Malling Research Station, Kent, and Wye College, Kent, respectively for post graduate studies.

The following officers who were sent abroad earlier under the Colombo Plan scholarships, continued their post graduate studies :

Mr. N. E. M. Jayasekera, Assistant Geneticist, at the University of Birmingham.

Mr. M. R. N. Fernando, Assistant Rubber Chemist, at the University of Aston,

Mr. A. M. A. Amarapathy, Assistant Rubber Chemist, at the University of Aston.

Mr. G. R. Chandrasiri, Assistant Agricultural Economist, at Wye College, University of London.

Mr. N. Yogaratnam, Assistant Soils Chemist, at the East Malling Research Station, Kent.

Mr. L. M. K. Tillakeratne, at the University of Aston.

The following officers who were sent abroad earlier on Colombo Plan scholarships returned to the Island on completion of their post graduate studies, at the end of the year:

Dr. A. Coomarasamy, Assistant Rubber Chemist.

Dr. A. de S. Liyanage, Assistant Plant Pathologist

Dr. U. P. de S. Waidyanatha, Assistant Botanist

Dr. G. Varathungarajan, Assistant Rubber Chemist.

Mr. R. A. Wijewansa, Assistant Estates Advisory Officer, proceeded to Japan in April to follow a short course of studies in Extension Methods in that country and returned to the Island in July.

Mr. S. K. W. Jayasuriya, Assistant Agricultural Economist, resigned his post on 1st December 1973.

Assistant and Minor Staff changes in the various Departments have been reported in the respective Departmental reports.

The salaried staff of the Institute at the end of the year was as follows :

Officers in Grade I & II	..	14
Officers in Grade III	..	24
Officers in Grade IV to IX	..	220
Officers in Grade X to XIII	..	142
TOTAL	..	400

Visitors

Visitors to the Institute from overseas included :

Mr. D. J. Coombs, Australian Freedom from Hunger Campaign
Mr. H. Nishinosono, UNESCO, Japan
Mr. S. S. Kulkarni, UNESCO, India
Mr. S. Mani, Blue Star Ltd., Madras, India
A delegation from the People's Republic of China
Mr. H. M. Parsons, Eastern Produce (H) Ltd., U.K.
Mr. K. L. Daniel, I.C.I. Head Office, U.K.
Mr. A. Kovoor, University of Paris.
A group of visitors headed by Dr. Mohinder Singh, from Malaysia.

Visits

The Director attended the IRRDB meetings held in Puncak Pass, Indonesia, from 6-10 July 1973, followed by the RRIM Planters' Conference, from 19-21 July 1973.

The Director and Research Officers of the Institute attended the following conferences and seminars :

Annual Sessions of the Ceylon Association for the Advancement of Science (CAAS)
Planters' Association
Low Country Products Association
District Planters' Associations
I.R.I. Committee Meetings
Seminars organised by the Chemical Society of Ceylon
Meeting of the Rubber Replanting Advisory Board
Meetings of the panels convened by the Industrial Development Board,
Standing Committee meetings on agro-chemicals and fertilizers.
Ad hoc meetings of the Ministry of Trade & Commerce
Seminars organised by the Soil Science Society,
Meetings of the Soil Conservation Society.
Meetings of various panels appointed by the Bureau of Ceylon Standards
Meetings of the Working Group on Fertilizers.

The Director served on the following Boards and Committees :

Rubber Research Board (RRB)
Administrative Committee of the RRB
Estate & Experimental Committee of the RRB
Scientific Committee of the RRB
National Science Council (NSC)
Agricultural Sub-Committee of the NSC
Sri Lanka Tyre Corporation Board of Directors
Committee to recommend proposals for the improvement of the Tyre Corporation
Coconut Research Board (CRB)
Scientific Committee of the CRB
Research Planning Council of the CISIR
Council of the Ceylon Association for the Advancement of Science (CAAS)
General Research Council of the CAAS.
Standing Committee on Minor Export Crops
Research Committee on Minor Export Crops
Committee for the review of the scheme of recruitment of University teaching staff.
Academic Council of the Faculty of Agriculture, Peradeniya Campus of the University of Sri Lanka
Academic Council of the Vidyodaya Campus, Science Faculty,
Rubber Replanting Advisory Board
Committee of the Institution of the Rubber Industry (Sri Lanka Section).

Research Scholars

Mr. S. D. Wimalaratne, working under the supervision of Mr. L. B.Chandrasekera. Head Botany Department, completed his studies for the M.Sc.degree. His thesis entitled "Economic Exploitation of *Hevea*" was accepted by the Senate of the Vidyodaya Campus, University of Sri Lanka, for the award of the degree of M.Sc.

A number of final year Chemistry (Special) and Engineering students from the different University Campuses worked for various periods in the Rubber Chemistry Department on short term research projects.

Workers from overseas

Professor Gerald Scott, University of Aston in Birmingham, our Consultant in Polymer Science & Technolngy, visited the Institute in January for an assessment of the work done by us in this field. His services to the Institute have been invaluable.

Mr. E. Bellis, Consultant in Soils Chemistry, spent 8 weeks at the Institute assisting us with the work in the Soils Chemistry Department. His assistance is greatly appreciated.

Mr. E. Findlay continued as Chief Adviser to the Mawanella Block Rubber Project.

Visiting Officers

Mr. V. Abeywardena, Biometrician, Coconut Research Institute, continued to visit the Rubber Research Institute regularly throughout the year to help us with statistical studies. We are very grateful to the Coconut Research Institute for the services rendered to us by this officer.

Lectures

The Director, Dr. O. S. Peries, delivered the following lectures during the year.

1. Export promotion for natural rubber—at the Seminar on Export Promotion organised by the Ceylon Chamber of Commerce.
2. Recent developments in the rubber industry—Inaugural lecture of the Institution of the Rubber Industry.
3. The significance of research for the natural rubber industry—CAAS.Seminar.
4. The prospects for pale crepe—Seminar on pale crepe, organised by the Institute.
5. Employment prospects in the rubber industry—Panel discussion arranged by the Institution of the Rubber Industry.

Prevocational Studies on "The Rubber Industry"

Officials from the Curriculum Development Centre of the Department of Education called on the Institute for assistance in drawing up a descriptive syllabus for prevocational studies on the Rubber Industry for the students from grade 6 to 9 at Maha Vidyalayas, where the rubber industry is being considered as a subject.

A committee with Dr. P. A. J. Yapa, Assistant Rubber Chemist, as Chairman, prepared a report on the Chemistry and Technology of the rubber industry was submitted to the Curriculum Development Centre. This was accompanied by a descriptive report on the plantation aspects of the rubber industry, prepared by Mr. J. A. Amaraweera, Librarian and Publications Officer, in collaboration with the Heads of Botany, Plant Pathology, Soils, Estate Advisory and Rubber Chemistry Departments, and this report has been highly commended, The Acting Head of the Rubber Chemistry Department, Mr. S. W. Karunaratne, as the co-ordinater, had the initial discussions with the Curriculum Officials.

Publications

The following papers were prepared by the Director for publication during the year :—

O.S. PERIES— Director's Review for 1972

O.S. PERIES— Review of the Plant Pathology Department

O.S. PERIES— Review of the Soils Chemistry Department

O.S. PERIES— The significance of weather conditions on the incidence of the diseases of *Hevea*. *Q. Jl. Rubb. Res. Inst. Sri Lanka* **50,** *Parts* 3 & 4 (in Press) Contribution to the International Rubber Conference 1973.

O.S. PERIES & G.W. LIYANAGE—The control of white root disease. *Q. Jl. Rubb. Res. Inst. Sri Lanka* **50,** *Parts 3 & 4* (in Press) Contribution to the International Rubber Conference—1973.

O.S. PERIES— The control of *Oidium* leaf disease of *Hevea* on the basis of experimental data—*The Planter, Kuala Lumpur,* **49,** *452—455*

O.S. PERIES— An assessment of the significance of the food base in relation to infection of *Hevea* roots by *Fomes lignosus. Plant Disease Reporter.* (in Press)

O.S. PERIES— *Ganoderma* basal stem rot of coconut: a new record of the disease in Sri Lanka — *Plant Disease Reporter.* (in Press)

O.S. PERIES— Disease problems on *Hevea* in the year 2000 AD. Contribution to the Rubber Research Institute of India Conference, January 1974.

O. S. PERIES — Studies on the liberation of spores of *Oidium heveae,* the causal fungus of *Oidium* leaf disease of rubber (1973).
Abst. in CAAS Proc. 29th Annual Session Part I, p. 64.

O. S. PERIES — A study of the factors affecting spore germination in *Oidium heveae* (1973).
Abst. in CAAS Proc. 29th Annual Session Part I, p. 64.

O. S. PERIES — The perennation of *Oidium heveae* the causal agent of *Oidium* leaf disease of rubber (1973).
Abst. in CAAS Proc. 29th Annual Session Part I, p. 65.

O. S. PERIES — Methods for the biological control White Root Disease (*Fomes lignosus*) of *Hevea* (1973).
Abst. in CAAS Proc. 29th Annual Session Part I, p. 68.

O. S. PERIES — The ecology of *Phytophthora meadii* Mc Rae, the causal agent of Bark Rot and mature leaf fall of *Hevea* (1973).
Abst. in CAAS Proc. 29th Annual Session Part I, p. 68.

Institute Publications

General :

Annual Review for 1972 (English)

Annual Report of the Rubber Research Board for 1971 (trilingual) Part I

Annual Report of the Rubber Research Board for 1970 (trilingual) Part II

Annual Report of the Rubber Research Board for 1972 (trilingual) Part I (in preparation).

Quarterly Journal Vol. 50 Parts 1 & 2 (Proceedings of the International Rubber Conference, Sri Lanka,-1973. In press)

Quarterly Journal Vol. 50 Parts 3 & 4 (Proceedings of the International Rubber Conference, Sri Lanka,- 1973. In press)

RRISL Bulletin Vol. 8 No. 1 (in press)

RRISL Bulletin Vol. 8 No. 2 (in press)

RRISL Bulletin Vol. 8 Nos. 3 & 4 (Conference Supplement. In press)

" Rubber Puwath " Sinhala Bulletin Vol. 4 Nos. 1 & 2 (in preparation).

Theses :

COOMARASWAMY, A. Oxidative modifications of rubber (1973). *Thesis submitted for Doctor of Philosophy of the University of Aston in Birmingham, England*—1973.

LIYANAGE, A. de S. Studies on resistance and over-wintering in hop powdery mildew (*Sphaerotheca humuli*),(1973) *Thesis submitted for the degree of Doctor of Philosophy of the University of London,-Wye College, England*—1973.

THARMALINGAM, R. A transient method of measuring thermal contact conductance between metal—plastic surfaces (1972). *Thesis submitted for the Degree of Master of Philosophy* (M. Phil). *Department of Chemical Engineering. University of Aston in Birmingham, England*—1972.

VARATHUNGARAJAN, G. Techno economic aspects of competitive position of NR with special reference to the NR Industry in Sri Lanka (1973). *Thesis submitted for the Doctor of Philosophy of the University of Aston in Birmingham, England*—1973.

WAIDYANATHA, U. P. DE S. The metabolism of glycollate in green leaves. (1973) *Thesis submitted for the Doctor of Philosophy of the University of London—Imperial College, England*—1973.

YAHAMPATH, A. C. I. An analysis of the physiological status of two tomato cultivars one susceptible and one tolarant to Tobacco Mosaic Virus (1972). *Thesis submitted for the Doctor of Philosophy of the University of London, Wye College, England*—1972.

YAPA, P. A. J. Biochemical and histochemical studies on the contents of sieve tubes with special reference to slime substances (1972). *Theses submitted for the Doctor of Philosophy of the University of London,-Bedford College, England*—1972.

Papers :

BALASINGHAM, C. G. Leather waste as a filler in the rubber industry. *RRISL Bulletin Vol. 8 Nos. 3 & 4.* (Conference Supplement. In press)

CHANDRASEKERA, L. B. A Critical assessment of the currently available results of some Ethrel trials in Sri Lanka. *Q. Jl. Rubb. Res. Inst. Sri Lanka (Ceylon) Vol. 50 Parts 1 & 2* (Proceedings of the International Rubber Conference, Sri Lanka, 1973. In press).

CHANDRASEKERA, L. B. Plantation Research. *RRISL Bulletin Vol. 8 Nos. 3 & 4* (Conference Supplement. In press).

DANTANARAYANA, D. M. The incidence and control of Bark Rot. *RRISL Bulletin Vol. 8 Nos. 3 & 4* (Conference Supplement. In press).

DAYARATNE, W. C. Oil from rubber seeds. *RRISL Bulletin Vol. 8 Nos. 3 & 4* (Conference Supplement. In press).

DHARMASENA, W. D. Use of natural rubber latex as an industrial raw material. *Rubber Puwath* **3,** 1—6 (in Sinhala).

DISSANAYAKE, A. B. Improving the viability of the NR industry of Sri Lanka. *Q. Jl. Rubb. Res. Inst. Sri Lanka (Ceylon) Vol.*50 *Nos.* 3 & 4 (Proceedings of the International Rubber Conference,Sri Lanka,-1973. In press).

DISSANAYAKE, A. B. How viable is the natural rubber industry in Sri Lanka. *RRISL Bulletin Vol.* 8 *Nos.* 3 & 4 (Conference Supplement. In press).

DISSANAYAKE, A. B. The Association of Natural Rubber Producing Countries (ANRPC). *RRISL Bulletin Vol.* 8 *Nos.* 3 & 4 (Conference Supplement. In press).

FERNANDO, D. M. The selection of stock in *Hevea* Vol. II Paper No. 9 *International Symposium on Seed Processing. Bergen, Norway* 1973.

FERNANDO, D. M. Trends in the improvement of rubber planting material with particular reference to Sri Lanka. *Q. Jl. Rubb. Res. Inst. Sri Lanka (Ceylon) Vol.* 50 *Nos.* 1 & 2. (Proceedings of the International Rubber Conference, Sri Lanka,-1973. In press).

FERNANDO, D. M. Crop improvement—*RRISL Bulletin Vol.* 8 *Nos.* 3 & 4. (Conference Supplement. In press).

FERNANDO, T. M. The control of three important diseases of *Hevea brasiliensis* in Sri Lanka. *RRISL Bulletin Vol.* 8 *Nos.* 3 & 4 (Conference Supplement. In press).

FERNANDO, W. S. E. Centrifuged latex as a raw material for the production of rubber goods. *RRISL Bulletin Vol.* 8 *Nos.* 3 & 4 (Conference Supplement In press).

JAYASINGHE, P. P. The future of natural rubber in adhesives. *RRISL Bulletin Vol.* 8 *Nos.* 3 & 4 (Conference Supplement. In press).

KARUNARATNA, S. W. Coagulation of latex. *Rubber Puwath* **3,** 7 (in Sinhala).

KARUNARATNE, S. W. Standards for raw natural rubber. *RRISL Bulletin Vol.* 8 *Nos.* 3 & 4 (Conference Supplement. In press).

KARUNARATNE,S.W. AND PIYADASA, K. A. Coagulation of natural rubber latex with Hydrochloric Acid (HCl). *Q. Jl. Rubb. Res. Inst. Sri Lanka (Ceylon) Vol.* 50 *Nos.* 3 & 4 (proceedings of the International Rubber Conference, Sri Lanka,-1973. In press).

KARUNARATNA, S.W. AND WICKREMASINGHE, D. C. Production of technically specified rubber (TSR) by the Cenat Process. *Q. Jl. Rubb. Res. Inst. Sri Lanka (Ceylon) Vol.* 50 *Nos.* 3 & 4. (Proceedings of the International Rubber Conference, Sri Lanka,-1973. In press).

LIYANAGE, G. W. AND PERIES, O. S. The Control of White Root disease in Sri Lanka. *Q. Jl. Rubb. Res. Inst. Sri Lanka (Ceylon) Vol.* 50 *Nos.* 3 & 4 (Proceedings of the International Rubber Conference, Sri Lanka,-1973. In press).

LIYANAGE, A. DE S., NEVE, R. A. AND ROYLE D. J.(1972)Resistance to Hop powdery mildew (*Sphaerotheca humuli (DC.) Burr*). *Rep. Dept. Hop Res., Wye College for* 1972. *p.* 49-50.

NADARAJAH, M. Recent advances in rubber chemistry and technology at the Rubber Research Institute of Sri Lanka. *RRISL Bulletin Vol.* 8 *Nos.* 3 & 4 (Conference Supplement. In press).

NADARAJAH, M., ARIYA ABEYSINGHE,DAYARATNA,W.C. AND THARMALINGAM, R. The potentialities of rubber seed collection and its utilisation in Sri Lanka. *RRISL Bulletin Vol.* 8 *No.* 1 (in press).

NADARAJAH, M. AND MEDAGAMA, D.D. The use of first fraction rubber in the manufacture of stereo rubber. *RRISL Bulletin Vol.* 8 *No.* 2. (in press).

NADARAJAH, M. AND NARANGODA,H. Easy processing natural rubber. *J.I.R.I.* **7,** 117 (1973).

NADARAJAH, M., NARANGODA, H., BALASINGHAM, C. G., KIRUBAKARAN, J. K. AND JAYASINGHE,P. P. Preparation and uses of cyclised rubber and chlorinated rubber. *Q. Jl. Rubb. Res. Inst.Sri Lanka (Ceylon) Vol.*50 *Nos.*3 &4 (Proceedings of the International Rubber Conference, Sri Lanka, 1973. In press).

NADARAJAH, M., PERERA, K. A., BALASINGHAM, K. AND FERNANDO,W.S.E. Proposals for central factories for latex in Sri Lanka. *RRISL Bulletin Vol. 8 No.* 2. (in press).

NADARAJAH, M., YAPA, P. A. J., BALASINGHAM, C.G. AND KASINATHAN, S. Papain as a coagulant for natural rubber latex. *Q. Jl. Rubb. Res.Inst. Sri Lanka (Ceylon) Vol. 50 Nos.* 3 & 4. (Proceedings of the International Rubber Conference, Sri Lanka, 1973. In press).

NARANGODA, H. Industrial uses of cyclised rubber. *RRISL. Bulletin Vol.* 8 *Nos.* 3 & 4 (Conference Supplement. In press).

PERIES, O. S. A critical assessment of the influence of weather on the incidence of *Hevea* diseases. *Q. Jl. Rubb. Res. Inst. Sri Lanka. Vol.* 50 (Proceedings of the International Rubber Conference, Sri Lanka, 1973. *Nos.* 3 & 4 In press).

PERIES, O. S. Crystal gazing for the Rubber Industry. *RRISL Bulletin Vol.* 8 *Nos.* 3 & 4. (Conference Supplement. In press).

PERIES,O.S. AND IRUGALBANDARA, Z. E. I. Histology of *Hevea* roots infected by *Fomes lignosus*. *Ann. Appl. Biol.* **73,** 1-7.

RATNAYAKE, C. M. B. An assay of growth inhibitors in rubber seed oil and normal and diseased (Brown Bast) bark of *Hevea*. *Q. Jl. Rubb. Res. Inst. Sri Lanka. Vol.* 50 *Nos.* 1 & 2 (Proceedings of the International Rubber Conference, Sri Lanka, 1973. In press).

ROYLE, D. J. AND LIYANAGE, A. DE S. (1973). Plant Pathology Section. *The Years Work. Rep. Dep. Hop. Res., Wye College for* 1972.

ROYLE, D. J. AND LIYANAGE, A. DE S. (1972) Plant Pathology Section. *The Years Work. Rep. Dep. Hop Res., Wye College for* 1971.

ROYLE, D. J. AND LIYANAGE, A. DE S. (1971). Plant Pathology Section. *The Years Work. Rep. Dep. Hop Res. Wye College for* 1970.

SAMARANAYAKE, A. C. I. The use of polythene film in budgrafting *Hevea* seedlings. *RRISL. Bulletin, Vol.* 8 *No.* 1 (in press).

SAMARANAYAKE, A. C. I. Propagation of *Hevea*. *RRISL Bulletin Vol.* 8 *Nos.* 3 & 4. (Conference, Supplement. In press).

SATCHUTHANANTHAVALE, R. *Hevea* tissue culture. *Q. Jl. Rubb. Res. Inst. Sri Lanka (Ceylon) Vol.* 50 *Nos.* 1 & 2. (Proceedings of the International Rubber Conference, Sri Lanka, 1973. In press).

SATCHUTHANANTHAVALE, R. Use of rain guards for rubber trees *Q. Jl. Rubb. Res. Inst. Sri Lanka (Ceylon) Vol.* 50 *Nos.* 1 & 2 (Proceedings of the International Rubber Conference, Sri Lanka, 1973. In press).

SATCHUTHANANTHAVALE, R. Tissue culture techniques in *Hevea* breeding *RRISL Bulletin Vol.* 8 *Nos.* 3 & 4. (Conference Supplement. In press)

SATCHUTHANANTHAVALE, R. AND IRUGALBANDARA, Z.E.I. Propagation of callus from *Hevea* anthers. *Q. Jl. Rubb. Res. Inst. Ceylon* **49,** 65-70.

SATCHUTHANANTHAVALE, V. *Hevea* diseases of economic importance. *RRISL Bulletin Vol.* 8 *Nos.* 3 & 4 (Conference Supplement. In press)

SATCHUTHANANTHAVALE, V. AND DANTANARAYANA, D. M. Observations on *Phytophthora* diseases of *Hevea*. *Q. Jl. Rubb. Res. Inst. Sri Lanka (Ceylon) Vol.* 50 *Nos.* 3 & 4. (Proceedings of the International Rubber Conference Sri Lanka, 1973. In press).

SELMAN, I. W. AND YAHAMPATH, A.C.I. Some physiological characteristics of two tomato cultivars one tolerant and one susceptible to Tobacco Mosaic Virus. *Ann. Bot.* **37,** 853-865. 1973.

SILVA, C. G. Manuring of Rubber. *Rubber Puwath* **3,** 8-12 (in Sinhala).

SILVA, C. G. Management of the rubber soils of Sri Lanka for maximum yield. *Q. Jl. Rubb. Res. Inst. Sri Lanka (Ceylon) Vol.* 50 *Nos.* 1 & 2 (Proceedings of the International Rubber Conference, Sri Lanka, 1973. In press).

THARMALINGAM, R. Drying Techniques in the preparation of natural rubber. *RRISL Bulletin, Vol.* 8 *Nos.* 3 & 4 (Conference Supplement. In press)

WICKREMASINGHE, D. C. AND KARUNARATNA, S.W. Production of Technically Specified Rubber (TSR) by Cenat Process. *Q. Jl. Rubb. Res. Inst. Sri Lanka (Ceylon) Vol.* 50 *Nos.* 3 & 4 (Proceedings of the International Rubber Conference, Sri Lanka, 1973. In press).

WIMALARATNA, S. D. Economic evaluation of tapping systems. *Q. Jl. Rubb. Res. Inst. Sri Lanka (Ceylon) Vol.* 50 *Nos.* 1 & 2. (Proceedings of the International Rubber Conference, Sri Lanka, 1973. In press).

WIMALARATNA, S. D. The development of tapping systems for rubber. *RRISL Bulletin, Vol.* 8 *Nos.* 3 & 4. (Conference Supplement. In press)

WIMALARATNA, S.D. AND PATHIRATNA, L. S. S. Observations on "wintering". in *Hevea. RRISL Bulletin, Vol.* 9 *No.* 1 (in preparation).

WIMALARATNA, S. D. A staining procedure for latex vessels of *Hevea. Stain Technology* **48,** (5), 219-221.

YAPA, P. A. J. Formation of artifacts in electrofocusing on acrylamide gel with ampholines. *Journal of Chromatography.* **87,** 311-313 (1973).

YAPA, P. A. J. Biosynthesis of latex. *RRISL Bulletin, Vol.* 8 *Nos.* 3 & 4 (Conference, Supplement. In press).

YAPA, P. A. J. AND KARUNARATNA, S.W. Effect of storage hardening on the *PRI* of Chemically treated rubber. *Q. Jl. Rubb. Res. Inst. Ceylon,* **49,** 59-64.

ZOYSA, R. P. M. DE. Group Processing Centres in Malaysia. *RRISL Bulletin, Vol.* 8 *No.* 1 (in press).

ZOYSA, R. P. M. DE. State sponsered group processing centres. *RRISL Bulletin, Vol.* 8 *Nos.* 3 & 4. (Conference, Supplement. In press).

Sports activities

For the first time in the history of the Staff Club of the Rubber Research Institute of Sri Lanka, our cricketers had an opportunity of facing two foreign cricket teams this year.

We played the first match against the Rubber Research Institute of Malaysia on the 23rd September and the second against the Northern Indian Railway on the 3rd October, 1973. We lost the match against the Rubber Research Institute of Malaysia team, but the opportunity of getting together with our brother officers in Malaysia was extremely useful.

The Northern Indian Railways team which had Ranji Trophy and Duleep Trophy players in it, was a team full of cricketing talent, but they had a difficult time winning against us. Our team did splendidly in this tough encounter.

We entered the 2nd Round of the Sri Lanka State Services Cricket Tournament, but were unfortunate to lose in that game. In the Kalutara District Cricket Tournament, we did well to enter the semi finals, but we lost due mostly to lapses in fielding. The match played against the Coconut Research Institute, was left drawn.

One of our cricketers, Mr. Deepal R. Peiris, was selected to represent the Sri Lanka State Services Cricket Association President's XI against the Northern Indian Railways. This brings credit to the Staff Club of the Institute.

We are sorry to have lost Mr. Marcus Fernando, one of our best Sportsman, who left the services of the Institute to take up a planting appointment. This was a big blow to the Staff Club.

Our Badminton team did not fare well this year as they lost in the 1st round of the All Island Inter Club Badminton Tournament ('C' Division).

The annual club tournament was conducted successfully. Mr. D. Jayasiri Perera, Chairman of the Rubber Research Board, was the Chief Guest at the Prize distribution and the Year ending party which was held on 21st December, 1973.

REVIEW OF THE PLANT PATHOLOGY DEPARTMENT

BY

O. S. PERIES

Director, RRISL & Head of Plant Pathology Department

SUMMARY

The incidence of the leaf diseases of *Hevea* was very low during the year, with scattered records of *Oidium*, *Phytophthora* and *Gloeosporium* leaf fall.

Laboratory experiments have been carried out on the biology of *Hevea* pathogens. Experiments are being conducted with a table model culture vessel for the mass culture of bacteria for latex coagulation.

Field experiments have shown that, if the food base is large enough, infection of budded stumps can take place even in the presence of the recommended quantities of sulphur in the planting holes. There is also evidence of a *Penicillium* spp. that can suppress the growth of *Fomes*, growing profusely in the presence of sulphur.

The field experiment for the assessment of the possibility of retaining the old timber on the site, after clearing, has been concluded, and it has been found that, where the incidence of *Fomes* in the old stand is low, the timber can be retained without effect on root disease incidence.

DETAILED REVIEW

Staff

The Department continued to function under the supervision of the Director, Dr. O. S. Peries. The Plant Pathologist, Dr. (Mrs.). V. Satchuthananthavale was on duty throughout the year. The Assistant Plant Pathologist, Dr. A. de S. Liyanage, returned to the Institute in December, after successfully completing his post graduate studies, leading to the Ph.D. degree of the University of London. Mr. G. W. Liyanage, Assistant Plant Pathologist, was on duty up to September, when he left for the U.K. for post graduate studies at Wye College, University of London.

The Senior Technical Assistant, Mr. T. M. Fernando, resigned from the services of the Institute in September in order to accept a planting job. Messrs. Z. E. Irugalbandara, D. M. Dantanarayana, S. A. R. D. Sebastian, L. Halangoda and S. S. Jayasooriya, Technical Assistants, were on duty throughout the year.

In the absence of the Senior Technical Assistant, his duties were performed by Mr. Z. E. Irugalbandara.

Visits

The number of visits paid by the staff of the Department for various purposes, is listed below :—

Advisory	15
Experimental	76
Miscellaneous	19
Total	110

There is a sharp decline in the number of requests now being made for advisory purposes, when compared to the position in the early 1960s. We should like to interpret this as an indication that the majority of planters are now quite familiar with the identification and control of the diseases of the rubber tree. It is also likely that most estates now adopt the correct cultural practices, as recommended by the Institute, so that the incidence of diseases is also low.

Meetings

The Director, as Head of the Department, attended the following District Planters Association meetings, and addressed them on the diseases of *Hevea* and their control, amongst other topics of interest :

Kelani Valley District Planters' Association—2 meetings
Kegalla District Planters' Association
Sabaragamuwa District Planters' Association,
General Committee of the Planters' Association—4 meetings.

Publications

The following papers were prepared for publication by the staff of the Department, during 1973.

1. SATCHUTHANANTHAVALE, V. AND DANTANARAYANA, D. M. Observations on *Phytophthora* diseases of *Hevea*. *Q. Jl. Rubb. Res. Inst. Sri Lanka,* **50** Parts 3 & 4 (in Press) Contribution to the International Rubber Conference—1973.

2. SATCHUTHANANTHAVALE, V., SATCHUTHANANTHAVALE R. AND DANTANARAYANA, D. M. Screening of clones for Black Stripe disease in *Hevea*. Contribution to the Indian Rubber Conference—1974.

3. O. S. PERIES—Director's Review for 1972.

4. O. S. PERIES—Review of the Plant Pathology Department for 1972.

5. O. S. PERIES—Review of the Soils Chemistry Department for 1972.

6. O. S. PERIES—The significance of weather conditions on the incidence of the diseases of *Hevea*. *Q. Jl. Rubb. Res. Inst. Sri Lanka* **50,** Parts 3 & 4 (in Press) Contribution to the International Rubber Conference—1973.

7. G. W. LIYANAGE AND O. S. PERIES—The control of white root disease. *Q. Jl. Rubb. Res. Inst. Sri Lanka* (in Press) Contribution to the International Rubber Conference—1973.

8. O. S. PERIES—The control of *Oidium* leaf disease of *Hevea* on the basis of experimental data. *The Planter, Kuala Lumpur* **49,** 452—455.

9. O. S. PERIES—An assessment of the significance of the food base in relation to infection of *Hevea* roots by *Fomes lignosus*. *Plant Disease Reporter* (in Press)

10. O. S. PERIES—*Ganoderma* basal stem rot of coconut: a new record of the disease in Sri Lanka. *Plant Disease Reporter*. (in Press)

Laboratory investigations

Diseased specimens : A very few specimens were received at the Institute for disease identification. Just as in the case of requests for advisory visits, there has been a significant reduction in the number of diseased specimens received at the Institute, and for perhaps the same reasons.

Routine fungicide tests: The fungicide, Difolatan, has given satisfactory results both in the laboratory for fungicidal properties and in the field, for phytotoxicity. It is now ready for testing in small scale field trials, to assess its performance as a fungicide for Bark Rot control. The opportunities for field testing fungicides for Bark Rot control are limited now, because of the low incidence of Bark Rot in Sri Lanka. (O. S. PERIES & S. A. R. D. SEBASTIAN).

Phytophthora spp:

Biology of Phytophthora *spp.* : Isolate 62, referred to in these Reviews in earlier years, produces oospores when grown by itself on Lima Bean Agar (LBA) at 20° C. A. number of single zoospore isolates have now been screend for oospore production. In 1973, only 8 out of the 50 isolates tested produced oospores. Up to date, only 19 out of 100 single zoospore isolates tested have produced oospores. (V. SATCHUTHANANTHAVALE & D. M. DANTANARAYANA).

In vitro studies were carried out on the survival of *Phytophthora* spp. in the presence of secondary invaders such as *Botryodiplodia* spp., *Fusarium* spp. and *Gloeosporium*. These studies will be continued. (V. SATCHUTHANANTHAVALE & D. M. DANTANARAYANA).

Studies on the effect of relative humidity (RH) on the germination of *Phytophthora* sporangia and zoospores, have indicated that sporangia will release zoospores at RH values between 75 and 100%—RH below 75% was not tested. These studies will be repeated for confirmation of these results. (V. SATCHUTHANANTHAVALE & S. S. JAYASOORIYA).

Shape of Sporangia: Five growth media were tested to see the variations in shape and dimensions of *Phytopthora* sporangia. Shapes and dimensions of 100 sporangia in each case were noted. The results were statistically analysed and the differences were found to be statistically significant (O. S. PERIES & S. A. R. D. SEBASTIAN).

Root infection : These studies, which were carried out a few years ago, were repeated in order to establish the zoospore concentration required to cause root infection of *Hevea*. These experiments will be repeated, as they did not give conclusive results this year. (O. S. PERIES & S. A. R. D. SEBASTIAN).

Physiology of disease resistance : An artificial inoculation method was developed to screen clones of *Hevea* for Black Stripe disease resistance. Clones of the RRIC 100 series, available at Nivitigalakele and Kuruwita Substations, were screened for disease resistance by this method. The available results were presented in the paper entitled "Observations on *Phytophthora* diseases of *Hevea*" and the method has been described in detail in the paper "Screening of *Hevea* clones for Black Stripe disease". This inoculation technique is now being tested on younger plant material in budwood nurseries. Development of a screening method for evaluation of resistance and susceptibility in *Hevea* clones for Black Stripe disease will greatly help in the recommendation of clones for planting in the wet districts. (V. SATCHUTHANANTHAVALE, R. SATCHUTHANANTHAVALE & D. M. DANTANARAYANA).

Gloeosporium Spp.

Pathogenicity studies—This study was carried out with two isolates of *Gloeosporium* spp. These were isolated from diseased leaves of clones RRIC 45, after a suitable period of incubation inside moist chambers.

The leaflets of RRIC 45 nursery plants were tagged at bud break and 7-day old leaflets were obtained for the experiment. *Gloeosporium* spores produced in Potato Dextrose Agar were used. Spore suspensions were obtained by agitating 3 petri dishes of 10-day old cultures in 30 ml of sterile distilled water. The suspension was filtered thrice to remove hyphal threads and other extraneous matter. Sterile distilled water suspensions containing different spore concentrations: 2×10^5, 2×10^4, 1×10^4, 2×10^3, 1×10^3 spores/ml were prepared with the aid of a haemocytometer.

Inoculations were carried out on 25 healthy leaflets. The adaxial surface of each leaflet was inoculated with drops of the above suspensions and two additional drops of sterile distilled water served as the control. Drops of size 0.01 ml were obtained, by using a syringe with needle No. BD 25 and drops of each suspension placed in duplicate. The leaves were inoculated at room temperature and at 100% RH for a period of 72 hrs.

A dark discolouration under each droplet was taken as a positive infection and the total number of infection out of 50 was recorded. The experiment was replicated thrice. The results are summarised in Table 1.

TABLE 1.

Positive Infections out of the Total Fifty Droplets of isolate No. 1

Spore concentration/ml.	1st Set	2nd Set	3rd Set
2×10^5	10	11	2
2×10^4	7	9	8
1×10^4	27	25	16
2×10^3	2	9	—
1×10^3	6	6	15
Control	2	1	5

(Isolate No. 2 was more pathogenic and caused 100% infection at a spore concentration of 1×10^4 per ml).

The readings of the third set varied widely in comparison to results of the others. The reason for this difference could not be accounted for except that the leaves for this set were picked after heavy rains.

Statistical analysis using Finnys Probit method will be used to determine the effective spore concentration to cause 50% infection and the upper and lower fiducial limits.

This study will be continued to assess the effect of age of leaves on pathogenicity, variability in pathogenicity among different isolates and on clonal susceptibility. The latter could be developed to screen *Hevea* clones for susceptibility to *Gloeosporium* leaf disease. (G. W. LIYANAGE).

Infection—Studies were carried out to determine the optimum conditions for infection of *Hevea* leaves by *G. alborubrium*. *Hevea* leaves appear to be most susceptible to this disease at the apple green stage. The leaves of clones PB 86 are more susceptible than the leaves of other clones. Temperatures between 15 and 25 °C appear to be optimum for lesion development.

Infection was found to be more rapid when leaves were inoculated with fresh spores from field infected leaves.

In the studies on the effect of RH on infection, it was found that *Gloeosporium* infection occurs only at 100% RH indicating that this disease would generally be associated with rainfall followed by highly humid conditions. Healthy dry leaves, over which sporulating infected leaves were held in moist chambers, did not become infected by the fungus. These studies will be repeated to confirm the results (O. S. PERIES & Z. E. IRUGALBANDARA).

Perennation—When *Gloeosporium* affected mature leaves, shed at wintering, are incubated in moist chambers, the fungus sporulates on the edge of old lesions. The resultant spores are viable. This is the first time this has been demonstrated in the case of *Gloeosporium* of *Hevea*. (O. S. PERIES & S. A. R. D. SEBASTIAN).

Oidium heveae

Spore germination—Studies were carried out on the effect of temperature on spore germination and the rate of germination at different temperatures in order to confirm previous results before publication. (O. S. PERIES & S. A. R. D. SEBASTIAN).

Infection—The early stages of infection of *Hevea* leaves by *O. heveae* were studied. Conidia begin to germinate in 4—6 h, and all viable conidia germinate in 24 h, on rubber leaves. At this stage the hyphae start branching and infection pegs appear in germ tubes of the conidia that germinated early. (O. S. PERIES & Z. E. IRUGALBANDARA).

Fomes lignosus

Toxin production—Peries (1959) found that *F. lignosus* liberates a toxin when grown in synthetic media. Experiments were started in order to study the nature of this toxic material. Paper chromatographic techniques were used in this study. The toxic substance appears to be a water soluble phenolic compound. (G. W. LIYANAGE & O. S. PERIES).

Effect of sulphur—An experiment was started to study the rate of decay of infected and healthy roots in 3 types of soil, treated with sulphur. Untreated soils served as controls. The microorganisms responsible for the decay of these roots will also be recorded.

Observations made on a small scale trial show that the pathogen from a large food base can always infect a young plant even if the surface soil of that planting hole is amended with the usual amount of sulphur.

In an experiment where wood pieces were buried in sulphur treated soils, it was evident that volatile substances were produced in sulphur treated soils and that they inhibited the growth of the pathogen on the wood pieces, but attempts to demonstrate this *in vitro* were not successful. Further work is to be carried out to confirm the presence of volatile substance toxic to *F. lignosus* in sulphur treated soils.

Rate of decay of rubber wood buried in sulphur treated soils is slow compared to that buried in untreated soil. A species of *Penicillium* which occurred in abundance on chips buried in sulphur treated soils was found to be antagonistic to *F. lignosus* in that the pathogen failed to grow in its presence. (V. SATCHUTHANANTHAVALE & L. HALANGODA).

Nutrition—The study to assess the effect of different levels of nitrogen in the food base on the rate of decay caused by *F. lignosus*, which was started in 1972 and described in the Annual Review for 1972, was concluded. The effect of the level of nitrogen in the food base was found to have a statistically significant effect on the rate of decay caused by *F. lignosus*. (O. S. PERIES & S. A. R. D. SEBASTIAN).

Histology of Brown Bast

Brown Bast affected tissue was embedded and sectioned for a systematic study of the histology of affected tissue. This study is being continued. (R. SATCHUTHANANTHAVALE & Z. E. IRUGALBANDARA).

Decay of Rubber wood

The succession of fungi, occurring naturally on rubber wood under field condition was studied. The fructifications were collected and their frequency was noted. Sof rot was found on all logs and most of the logs were easy to crush. Extensive galleries have been noted due to the action of white ants. Larvae of wood destroying beetles and earthworms were found, but the earthworm population was higher. A major part of the heart wood was destroyed and the galleries were filled with humus. The observed increase in insect activity may be mainly due to soft rot caused by wood destroying fungi. Further observation on these will be continued, particularly on the nature and extent of damage by white ants. (G. W. LIYANAGE & O. S. PERIES).

Hyphal interference—The wood rotting fungi described in the section above were isolated and they were grown in paired cultures in petri dishes with *F. lignosus*. Three kinds of reactions were observed between the paired fungi: in the first, *Fomes* stopped the growth of the other fungus and grew over it, in the second the saprophytic fungus stopped the growth of *Fomes* and grew over the latter; and in the third, the saprophyte not only grew over the *Fomes* mycelium but produced thicker hyphae when growing over the latter. It now remains to find out whether the growth of the latter two types of fungi can be encouraged at the expense of *Fomes*, as a method of biological control of *F. lignosus*. (O. S. PERIES & G. W. LIYANAGE).

Soil microbiology

The studies started in 1972 (Ann. Rev. 1972) were continued, in an attempt to identify the fungi in Sri Lanka soils, to form the basis for the systematic study of soil fungi, in order to devise methods for the biological control of *Fomes*.

Media for isolation—Malt Agar (Difco), Czapex Dox Agar and Peptone Dextrose Agar were tested initially to find out the best medium for isolation of soil fungi. Malt Agar (MA) was selected for this purpose.

Bacteriostatic agents—Three levels each of Rose Bengal and Streptomycin were tested, to find a suitable level of bacteriostatic agents for use under local conditions. It was found that 30 ppm Streptomycin and 33 ppm Rose Bengal, added after sterilization to MA, gave an adequate control of bacteria in dilution plates, and these levels were adopted.

Soil depth—Studies were carried out to check the differences, if any in the species of fungi and their numbers at different depths in selected soils of the rubber growing areas of the country.

Soil fungi—Samples of the fungi isolated from the rubber growing soils of Sri Lanka, have been identified by the Commonwealth Mycological Institute, U.K. (O.S. PERIES, T. M. FERNANDO & S. A. R. D. SEBASTIAN).

Root Disease of Coconut Palms

Studies were carried out in the laboratory and the greenhouse on a root disease of coconut palms, caused by the fungus *Ganoderma boninense*. As this is the first record of this disease in Sri Lanka, a short paper was written for publication in the *Plant Disease Reporter*, U.S.A. (O. S. PERIES & Z. E. IRUGALBANDARA).

Bacterial Coagulation

Mass culture of bacteria, using a table model culture vessel, is being attempted. (V. SATCHUTHANANTHAVALE, R. SATCHUTHANANTHAVALE & R. THARMALINGAM).

Leaf diseases

Oidium *leaf disease*—The incidence of *Oidium* leaf disease was very low during the refoliating season of 1973. December 1972 was rather dry, so that wintering commenced early, and by the time that the weather conditions became conducive to the rapid spread of the disease, most clones had refoliated, their leaves were mature and immune to infection. A few late wintering clones suffered rather mild attacks of the disease.

Careful records were maintained on the wintering of *Hevea*, along with observations on weather and incidence of the disease. (O. S. PERIES & Z. E. IRUGALBANDARA).

Phytophthora *leaf disease*—The incidence of *Phytophthora* leaf disease too was negligible during the South West Monsoon season, due to the pattern of rainfall recorded. The weather conditions, generally, were not conducive to the rapid propagation of the fungus and the spread of the disease, during the months of June, July and August when rubber pods, which are essential for heavy sporulation of the fungus, were present.

Observations on disease incidence in relation to rainfall was made at Dartonfield Estate. A paper was written on the observations made in the previous years on the incidence of disease, pod set and rainfall. A Thermohygrograph was maintained right through the year in Dartonfield Estate. Fungicides were not applied during the wet season in Dartonfield Estate and not a single case of Black Stripe disease was reported during the year. ((V. SATCHUTHANANTHAVALE & D. M. DANTANARAYANA).

Gloeosporium *leaf disease*—The incidence of *Gloeosporium* leaf disease too was very mild during 1973.

Monthly observations were made on clonal susceptibility to *Gloeosporium* leaf disease in the budwood nurseries at Dartonfield. The results will be critically evaluated now, to find out whether they are sufficient for an adequate assessment of the clones tested, or whether special clonal nurseries will have to be established for this evaluation. (O. S. PERIES & S. A. R. D. SEBASTIAN).

Field Experiments

Root Diseases

Effect of sulphur and Collar protectants on Fomes—Two experiments were laid out in 1970 at Milleniya Estate and Malaboda Estate. A census of the infected trees were taken in August 1973. There was no incidence of *Fomes* root disease in the experimental area at Milleniya Estate. At Malaboda Estate incidence was very low and the food base was traced in each case of infection and found to be a stump left over at the time of planting.

Collar protectant was not used as trees adjacent to diseased trees were not infected. (V. SATCHUTHANANTHAVALE & L. HALANGODA).

Minimum dosage of sulphur—An experinent was laid out at Milleniya Estate in 1972. The majority of the plants died probably due to drought and the vacancies were filled in 1973. This experiment had to be terminated due to the discrepancy in the age of the plants within the plots.

Another experiment was laid out in Dartonfield in 1973. A census was taken of the diseased trees before felling and of the infected stumps of the old stand after the trees were felled. At the time of planting, surface soil of planting holes was treated with different amounts of sulphur.

Census was taken twice after planting in June 1973. The incidence of *Fomes* root disease was low. (V. SATCHUTHANANTHAVALE & L. HALANGODA).

Spread of Fomes—Observations are being made on a 4 acre area at Malaboda Estate, on the spread of *Fomes* root disease. Census was taken twice during the year; wherever infection was recorded small infected roots left over from the old stand were found in the planting holes.

A new experiment was laid out during the 1974 season at Malaboda Estate, to Investigate the spread of *Fomes*. A census of the *Fomes* infected trees was taken prior to felling of the trees in the old stand. (V. SATCHUTHANANTHAVALE & L. HALANGODA).

Food Base—The experiment carried out at Glenesk Estate from 1967, to assess the possibilility of retaining the timber from the old stand in areas where *Fomes* infection is low, was concluded in 1973. It was found that there was no significant difference in the incidence of root disease in areas where the old timber was allowed to rot in site and where it was burnt. This shows that the old timber can be retained on situ, after uprooting, in selected areas. The results of this experiment were written up for publication in the *Plant Disease Reporter*, U.S.A. (O. S. PERIES & T. M. FERNANDO).

Leaf and Bark diseases

Glocosporium *leaf disease*—An assessment was carried out at monthly intervals on clones RRIC 6 and RRIC 74 on the sporulation of the causal fungus under field conditions. The results of this study will be analysed shortly. (O. S. PERIES & S. A. R. D. SEBASTIAN).

Bark Rot—Trees artificially inoculated with *Phytophthora* zoospore suspensions were inspected to check the progress of calussing. It was observed that calussing was even and satisfactory when the method of treatment advocated by the Institute was adopted, but that it was uneven and irregular when lesions were left untreated. All trees will be inspected for internal symptoms in due course. (V. SATCHUTHANANTHAVALE & D. M. DANTANARAYANA).

REVIEW OF THE GENETICS AND PLANT BREEDING DEPARTMENT

BY

D. M. FERNANDO

(Head of Genetics & Plant Breeding Department)

SUMMARY

More information was gathered this year on the large scale yields, and secondary characters of the RRIC 100 series clones. RRIC 101 recorded very high initial yields on a number of locations. RRIC 102 showed resistance to wind damage and RRIC 103 showed suitability for the dry zone and areas above 1000 ft. elevation. Susceptibility to Bark Rot was found in RRIC 107 by the Plant Pathology Department. Investigations of the relationship between lipids in the cotyledon and roots continued. Selection from new clonal sources and from hand pollinated families continued. A preliminary report from the RRIM unit at Trinidad indicated the possibility of South American Leaf Blight resistance in hybrids synthesized in Sri Lanka.

DETAILED REVIEW

General

A preliminary report from the Rubber Research Institute of Malaysia (RRIM) indicated the possibility of resistance to South American Leaf Blight (SLAB) in some of the Ford and IAN progeny, synthesized in Sri Lanka, selected, and sent to the RRIM unit at Trinidad for test. At least one of these clones is giving yields comparable with the RRIC 100 series.

Very satisfactory yields were obtained from the RRIC 100 series opened at five years. Exposure to a cyclone through large scale trials at Kuruwita showed comparative wind-fastness of RRIC 101 and RRIC 102, possibly derived from the parent RRIC 7.

Food and Fibre Crops (D. M. Fernando & K. B. Karunasena) :

An attempt was made to find most suitable additional food crops for the soil and climatic conditions obtaining in this district. Soils normally under rubber were found to be of very poor fertility for most food crops. Sorghum emerged as a crop with promise: in contrast to dry zone conditions, the tall sorghums such as Thambagalla could be more effectively protected from predators than the better yielding dwarf varieties such as I.S. 2941. Two varieties of high lysine opaque II maize were also obtained from Thailand for multiplication and distribution. Container growth in polythene or pots was found to be more suitable than field growth for maintenance of germ-plasm and seed production. A ramie selection R 1411 was obtained from India for propagation and later inter-cropping. Frequent (monthly or bi-monthly) plantings were found advisable for wet zone plantings for annual crops.

Staff

The Head of the Department, Mr. D. M. Fernando was on duty throughout the year. The Assistant Geneticist, Mr. N. E. M. Jayasekera continued his post-graduate studies in the University of Birmingham. Mr. C. M. B. Ratnayake left towards the end of the year to commence post-graduate studies at East Malling Research Station. All other staff were on duty throughout the year.

Visits

The Head of the Department made 24 visits and the rest of the staff made 115 visits in connection with experimental work.

Conferences

The Head of the Department, Mr. D. M. Fernando, attended the Second General Congress of SABRO at New Delhi, in February, and presented a paper entitled 'Trends in the improvement of rubber planting material with particular reference to Sri Lanka'. The same paper was presented at the International Rubber Conference at Colombo in June: a paper entitled 'An assay of growth inhibitors in rubber seed oil and normal and diseased (Brown Bast) bark of *Hevea*' by Mr. C. M. B. Ratnayake was also presented at this latter Conference.

Liaison

Arrangements were finalized for the exchange of clones between Malaysia, Thailand, Indonesia and Sri Lanka.

Lectures

Talks were given at the K. V. Planters' Association and the Sabaragamuwa Planters' Association.

Building and Facilities

The approach road to Nivitigalakele was metalled.

Research Investigations

Clone evaluation (D. M. Fernando):

Large scale plots of RRIC 100, 101, 102 and 103 showed very promising yields matched against controls such as RRIC 45 and RRIM 623. Large scale planting of these clones could therefore be confidently advocated, particularly in view of the findings of the Plant Pathology Department regarding resistance to Bark Rot in the case of the RRIC 100 series (except RRIC 107 which was found susceptible). Preliminary indications of resistance to South American Leaf Blight (SLAB) in some of the clones shipped to the RRIM unit at Trinidad in 1969 also provide a welcome factor of security for the industry, which is in a particularly viable condition today.

Seedling variability—Tjir 1 (N. E. M. Jayasekera & P. Samaranayake):

This area was supplied during the South West Monsoon. A micro-tapping was carried out and monthly height and diameter measurements were taken. Significant correlations were observed between root, stem, leaf and total plant dry weight and height, stem diameter and root length.

1968 H. P. Seedlings (P. Samaranayake) :

A significant linear relationship was found between cotyledonary and root lipid content.

Molecular weight of latices (P. Samaranayake):

Studies on the molecular weight of rubber in the RRIC 100 series were initiated.

Photosynthetic efficiency (C. M. B. Ratnayake & P. Samaranayake):

Studies on the variation of photosynthetic efficiency were continued.

Selection :

1969 H.P. (W. D. Gunadasa):

This population was micro-tapped, selected, budded and reselected for a 1974 S.W. planting at Nivitigalakele.

1970 Selections (M. S. C. de Silva & A. K. M. S. Senaratne) :

63 seedlings left over from the 1972 seedling trial at Nivitigalakele were sent to Kuruwita during the 1972 N.E. monsoon as supplies to a storm damaged area.

1971 Selection (M. S. C. de Silva) :

166 plants now in polybags were serially numbered for supply to storm damaged areas in Kuruwita in 1974.

1972 Selections (M. S. C. de Silva):

71 selections from IAN 6500, IAN 45/710 and 5326 were also labelled and poly-bagged. 300 selections from 2545 RRIC 103 seedlings were planted in a polythene lined pit and were found to grow as well as bagged plants.

1973 Selections (M. S. C. de Silva) :

124 seedlings were selected from a population of 1200 AVROS 2037 seedlings for further study.

Stock/scion effect (M. S. C. de Silva):

1969 seedlings from Tjir 1, RRIM 513, PB 86, RRIM 623, RRIC 37, RRIC 52 and 506 were budded with RRIC 101 and RRIC 103 and micro-tapped; for correlation with cotyledonary and root oil content.

Root oil (M. S. C. de Silva):

Clones in tapping budded on to Tjir 1 seedlings were examined for possible correlation between root oil content and yield or girth. No correlation could be established.

An analysis of variance of the root oil content of the 1969 H.P. seedlings showed a correlation with growth in certain families as evidenced in cotyledonary oil content in earlier work.

Hand Pollination Programme (A. K. M. S. Senaratne):

The annual hand pollination programme was restricted to an estate with smaller trees in flower. The following seedlings were obtained from a total of 3940 pollinations effected.

Cross made	No. of Seedlings
RRIC 100 × 1305	56
RRIC 103 × 1458	18
1458 × RRIC 100	2
1458 × RRIC 103	43
RRIC 103 × 1305	3
Total	122

Disease resistance

Oidium (D. S. Gamage)

1963 Experiment 6A, Matale

More trees of PB 86 were brought into tapping and the yields of RRIC 102 were found to be satisfactory as shown below:

Clone	Trees tapped	Girth cm	1970	1971	1972	1973
RRIC 102	43	54.1	15.4	25.7	32.0	23.3
PB 86	5	52.8	—	—	—	16.4

1965—Experiment No. 10—Matale

This area was brought into tapping at seven years (Table 1) and RRIC 103 showed yields comparable to RRIC 102 in the earlier trial. The yields of clone 828 are poor in lower elevation plantings. Clone 4011 of RRIC 52 selfed parentage also shows satisfactory yields at Kuruwita (Table 8). Preliminary evidence of SALB resistance has been reported from Trinidad for clones 2462 and 5329.

TABLE I

1965 EXPERIMENT NO. 10—MATALE

(TAPPED s/2, d/2, 100%)

Clone	Parentage	Trees tapped	Yield 1973 g/tree/tapping
IAN 45-710	—	17	12.5
RRIC 52	—	8	5.7
RRIC 103	RRIC 52×PB 86	6	23.8
828	PB 5/139×RRIC 52	5	24.3
1004	T 170×RRIC 52	11	12.4
1108	RRIC 52×RRIC 7	14	12.3
2413	RRIC 45×FX 4098	5	9.5
2427	RRIC 45×FX 4098	27	11.3
2462	RRIC 88×FX 4098	32	12.3
4011	RRIC 52×RRIC 52	5	17.5
5329	IAN 3434×RRIC 52	20	9.4
5334	IAN 3434×RRIC 52	29	15.0
6004	RRIC 52×IAN 2750	20	4.4

Glocosporium: *1964 Experiment 7A (H. B. H. de Silva)*

The effect of *Gloeosporium* leaf-fall was reflected in the poor girth of PB 86 in this experiment. Clones 3221 and 3229, of parentage RRIC 52× RRIC 36, both showed satisfactory yields (Table 2A) and were multiplied for further trial.

TABLE 2A

1964 EXPERIMENT 7A

(TAPPED S/2. d/2. 100% FROM 1970)

Clone	Trees tapped	Girth cm 1973	Yield in g/tree/tapping				Brown Bast trees
			1970	1971	1972	1973	
3221	10	76.4	22.5	38.1	38.7	52.2	
815	10	81.3	21.7	30.0	34.9	38.6	
79	21	66.1	21.0	31.9	38.8	34.8	3
PB 86	11	49.1	19.7	27.0	27.9	30.0	
IAN 6505	6	56.7	26.4	28.2	27.5	57.0	
3229	4	90.0	20.0	37.9	50.8	58.0	
687	4	70.2	15.6	28.1	39.0	49.2	
6338	5	65.2	22.1	32.0	33.8	34.7	

Phytophthora :

Secondary leaf-fall in the RRIC 100 series caused by *Phytophthora* was minimal. RRIC 107 showed some susceptibility to bark rot in tests conducted by the Plant Pathology Department; in the same series of tests RRIC 104 and 105 did not show susceptibility even though they had Tjir 1 parentage.

TABLE 2

1960 EXPERIMENT 1A

(TAPPED 2S/2, d/4, 100%)

Clone	Trees tapped	Girth cm 1973	Yield in g/tree/tapping				
			1969	1970	1971	1972	1973
IRCI 7	36	75.8	48.6	39.8	41.8	45.5	41.8
IAN 45-873	34	80.0	38.5	33.4	35.5	29.8	30.5
PB 86	40	69.8	26.4	29.8	33.3	24.0	30.2

South American Leaf Blight (SLAB) 1960 Experiment 1A (W. D. Armon)

IAN 45-873 showed the same yields as PB 86 but much better growth. IRCI 7 was the best yielder in this experiment (Table 2).

1965 Experiment No. 8 (D. S. Gamage)

Preliminary observations at the RRIM unit at Trinidad have shown some resistance to SALB in 2473 which has a sufficiently good yield for larger scale trial (Table 3). Available seeds from selections such as 5326 and 2473 were collected for selection. A micro-tapping of the 1972 Hand Pollination progeny combining 2473 with 5326, which has a different clonal source of SALB resistance, showed a very low level of yield in the family.

TABLE 3

FIELD EXPERIMENT NO. 8

(TAPPED s/2, d/3, 67%)

Clone	Parentage	Trees tapped	Girth cm 1973	Yield in g/tree/tapping			
				1970	1971	1972	1973
RRIC 102	RRIC 52×RRIC 7	4	64.6	25.8	32.4	35.4	57.2
6306	RRIC 36×FX 516	11	64.3	23.9	34.9	32.0	34.5
2417	RRIC 45×FX 4098	5	63.8	21.7	31.0	30.1	39.7
2473	RRIC 45×IAN 45-873	11	66.4	14.8	23.2	27.9	30.7
1461	RRIC 52×T 792	9	72.1	20.0	27.2	27.1	29.4
2885	Ch 26×RRIC 52	10	78.4	14.6	20.9	22.7	28.4
6182	PB 28/59×IAN 873	11	70.8	14.7	18.7	24.7	29.3
IAN 45-710	PB 86×F 409	4	64.1	13.7	16.9	16.8	28.1
RRIM 623	PB 49×Pil B 84	9	65.6	16.2	16.1	17.4	20.4
5326	RRIC 51×F 4542	7	64.1	16.2	20.5	18.5	26.8
5352	RRIC 52×IAN 710	11	75.5	13.6	18.8	18.8	27.0
RRIC 106	PB 5/139×RRIC 52	13	70.0	16.0	14.4	15.9	21.1
RRIC 45	RRIC 8×Tjir 1	46	61.7	18.7	22.7	23.1	23.7

Clone Trials : 1961 Experiment 1 (B. M. S. G. Peiris)

A cyclonic storm affected nearly 20 % of the trees in this area which has a high water table. RRIC 104 and RRIC 107 showed appreciable uprooting owing to heavy crowns. The small crown of RRIC 100 was possibly responsible for a lack of casualties in this clone. The results of test-tapping are given in Table 4.

Intensive tapping

The trees tapped on 2S/2, d/3, 133% intensity in this area, selected on the basis of poorer yields on 100% intensity, combined with better growth, maintained the high yields shown earlier (Table 5).

TABLE 4

1961 EXPERIMENT 4

(TAPPED 67% IN 1966, 1967; 100% IN 1968, 1969; 67% FROM 1970)

Clone	Trees tapped	Girth cm 1973	Yield g/tree/tapping				
			1969	1970	1971	1972	1973
RRIC 100	10	73.3	63.7	58.6	51.3	56.7	61.4
RRIC 100	4	69.2	67.3	78.5	59.8	60.4	66.6
RRIC 101	7	71.7	56.5	46.1	35.0	45.6	50.6
RRIC 104	3	87.0	52.6	68.4	56.4	55.1	64.5
RRIC 107	2	107.4	62.2	44.1	47.8	59.6	57.8
1305	5	83.8	73.8	51.4	58.2	76.0	77.1
PB 86	37	76 7	37.8	40.2	45.7	44.8	53.4

TABLE 5

INTENSIVE TAPPING EXPERIMENT

(TAPPED 2S/2, d/3, 133% INTENSITY)

Clone	Parentage	Trees tapped	Girth cm		Yield in g/tree/tapping		
			1972	1973	1971	1972	1973
715	PB 86×RRIC 36	3	85.2	87.3	124.8	104.6	117.1
1057	T 170×Tjir 1	3	90.4	91.3	116.6	114.3	116.3
1793	RRIC 45×PR 107	5	91.6	97.7	115.5	102.0	97.7
1799	RRIC 45×PR 107	4	81.2	83.8	139.6	128.9	126.3
1851	RRIC 45×LCB 1320	3	94.8	97.6	122.6	122.4	98.0

1962 Experiment No. 3 (W. A. C. Wijesinghe):

The number of tappable trees of some of the clones in the path of a cyclonic storm severely reduced owing to trunk snap or uprooting and were taken out of this test. RRIC 36, RRIM 701, RRIC 37 and PB 86 were the best yielders in this large scale trial (Table 6).

TABLE 6

1962 EXPERIMENT NO. 3

(TAPPED S/2, d/2, 100%)

Clone	Trees tapped	Girth cm 1973	Yield in g/tree/tapping				
			1969	1970	1971	1972	1973
RRIM 701	228	67.6	32.1	51.7	51.7	70.9	55.5
RRIC 36	158	65.6	35.3	37.3	43.0	43.0	58.4
PR 228	112	62.7	37.8	46.9	39.8	36.0	38.7
RRIM 628	147	57.1	52.2	38.0	39.6	52.4	48.5
RRIM 623	223	68.0	46.5	49.7	36.9	41.9	48.1
PB 86	182	65.3	30.0	31.9	36.1	45.8	50.8
RRIC 37	106	62.9	27.5	38.7	32.3	51.6	53.2
PR 259	118	56.9	35.0	36.3	32.0	42.3	35.3
RRIM 607	145	65.0	24.9	31.4	30.1	40.1	37.9
RRIC 14	197	71.1	31.4	29.3	24.8	30.8	40.1
RRIC 7	115	62.4	43.7	37.0	26.1	34.2	31.7
RRIC 52	240	73.4	10.2	14.8	19.9	30.7	31.1

1962 Experiment Nos. 4 and 5 (D. S. Gamage & B. M. S. C. Peiris):

The yields of RRIC 52 improved considerably. One tree of clone 82 and three trees of RRIC 45 were damaged by wind. RRIC 102 showed good yields in both clearings (Table 7).

TABLE 7

1962 EXPERIMENT NOS. 4 & 5—SMALL SCALE TRIALS

(TAPPED AT NIVITIGALAKELE AT 67% IN 1969, 100% 1970, AND THEREAFTER; AND AT KURUWITA AT 67% THROUGHOUT)

Clone	Trees tapped	Girth cm 1973	Yield in g/tree/tapping				
			1969	1970	1971	1972	1973
RRIC 102 (Kuruwita)	8	66.4	48.5	55.3	57.2	44.4	50.7
RRIC 102 (N'kele)	10	60.8	41.4	32.7	49.2	50.8	44.6
82 (Nivitigalakele)	6	88.5	42.2	33.2	44.8	57.3	56.2
RRIC 45 (,,)	6	63.2	32.5	29.0	45.6	36.4	27.6
RRIC 52 (,,)	7	78.8	24.1	19.6	28.1	28.2	31.1

1963 Experiment No. 6, Kuruwita (B. M. S. G. Peiris)

The yield of the RRIC 52 selfed clone 4011 (Table 8) improved considerably; satisfactory leaf and yields were also shown at Matale by 4011. The yield of RRIC 105 was depressed owing to large wounds just above the tapping panel for a bark rot resistance test by the Plant Pathology Department, yields are expected to recover in 1974.

TABLE 8

1963 EXPERIMENT 6A

(TAPPED S/2, D/3, 67%)

Clone	Trees tapped	Girth cm 1973	Yield in g/tree/tapping			
			1970	1971	1972	1973
3606	3	74.5	50.4	71.0	65.6	72.8
3060	4	72.9	18.7	65.1	71.1	70.8
RRIC 109	6	75.0	49.9	73.7	57.3	68.7
3076	6	61.4	56.7	43.4	50.1	67.4
4011	7	67.9	47.5	54.4	53.0	67.3
1620	5	70.1	57.2	57.8	49.5	66.6
T 132	8	64.7	41.1	52.8	60.0	62.8
RRIC 105	5	77.4	70.8	78.8	95.1	54.9
2994	8	72.5	42.0	53.9	55.7	53.8
RRIC 108	7	63.6	62.2	55.8	48.7	51.9
1501	10	61.0	28.0	41.8	49.4	46.3
4008	10	74.8	32.8	40.7	41.0	45.1
PB 86	58	64.5	28.5	33.3	36.4	41.2
2228	10	69.2	44.7	28.3	44.1	34.4

1964 Experiment No. 7 (B. M. S. G. Peiris)

Clones 1152 and 266 showed susceptibility to wind damage. The trend of yields indicates that a 67% intensity is definitely advisable for the first five years of tapping of high yielding clones as RRIC 102 and RRIC 110 (Table 9) which are open four to five years after planting.

TABLE 9

1964 EXPERIMENT NO. 7

(TAPPED: s/2, d/3, 67%)

Clone	Trees tapped	Girth cm 1973	Yield in g/tree/tapping			
			1970	1971	1972	1973
RRIC 102	69	66.3	44.3	46.8	49.8	63.8
RRIC 110	11	71.9	61.9	64.2	66.3	81.5
226	19	76.5	41.6	46.8	47.8	44.5
1152	11	68.0	32.5	33.4	34.1	52.4

1965 Experimeni No. 9—Moneragala:

The trees in this trial were opened at 7 years of age, which is early for this district. RRIC 89 showed satisfactory yields but only a small percentage of the trees could be opened. RRIC 101, 102, 103 and 104 along with control RRIM 623 showed the possibility of obtaining first year yields equivalent to that from the wet zone (Table 10).

TABLE 10

1965 EXPERIMENT NO. 9—MONERAGALA

(TAPPED: s/2, d/2, 100%)

Clone	Trees tapped	Girth cm 1973	% trees in tapping	Yield in g/tree/tapping 1973
RRIC 101	11	52.2	40	31.5
1307	10	53.7	43	30.2
1487	9	54.2	52	22.6
RRIC 102	12	55.3	42	20.0
RRIC 89	16	51.6	26	19.8
RRIM 623	21	53.2	46	19.6
RRIC 103	16	56.8	80	17.8
1305	14	51.7	63	15.6
RRIC 104	12	56.4	52	15.2
RRIC 45	20	51.4	38	14.1
IAN 45-710	7	50.6	13	15.3
1108	11	56.0	40	14.0
266	23	51.7	67	12.1

1966 Experiment No. 11—Kuruwita (B. M. S. G. Peiris)

RRIC 45 and RRIC 103 were rather severely affected by cyclonic storm damage. RRIC 101 (Table 11) sustained high initial yields but the girthing of RRIC 103 suggests a higher latex potential.

TABLE 11

1966 EXPERIMENT NO. 11—KURUWITA

(TAPPED: s/2, d/3, 67%)

Clone	Trees tapped	Girth cm 1973	Yield in g/tree/tapping			% Losses due to cyclone
			1971	1972	1973	
RRIC 101	154	55.0	48.2	54.5	47.4	9
RRIC 103	94	61.1	31.7	38.1	39.1	42
1004	106	56.1	18.1	30.2	23.5	2
RRIC 45	58	59.0	28.3	29.2	29.4	42

1966 Experiment No. 12 Nivitigalakele (H. B. H. de Silva)

80% of the trees of RRIC 103 and 1004 were in tapping as against 61% of the control clone RRIC 45. It has been observed that the crown of RRIC 103 is rather large in the wet zone predisposing it to uprooting to some extent in the first years of tapping: in the drier areas such as Moneragala the size of the crown is much reduced and this tendency for uprooting is also lessened. Vigorous stocks such as *Hevea spruceana* hybrids may assist in better anchorage. The yields of the clones in this experiment are given in Table 12.

TABLE 12

1966 EXPERIMENT NO. 12

(TAPPED: s/2, d/3, 67%)

Clone	Trees tapped	Girth cm 1973	Yield in g/tree/tapping			Wind damaged trees
			1971	1972	1973	
RRIC 103	209	61.5	28.7	29.8	43.5	4
1004	171	56.3	25.7	23.6	29.1	1
RRIC 45	118	49.6	30.8	27.7	38.4	2

1967 N.E. Experiment No. 16 Neboda, (A. K. M. S. Senaratne)

In this experiment the trees were opened at 4 years and 9 months in 1972 and the tapping intensity increased to 100% in 1973, with recovery tapping. On this basis RRIC 103 yielded over 1000 lb/ac. in its second year of tapping but the incidence of brown bast as seen in Table 13 was appreciably more than in clearings opened early (at 5 years), and tapped on s/2, d/3, 67% intensity. For high yielding trees, opened early, a 67% intensity would appear preferable for the first few years of tapping.

TABLE 13

1967 EXPERIMENT NO. 6

(TAPPED S/2, D/3, 67% IN 1972, S/2, D/2, 100% FROM 1973)

Clone	Trees tapped	% Trees tapped	Trees rested BB	Girth cm 1973	Yield in g/tree/tapping	
					1972	1973
RRIC 103	427	82	16	60.8	16.2	31.0
RRIC 102	240	74	4	56.4	27.2	28.1
1004	350	87	2	56.4	14.9	19.2
RRIM 623	297	75	7	56.5	27.0	29.1

1967 N.E. Experiment No. 17, Peenkande (W. D. Armon)

In this experiment on a commercial estate the high initial yields of RRIC 101 were confirmed. Sited on an area previously extensively damaged by wind no increased susceptibility owing to early opening has been observed so far. Yields on a large scale (Table 14) were comparatively equivalent to small scale yields observed earlier.

TABLE 14

1967 N.E. EXPERIMENT NO. 17

(TAPPED S/2, D/3, 67%)

Clone	Trees tapped	% trees tapped	Girth cm 1973	Yield in g/tree/ tapping 1973
RRIC 100	291	53	59.0	38.3
RRIC 101	282	48	55.5	68.0
1004	139	26	53.5	34.8
815	319	65	64.0	31.8
RRIM 623	215	42	56.9	49.6
RRIC 45	142	34	51.4	48.9

1967 N.E. Experiment No. 20 (H. B. H. de Silva)

Five trees of 1305 showed branch breakage in this experiment sited at Bibile. The girth figures are given in Table 15 and it is proposed to open tapping cuts in 1974 at six years of age. Plot to plot variation in growth was found to be appreciable and differences in growth between clones were not significant.

TABLE 15

1967 N.E. EXPERIMENT NO. 20

Clone	Trees tapped	Girth cm	
		1972	1973
RRIC 100	542	30.7	35.4
RRIC 101	422	33.8	38.5
RRIC 103	284	32.7	38.4
IAN 45-710	395	26.1	33.8
1004	356	29.3	33.3
1108	502	36.4	41.4
1305	391	34.0	38.9
1010	138	24.7	28.4
RRIC 45	464	30.8	34.9

1967 Experiment No. 14 Nivitigalakele (H. B. H. de Silva)

With 70% of the trees in tapping RRIC 101 indicated a potential of over 1300 kg/ha on a 300 trees/ha basis. RRIC 102 initial yields were similar to those obtained on small scale trial but RRIM 623 yields were rather lower than usual (Table 16),

TABLE 16

1967 EXPERIMENT NO. 14 KALUTARA

(TAPPED s/2, d/3, 67%)

Clone	Trees tapped	% trees tapped	Girth cm 1973	Yield in g/tree/ tapping 1973
RRIC 101	267	70	45.85	52.0
RRIC 102	162	49	48.7	34.2
815	352	71	56.2	23.2
RRIM 623	127	70	49.7	28.6

1967 Experiment No. 15 (W. A. C. Wijesinghe)

This clearing was opened at six years. The yields of some of the clones with better secondary characters are given in Table 17.

TABLE 17

EXPERIMENT NO. 15—KURUWITA

(TAPPED s/2, d/3, 67%)

Clone	Parentage	Trees tapped	Girth cm 1973	Yield in g/tree/ tapping 1973
10570	RRIC 45×PB 28/59	21	57.6	56.7
8811	LCB 1320×RRIC 52	2	60.3	42.2
5682	FX 25×Ch 26	24	54.4	24.8
10727	RRIC 52×PB 86	14	56.1	21.5
8501	RRIC 52×FX 360	11	62.3	20.4
7281	IAN 873×RRIC 52	12	51.8	16.4
RRIM 623	PB 49×Pil B 84	31	51.5	28.0

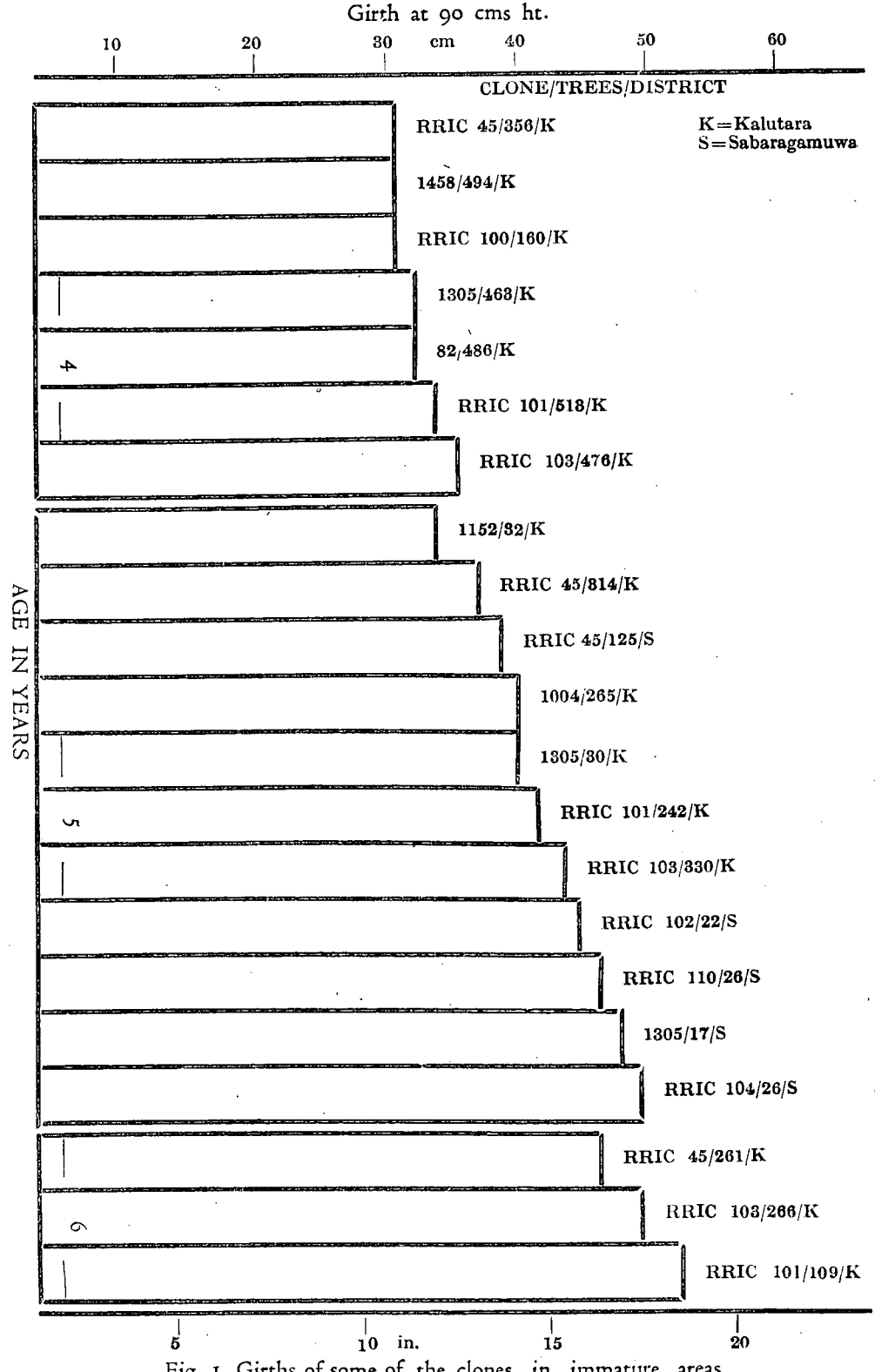

Fig. 1. Girths of some of the clones in immature areas

Immature areas

The girth of some of the clones in large scale areas, along with the control, are shown in Fig 1. Tests for significance of the differences in girth are proceeding.

New Plantings

A 20 acre clone trial cum seed garden at Bibile was planted towards the end of the year. Clones 2473 and 1461 were planted on a larger scale along with 506, RRIC 103, RRIC 102 and 1305.

Index to field experiments

Field Experiment	*Description*	*District/Site*
1	1961 small scale clone trial	Kuruwita
1A	1960 clone trial	Peenkande
2	1961 clone trial	Kuruwita
3	1962 large scale clone trial	Kuruwita
4	1962 small scale ,, ,,	,,
5	1962 ,, ,, ,, ,,	Nivitigalakele
6	1963 ,, ,, ,, ,,	Kuruwita
6A	1963 ,, ,, ,, ,,	Matale
7	1964 clone trial	Kuruwita
7A	1964 *Gloeosporium* test	Nakiadeniya
8	1965 small scale clone trial	Dartonfield
9	1965 clone trial	Moneragala
10	1965 clone trial	Matale
11	1966 clone trial	Kuruwita
12	1966 ,, ,,	Nivitigalakele
13	1966 ,, ,,	Moneragala
14	1967 ,, ,,	Nivitigalakele
15	1967 small scale clone trial	Kuruwita
16	1967 clone trial	Gikiyanakande
17	1967 ,, ,,	Peenkande
18	1967 ,, ,,	Gampola
19	1967 ,, ,,	Hedigalla
20	1967 ,, ,,	Bibile
21	1968 small scale clone trial	Kuruwita
22	1968 clone trial	Pannagula
23	1968 ,, ,,	Hedigalla
24	1968 ,, ,,	Bibile
25	1968 ,, ,,	Wariapola
25A	1968 small scale (supply)	Sirikandura

Field Experiment	Description	District/Site
26	1969 clone trial	Sirikandura
27	1969 ,, ,,	Pantiya
28	1969 small scale clone trial	Kuruwita
29	1969 clone trial	Eladuwa
30	1969 ,, ,,	Hedigalla
31	1970 ,, ,,	Palmgarden
32	1971 polyclone planting	Tatuwalakande
33	1971 ,, ,,	Lened
34	1971 ,, ,,	St. Andrews
34A	1972 stock/scion experiment	Nivitigalakele
35	1972 seedling trial	Nivitigalakele
36	1973 clone trial	Ambetenne
37	1973 ,, ,,	Bibile

REVIEW OF THE BOTANY DEPARTMENT

BY

L. B. CHANDRASEKERA

(Head of Botany Department)

SUMMARY

Yield Stimulants

All investigations on Ethrel have been confined to its use as a yield stimulant. The first of these experiments, started in Sri Lanka, has now been in operation for over three years. Although in some trials, with six applications a year and tapped at 100% intensity, there has been a trend towards a progressively declining yield response, the overall response has continued to remain well above the control plots. This indicates that with either reduced tapping intensities or with a lesser number of applications a year, it should be possible to maintain yield increase over a long period. The promising results recorded in one trial on the S/4, d/2, 50% and S/3, d/2, 67% tapping systems offer prospects of increased yields with greatly reduced tapping costs and conservation of bark with the use of Ethrel.

A trial comparing tapping at 150% intensity with Ethrel stimulation at 100% tapping intensity has indicated during the first two years, in 1972 and 1973, that higher yields could be obtained by high intensity tapping than by Ethrel stimulation. This indicates that Ethrel stimulation may not be an economic substitute for the present practice of progressively intensifying tapping before replanting. A contributory factor to the results observed may be the generally poor quality of bark present on trees that are due for replanting.

Application of Ethrel above the tapping cut has given results comparable to that of application below the tapping cut. No obvious deleterious effects have been observed so far on trees by applications above the cut. Commercial formulations containing 10% Ethrel have been more effective than similar formulations with 5% Ethrel.

Tapping

Tapping of clone RRIC 52 with the Jebong knife has given comparable results with that of the Michie-Golledge knife with reference to yield and the rate of bark consumption. With the use of the Jebong knife it should be possible to tap at a higher level than is possible with the Michie-Golledge knife. Opening of tapping cuts high on the panel may have advantages in the dry districts where the rate of bark renewal is relatively slow.

Daily tapping on a half spiral cut of clones RRIC 7, 45, 52 and PB 86 has resulted in lower yields per tapping in the third year. A similar declining trend in yields has been recorded for clone PB 86 tapped on full spiral fourth daily and double cut third daily systems. On high panel tapping, upward tapping on a 'V' cut has given higher yields than upward tapping on two quarter spiral cuts or ladder tapping downwards on a half spiral cut. However, the yields for all three tapping systems have declined in the second year.

Tapping of two clones RRIC 89 and PB 28/59 on S/2, d/2, 100% and S/2, d/3, 67% systems has resulted in higher yields per tapping for the S/2, d/3, 67% system, although the average yield per acre per year has been less due to the lesser number of tappings possible. However, tapping at a reduced intensity of 67% would be more economical as the difference in yield per acre for the two tapping systems has been relatively small.

Planting material

Clone RRIC 36 has proved to be the outstanding yielder in the fairly dry districts such as Matale and Kegalla, where the climatic conditions are unfavourable for the development of panel diseases. Under such conditions, clone PB 86 has remained the next best yielder.

Experimental plantings of clone RRIM 600 have been tapped for the first time in Sri Lanka in 1973. In one trial at Dartonfield, comparing RRIM 600 with five RRIC clones, RRIM 600 has given the highest yields in the first year. In another trial sited at Polgahawela, under relatively dry climatic conditions, RRIM 600 has again been the best yielder in the first year among four clones: RRIM 600, RRIC 36, 45 and 89.

Rainguards

Trials have shown that, with the use of polythene rainguards, when tapping is possible every day of the year, the yields were depressed, indicating that enforced rest periods due to rain interference of tapping can be beneficial. Investigations were next made on the use of a cheap rubber rainguard which permitted a reasonable increase in the number of tapping days, but where tapping is not possible during heavy rains. In Dartonfield, the use of these rainguards permitted 50 additional tapping days in 1973 resulting in a yield increase of 633.6 lb dry rubber for two tapping tasks.

Stock experiments

The first year yields of the oldest stock experiment, set down in 1966, and the growth statistics of other trials have indicated that seeds of recommended clones could be used for raising seedling stocks for budgrafting. These seeds could now replace the dwindling supplies of Tjir 1 seed.

Crown budding

Dieback in clone RRIM 701 has been observed in many estates. As these symptoms were observed on fairly mature trees, different methods of crown budding such trees have been tried out. None of these methods have proved to be entirely satisfactory so far.

Tissue culture

It has been possible to maintain cultures of tissue, obtained from various organs of *Hevea*, in artificial culture media, but it has so far not been possible to induce such tissues to differentiate into vegetative organs.

Physiology of disease resistance

A method has been devised, in collaboration with the Plant Pathology Department, screening of clones for disease resistance at an early stage. There are indications that a few clones such as RRIC 100, 102 and 103 have a resistance to Bark Rot.

Intercropping

In trials where Passion fruit and Bananas were interplanted among immature rubber, there has been no adverse effects on the growth of rubber.

Experimental plots of Maize, Sorghum, Soya bean, Cow pea and Tur Dhal were successfully grown in the wet zone during the North East Monsoon season. With correct timing of planting it should be possible to grow these crops in the wet zone.

DETAILED REVIEW

Staff

Mr. L. B. Chandrasekera, Head of Botany Department, Dr. R. Satchuthananthavale, Botanist, and Dr. (Mrs.) A. C. I. Samaranayake, Assistant Botanist, were on duty throughout the year. Dr. U. P. de S. Waidyanatha, Assistant Botanist, assumed duties on 11th December 1973 after successfully completing his post graduate studies. Mr. S. D. Wimalaratne, Research Student, continued his studies and was awarded the M.Sc. degree for his thesis on "Tapping of *Hevea*".

The Senior Technical Assistant, Mr. W. G. V. Fernando, Technical Assistants, Messrs. L. S. S. Pathiratne, I. Amarasinghe, J. G. de Mel, T. C. Weerasinghe, Miss C. W. Ranasinghe and Field Assistants, Messrs. D. R. Colonne, U. K. D. Lewis, D. A. Brahamana, W. T. Silva, S. Kodikara, R. B. Gunaratne and S. Wilbert were on duty throughout the year.

Visits

The technical staff of the Department paid advisory visits to estates and routine visits to experimental areas.

Publications

Annual Review of the Botany Department for 1972.

Recommended planting material—1973/74.
L. B. Chandrasekera, *RRIC Bulletin* **7**, 85-93.

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L. B. Chandrasekera, *Q. Jl. Rubb. Res. Inst. (Ceylon), Sri Lanka.* **50** Parts 1&2 (in press).
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The use of polythene film in budgrafting *Hevea* seedlings.
A. C. I. Samaranayake. *RRISL Bulletin* **8,** No. 1, 1973 (in press).

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Propagation of callus from *Hevea* anthers.
R. Satchuthananthavale and Z. E. Irugalbandara. *Q. Jl. Rubb. Res. Inst. Ceylon* **49,** 65-69.

Use of rainguards for rubber trees.
R. Satchuthananthavale. *Q. Jl. Rubb. Res. Int. (Ceylon) Sri Lanka.* **50,** Parts 1&2 (in press).
(Conf. Proc. International Rubber Conference—Sri Lanka—1973)

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(Conf. Proc. International Rubber Conference—Sri Lanka—1973)

Tissue culture techniques in *Hevea* breeding.
R. Satchuthananthavale. *RRISL Bulletin* **8,** Nos. 3 & 4, 1973 (in press).

Economic evaluation of tapping systems.
S. D. Wimalaratna. *Q. Jl. Rubb. Rs. Inst. (Ceylon) Sri Lanka.* **50,** Parts 1&2 (in press).
(Conf. Proc. International Rubber Conference—Sri Lanka—1973)

The development of tapping systems for rubber.
S. D. Wimalaratna *RRISL Bulletin* **8,** Nos. 3 & 4, 1973 (in press).

Yield stimulation experiments

Field Experiment No. 58—Ethrel stimulation experiment—Malaboda Estate :
(L. B. Chandrasekera & D. A. Brahmana)

A 10% solution of Ethrel in coconut oil is applied to a 3.8 cm (1.5 in.) strip of scraped bark below the tapping cut once in two months on panel C of clone PB 86 planted in 1946. Two tapping tasks were stimulated while two tasks serve as the controls. Tapping is on the S/2, d/2, 100% system and the yields are recorded on the basis of daily yield per tappers task. Additional fertilizer is applied to the stimulated plots.

The experiment commenced in March 1971 and the average yields recorded for 1971, 1972 and 1973 are given in Table 1.

TABLE I

YIELDS OF ETHREL STIMULATED BLOCKS COMPARED WITH CONTROL BLOCKS

	Stimulated		Control	
	Block I	Block IV	Block II	Block III
*Average yield/tapping (1971)				
lb	28.3	27.9	12.2	12.8
kg	12.84	12.66	5.53	5.81
*Average yield/tapping (1972)				
lb	21.1	19.4	10.2	11.1
kg	9.57	8.80	4.63	5.03
*Average yield/tapping (1973)				
lb	19.6	17.7	10.2	11.5
kg	8.89	8.03	4.63	5.22
Percentage Scrap (1973)	15.4	14.3	10.1	9.1

*Inclusive of scrap

The overall response to Ethrel stimulation appears to have declined further in the 3rd year, but still remains well above that in the control plots.

Field Experiment No. 63—Ethrel stimulation experiment. Eladuwa Estate :
(L. B. Chandrasekera & D. A. Brahamana)

Three concentrations of Ethrel, 5%, 10% and 15%, in coconut oil, are compared with an unstimulated control on panel C of clone PB 86, planted in 1952. Applications are made on a 3.8 cm (1.5 in.) strip of scraped bark, below the tapping cut, once every 2 months, and tapped on the S/2, d/2, 100% system. The experimental design is a randomized layout with each treatment replicated six times. Each plot consists of 50 trees. Extra fertilizer was applied to stimulated plots based on the increased yields recorded. The yields recorded for the first three years of the experiment are summarised in Table 2.

TABLE 2

COMPARATIVE YIELDS IN G/TREE/TAPPING OF PLOTS STIMULATED WITH ETHREL AT DIFFERENT CONCENTRATIONS

	Treatments			
	5% Ethrel	10% Ethrel	15% Ethrel	Control
*Average yield 1971	71.6	73.6	84.5	39.3
,, ,, 1972	53.9	58.2	59.7	34.8
,, ,, 1973	57.9	58.0	59.0	32.2
Percentage Brown Bast Partial dryness	5.2	6.0	5.1	2.4
Total ,,	4.2	5.9	3.8	2.6

*Yields inclusive of scrap

Field Experiment No. 67—Ethrel stimulation experiment—Dewalakande Estate ;
(L. B. Chandrasekera & D. A. Brahamana)

This experiment compares a progressive intensification of tapping, eight years before replanting, with Ethrel stimulation six times a year on the S/2, d/2, 100% tapping system. Ten acres of clone PB 86, planted in 1948, are divided into four tapping blocks and the two treatments are applied as follows :

1. Two blocks with 160 trees per block tapped alternate daily on a half spiral cut downwards and a quarter spiral cut upwards at an intensity of 150 per cent.

2. Two blocks with 218 trees per block tapped alternate daily on a half spiral cut downwards at an intensity of 100 per cent and stimulated with Ethrel once every two months.

The yields are recorded on the basis of daily yields per tapping block. The yield data recorded for the first two years are given in Table 3.

TABLE 3

YIELDS OF AREAS TAPPED AT HIGH INTENSITY COMPARED WITH THOSE STIMULATED WITH ETHREL

	No Ethrel Tapped at 150% Intensity	Ethrel stimulated Tapped at 100% Intensity
*Average yield/tapping		
1972— lb	17.6	18.1
kg	8.0	8.21
1973— lb	14.7	12.6
kg	6.66	5.74
Percentage Scrap (1973)	11.2	16.1
*Average yield—1972		
lb/ac.	1369.8	925.5
kg/ha	1535.3	1037.4
*Average yield—1973		
lb/ac.	1228.0	683.0
kg/ha	1376.4	765.5

*Inclusive of scrap

The yield decline in Ethrel stimulated plots has been greater in the 2nd year than the plots tapped at 150% intensity. The poor response to Ethrel stimulation may possibly be due to the poor bark conditions in rubber scheduled to be replanted shortly.

Field Experiment No. 68—Ethrel stimulation experiment—Eduragalla Estate:
(L. B. Chandrasekera & W. T. Silva)

A 10 per cent solution of Ethrel in coconut oil is applied to a 3.8 cm (1.5 in.) strip of scraped bark below the tapping cut once in two months on panel D of clone PB 86 planted in 1949. Three tappers' tasks are stimulated while three tasks serve as the controls. Yields are recorded on the basis of daily yields per task. The yields recorded during the first two years of the trial are given in Table 4.

TABLE 4

AVERAGE YIELD OF ETHREL STIMULATED BLOCKS AS COMPARED WITH CONTROL BLOCKS

	Stimulated	Unstimulated
*Average yield/tapping 1972		
lb	18.2	9.9
kg	8.27	4.50
*Average yield/tapping 1973		
lb	19.2	10.6
kg	8.70	4.82
*Average yield 1972		
lb/ac.	1581	858
kg/ha	1771.98	961.65
*Average yield 1973		
lb/ac.	1561	839
kg/ha	708.07	380.57

*Inclusive of scrap

No decline in yield response in stimulated plots has been recorded in the second year of this trial.

Field Experiment No. 73—1972 Ethrel stimulation experiment—Eladuwa Estate: (*R. Satchithanantbavale & I. Amarasinghe*)

Two experiments on the use of Ethrel as a yield stimulant, intiated in February and June 1972 on panel C. of clone PB 86 were continued. The details of these experiments are as follows :—

Experiment 1

The experiment is laid out on a randomised block design with three replications and a plot size of 25 trees. The treatments comprise the following :

(1) Tapped S/2, d/2, 100% — Untreated control.
(2) ,, ,, + 5% Ethrel 'ACP 70-90 I'
(3) ,, ,, + 10% ,, ,,
(4) ,, S/3, d/2, 67% — Untreated control
(5) ,, ,, + 5% Ethrel 'ACP 70-90 I'
(6) ,, ,, + 10% ,, ,,
(7) ,, S/4, d/2, 50% — Untreated control
(8) ,, ,, + 5% Ethrel 'ACP 70-90 I'
(9) ,, ,, + 10% ,, ,,

As in 1972, stimulation was restricted to two applications in 1973, one on 13-9-73 and another on 12-12-73. A fertilizer mixture composed of 20 parts sulphate of ammonia and 7 parts muriate of potash was applied to the experimental area at the rate of 2½ lb per tree. The mean yields recorded for the various treatments in 1973 are given in Table 5.

TABLE 5

AVERAGE YIELD IN G/TREE/TAPPING FOR 12 MONTHS WITH TWO STIMULANT APPLICATIONS PER YEAR

Treatment	Mean yield g/tree/tapping	Mean yield as % of S/2, d/2, 100% control
1. S/2, d/2, 100% Unstimulated control	28.31	100.00
2. ,, + 5% Ethrel (ACP 70-90 I)	39.68	140.16
3. ,, + 10% ,, ,,	56.67	200.18
4. S/3, d/2, 67% Unstimulated control	18.18	64.22
5. ,, + 5% Ethrel (ACP 70-90 I)	33.94	119.89
6. ,, + 10% ,, ,,	39.30	138.82
7. S/4, d/2, 50% Unstimulated control	19.12	67.54
8. ,, + 5% Ethrel (ACP 70-90 I)	28.56	100.88
9. ,, + 10% ,, ,,	32.42	114.52

Experiment 2

There are 12 treatments with 20 trees per plot randomised within a tapping task and replicated three times. The twelve treatments include six above cut and six below cut applications. The application below cut is on a 3.8 cm (1.5 in.) strip of scraped bark while the above cut application is on a one inch band on renewing bark. The treatments are applied on panel C of clone PB 86 planted in 1951.

Stimulation was restricted to two applications a year, one on 13-9-73 and another on 12-12-73. The fertilizer used were the same as in Experiment I. The details of treatments and yields recorded in the second year of the experiment in 1973 are given in Table 6.

TABLE 6

MEAN YIELD IN G/TREE/TAPPING FOR 12 MONTHS

WITH TWO STIMULANT APPLICATIONS

Treatment	Mean yield g/tree/ tapping	Mean yield as % of S/2, d/2, 100 % control
Above cut application		
1. S/2, d/2 100% Unstimulated control	37.35	100.00
2. ,, + Coconut oil	41.73	111.73
3. ,, + 5% Ethrel (70-90 I)	64.62	173.01
4. ,, + 10% ,, ,,	59.99	160.62
5. ,, 5% Ethrel (70-90 K) (with penetrant)	51.17	137.00
6. ,, + 10% ,,	58.97	157.88
Below cut application		
7. S/2, d/2, 100% Unstimulated control	40.19	100.00
8. ,, + Coconut oil	37.11	92.34
9. ,, + 5% Ethrel (70-90 I)	62.16	154.67
10. ,, + 10% ,, ,,	64.02	159.29
11. ,, + 5% Ethrel (70-90 K)	53.40	132.87
12. ,, + 10% ,, ,,	46.44	115.55

As observed in the previous year, 10% Ethrel generally gave a better yield response than 5% Ethrel. The results of Ethrel stimulation on one third and quarter spiral cuts appear to be promising. Above cut applications on a one inch band has been as effective as below cut application. Generally, in experimental formulation ACP 70-90 K, which contains a penetrant for application on unscraped bark below the tapping cut, has not given a good response as the commercially available formulation ACP 70-90 I, which is applied to scraped bark below the tapping cut. No obvious ill effects on bark were noted in above cut applications.

Tapping Experiments

Field Experiment No. 53—Tapping experiment, Dartonfield:
(L. B. Chandrasekera, S. D. Wimalaratne, L. S. S. Pathiratne & S. Kodikara)

The following tapping systems are applied to five-tree plots of each of clones RRIC 7, 45, 52 and PB 86 replicated eight times :

(1) S/2, d/2, 100%
(2) S/2, d/1, 200%
(3) S/1, d/4, 100%
(4) S/1, d/3, 133%
(5) 2S/2, d/4, 100%
(6) 2S/2, d/3, 133%

The data recorded during the third year of the experiment are given in Tables 7, 8 and 9.

TABLE 7

MEAN YIELD IN g.d.r./TREE/TAPPING IN 1973

Tapping system	RRIC 7	RRIC 45	RRIC 52	PB 86
S/2, d/2, 100%	26.6	24.1	25.5	28.5
S/2, d/1, 200%	18.2	20.0	20.8	27.3
S/1, d/4, 100%	36.8	51.7	45.9	58.5
S/1, d/3, 133%	28.3	36.9	43.3	60.3
2S/2, d/4, 100%	51.4	49.2	48.2	73.4
2S/2, d/3, 133%	29.1	49.8	50.9	56.8

TABLE 8

MEAN YIELD/TAPPING IN 1973 EXPRESSED AS A PERCENTAGE OF THE CONTROL (S/2, d/2, 100%)

Tapping system	RRIC 7	RRIC 45	RRIC 52	PB 86
S/2, d/2, 100%	100	100	100	100
S/2, d/1, 200%	68.6	83.0	81.5	95.8
S/1, d/4, 100%	138.7	214.6	179.9	205.7
S/1, d/3, 133%	106.7	133.1	167.9	211.6
2S/2, d/4, 100%	193.4	204.2	188.9	257.6
2S/2, d/3, 133%	109.7	206.7	199.5	199.4

TABLE 9

PERCENTAGE BROWN BAST IN 1973

Tapping system	RRIC 7	RRIC 45	RRIC 52	PB 86
S/2, d/2, 100%	2.0	5.4	—	3.8
S/2, d/1, 200%	5.0	15.7	10.5	3.7
S/1, d/4, 100%	15.3	16.2	2.6	3.3
S/1, d/3, 133%	17.0	8.6	5.2	3.3
2S/2, d/4, 100%	—	5.0	—	3.3
2S/2, d/3, 133%	10.5	2.6	2.5	3.3

As compared with half spiral alternate daily tapping, the daily tapped plots have shown a higher incidence of Brown Bast except for the two clones RRIC 7 and PB 86. However, all clones tapped daily have shown a declining yield trend. A similar declining yield trend has been recorded in clone PB 86 for full spiral fourth daily tapping and double three tapping at 133% intensity.

Field Experiment No. 54—Tapping experiment, Dartonfield: (*L. B. Chandrasekera & D. A. Brahamana*)

The tapping systems S/2, d/3, 67% and S/2, d/2, 100% are compared on each of two clones PB 28/59 and RRIC 89. The two clones were planted in 1961 at approximately 650 trees per clone and tapped on the S/2, d/2, 100% system since March 1968. In January 1971, each tapping system was introduced to approximately half the number of trees in each clone. The average yields recorded during the third year of the experiment are given in Table 10.

TABLE 10

COMPARATIVE YIELDS FOR TWO TAPPING SYSTEMS ON TWO CLONES IN 1973

	RRIC 89		PB 28/59	
	S/2, d/2, 100%	S/2, d/3, 67%	S/2, d/2, 100%	S/2, d/3, 67%
G dry rubber/tree/tapping	29.9	39.7	33.7	48.0
*Dry rubber/tree/year				
(a) lb	9.2	8.2	10.4	9.9
(b) kg	4.2	3.7	4.7	4.5
Theoretical yield (130 tree/ac.)				
(a) lb/ac.	1196.0	1066.0	1352.0	1287.0
(b) kg/ha	1340.5	1194.8	1515.4	1442.5

*Theoretical value for 280 tapping days

In both clones, tapping on S/2, d/3, 67% system has resulted in higher yields per tapping although the average yield per acre has been less due to the lesser number of tappings possible. However, tapping at a reduced intensity of 67% is likely to be more economical from the point of view of tapping costs as the difference in yield per acre for the two tapping systems have been relatively small.

Field Experiment No. 59—Tapping experiment—Vogan Group: (*R. Satchuthananthanthavale & I. Amarasinghe*)

This experiment compares two tapping knives, the Michie-Golledge and the Jebong on each of the tapping system S/2, d/2, 100% and 2S/2, d/4, 100% in clone RRIC 52. The data recorded for the past three years of this experiment are given in Table 11.

TABLE 11

RESULTS OF TAPPING WITH MICHIE-GOLLEDGE AND JEBONG TAPPING KNIVES

Tapping Knife	Year	g/tree/tapping		Mean thickness of bark shavings in mm
		S/3, d/2, 100%	2S/2, d/4, 100%	
M-G	1971	17.86	58.42	1.6
J	,,	17.04	61.90	1.5
M-G	1972	13.9	43.80	2.0
J	,,	13.7	47.10	2.0
M-G	1973	19.48	59.63	0.77
J	,,	19.02	63.30	0.72
Mean girth increment				
1971/72		3.50cm	2.50 cm	
1972/73		4.96 cm	3.11 cm	

Over the three year period, tapping with the Jebong knife has compared well with that of the Michie-Golledge knife in terms of yield and rate of bark consumption. The use of the Jebong knife appears to have an advantage where tapping cuts are opened above the recommended maximum height of 42" above the graft union on budgrafts. Tapping on double cuts have depressed the rate of girthing of trees to a greater degree as compared with the S/2, d/2, 100% tapping system.

Field Experiment No. 70—Tapping experiment—Dartonfield: (*L. B. Chandrasekera & S. D. Wimalaratne*)

This is a small scale trial where each of the following treatments are applied to five trees of clone RRIC 52 planted in 1955.

(A) Ladder tapping downwards on a half spiral cut marked at 100 in. above ground level and tapped alternate daily.

(B) Two quarter spiral cuts marked immediately above panel A on virgin bark and tapped upwards alternate daily.

(C) A 'V' cut marked immediately above panel A on virgin bark and tapped upwards alternate daily.

The average yields recorded during the first two years of the experiment are given in Table 12.

TABLE 12

AVERAGE YIELD IN G/TREE/TAPPING FOR THE VARIOUS TAPPING SYSTEMS

Year	Treatments		
	A	B	C
1972	33.9	30.8	40.0
1973	26.4	28.3	31.3

The yields of all three tapping systems have declined in the second year. Among the three treatments, upwards tapping on a 'V' cut has recorded the highest yields in both years.

Field Experiment No. 74—Tapping experiment, Nivitigalakele: (*L.B. Chandrasekera & W.T. Silva*)

This experiment consists of the following treatments applied to 50-tree plots replicated four times.

(1) Tapped S/2, d/2, 100% with an annual change over of tapping panels after the 3rd year.

(2) Tapped S/2, d/2, 100% down to the graft union before changing over of panels.

(3) Tapped S/2, d/1, 200% down to the graft union before changing over of panels.

Clone RRIC 45 planted in 1965 was first tapped on the S/2, d/2, 100% in March 1972. The experiment commenced one year later in March 1973. Plots receiving treatment 1 are therefore still being tapped on panel A. The yields recorded during the first year in 1973 are summarised in Table 13.

TABLE 13

COMPARATIVE YIELDS IN 1973 FOR VARIOUS TAPPING SYSTEMS

	Treatments		
	S/2, d/2, 100%	S/2, d/2, 100%	S/2, d/1, 200%
g.d.r/tree/tapping	39.1	38.1	35.1
*lb d.r/tree/year	12.1	11.8	21.6
*kg d.r/tree/year	5.49	5.35	9.80

*For 280 tapping days

Daily tapping on a half spiral cut has not resulted in drying of tapping cuts in the first year. However the yields per tapping have been depressed.

Clone evaluation trials

Field Experiment No. 7—1954 Clone trial, Nivitigalakele: (*L. B. Chandrasekera & W. T. Silva*)

All clones are planted in 40-tree plots replicated five times. The yields of the best selections IRCI 7 and PB 28/59 are compared with clone RRIM 501 in Table 14.

TABLE 14

COMPARATIVE YIELDS OF IRCI 7 AND PB 28/59 WITH RRIM 501 AS CONTROL

YIELD OF DRY RUBBER PER TREE PER YEAR (140 TAPPINGS)
(TAPPED S/2, d/2, 100% FROM MARCH 1960)

Year of tapping	IRCI 7		PB 28/59		RRIM 501	
	lb	kg	lb	kg	lb	kg
1961	10.2	4.63	14.2	6.44	9.7	4.40
1962	9.2	4.17	15.3	6.94	11.9	5.40
1963	8.8	3.99	14.2	6.44	12.6	5.72
1964	9.5	4.31	15.1	6.85	13.6	6.17
1965	10.6	4.81	16.3	7.39	13.1	5.94
1966	13.1	5.94	19.5	8.85	13.9	6.31
1967	15.4	6.99	18.6	8.44	13.3	6.03
1968	14.8	6.71	17.2	7.80	12.5	5.67
1969	12.7	5.76	15.0	6.80	11.1	5.03
1970	10.9	4.94	13.7	6.21	10.0	4.54
1971	11.2	5.08	12.3	5.58	10.7	4.85
1972	11.3	5.13	12.0	5.44	10.0	4.54
1973	16.2	7.35	15.5	7.03	10.6	4.81
Brown Bast cases	7		—		2	
Wind damage ,,	—		4		5	
Mean girth, 1973						
in.	32.6		33.9		29.8	
cm	82.8		86.2		75.6	

The yields from 1970 onwards are on bark of first renewal.

The two clones IRCI 7 and PB 28/59 are now recommended for moderate scale planting in Sri Lanka.

Field Experiment No. 14—1955 Large scale clone trial, Hedigalla: (L. B. Chandrasekera & S. Wilbert)

All clones are planted in monoclonal blocks of 750 trees per clone. Test tapping results of the two final selections are given in Table 15.

TABLE 15

YIELD OF DRY RUBBER PER TREE PER YEAR
(140 TAPPINGS)—TAPPED s/2, d/2, 100%

Year of tapping	RRIC 13 lb	RRIC 13 kg	RRIC 50 lb.	RRIC 50 kg
1962	9.4	4.26	5.5	2.49
1963	10.2	4.63	10.5	4.63
1964	10.7	4.85	11.9	5.40
1965	14.0	6.35	12.4	5.62
1966	14.9	6.76	18.4	8.35
1967	16.7	7.58	18.1	8.21
1968	18.2	8.26	15.4	6.99
1969	15.2	6.89	15.4	6.99
1970	19.2	8.71	15.3	6.97
1971	17.3	7.84	15.8	7.17
1972	14.8	6.71	14.0	6.35
1973	15.1	6.85	14.0	6.35
% Brown Bast trees				
1972	3		5	
1973	negligible		negligible	

Both clones are vigorous growers with high initial yields. Most Brown Bast trees have recovered after a rest period.

Field Experiment No. 16—1956 Clone trial, Hedigalla : (*L. B. Chandrasekera & S. Wilbert*)

All clones are planted in monoclonal blocks of 300 trees per clone. The yields of the best selections are given in Table 16.

TABLE 16

YIELD OF DRY RUBBER PER TREE PER YEAR FOR 140 TAPPINGS. TAPPED ON s/2, d/2, 100% FROM 1963

Clone		Yield									
		1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
IRCI 9	lb	7.3	9.8	12.0	11.3	12.0	10.4	14.2	13.0	11.9	13.5
	kg	3.31	4.45	5.44	5.13	5.44	4.72	6.44	5.90	5.40	6.12
*RRIC 48	lb	8.0	8.8	12.3	12.8	10.8	11.4	12.3	10.7	8.3	12.6
	kg	3.83	3.99	5.58	5.81	4.90	5.17	5.58	4.85	3.76	5.72
PR 252	lb	7.6	10.9	10.2	10.6	10.0	8.6	14.4	15.3	12.0	10.4
	kg	3.45	4.94	4.63	4.81	4.54	3.90	6.53	6.94	5.44	4.72
PB 86	lb	6.4	7.1	8.7	9.1	8.0	8.3	11.2	12.8	11.1	10.0
	kg	2.90	3.22	3.95	4.13	3.63	3.76	5.08	5.81	5.03	4.54

*Tapped in 1964

Field Experiment No. 19—1962 Clone trial, Nivitigalakele : (*L.B. Chandrasekera & W.T. Silva*)

All clones are planted at 150 trees per clone. The test tapping results for the first five years are summarised in Table 17.

TABLE 17

YIELD OF DRY RUBBER PER TREE PER YEAR (140 TAPPING)
(TAPPED S/2, d/2, 100%)

Clone	Average girth 1973		Yield					
	in.	cm		1969	1970	1971	1972	1973
RRIC 5	27.6	70.0	lb	7.8	9.7	12.2	12.6	17.3
			kg	3.54	4.40	5.53	5.72	7.85
RRIC 39	27.1	68.9	lb	8.7	8.7	10.3	11.4	15.9
			kg	3.95	3.95	4.67	5.17	7.21
RRIC 93	24.6	62.4	lb	10.4	8.7	12.3	12.7	14.7
			kg	4.72	3.95	5.58	5.76	6.67
RRIC 86	25.3	64.2	lb	8.1	6.3	8.8	10.4	12.7
			kg	3.67	2.86	3.99	4.72	5.76
RRIC 94	22.7	57.6	lb.	13.8	12.0	10.3	11.7	12.4
			kg	6.26	5.44	4.67	5.31	5.62
RRIM 628	24.2	61.4	lb	16.0	15.1	11.3	13.4	12.3
			kg	7.26	6.85	5.13	6.08	5.58
IAN 45-717	28.3	71.8	lb	9.0	8.6	7.6	8.1	12.0
			kg	4.08	3.90	3.45	3.67	5.44
RRIC 91	30.2	76.6	lb	7.8	9.1	9.0	10.4	11.7
			kg	3.54	4.13	4.08	4.72	5.31
RRIM 623	25.8	65.6	lb	10.3	8.7	9.6	10.3	10.9
			kg	4.67	3.95	4.35	4.67	4.94
RRIC 95	32.7	83.1	lb	10.6	8.1	9.2	9.7	10.3
			kg	4.81	3.67	4.17	4.40	4.67
PB 86	26.7	67.8	lb.	9.2	8.4	8.2	8.8	10.6
			kg	4.17	3.81	3.72	3.99	4.81
RRIC 92	25.2	64.0	lb	10.7	11.2	10.1	10.7	9.0
			kg	4.85	5.08	4.58	4.85	4.08

Field Experiment No. 21—1964 Yield trial, Nivitigalakele: (L.B. Chandrasekera & W.T. Silva)

This trial compares the yields of four clones RRIC 41, 45, 52 and 86. Each clone is planted in 106-tree plots replicated three times. Test tapping results during the first four years are given in Table 18.

TABLE 18

YIELD OF DRY RUBBER/TREE/YEAR (140 TAPPINGS)
OF FOUR RRIC CLONES OVER FOUR YEARS
(TAPPED S/2, d/2, 100% FROM 1970)

Clone	No. of trees tapped 1973	Average girth 1973		Yield			
		in.	cm	1970	1971	1972	1973
RRIC 45	222	25.0	63.6	lb 8.2 kg 3.72	10.2 4.63	11.8 5.35	13.7 6.21
RRIC 41	202-204	25.9	65.7	lb 8.4 kg 3.81	9.5 4.31	11.8 5.35	13.1 5.94
RRIC 52	259-266	30.2	76.7	lb 5.3 kg 2.40	6.7 3.04	7.6 3.45	9.9 4.49
RRIC 86	195-202	25.0	63.5	lb 6.5 kg 2.95	8.0 3.63	9.0 4.08	9.9 4.49

Clone RRIC 41 is susceptible to wind damage and is no longer recommended.

Field Experiment No. 23—1965 Clone trial—Dartonfield: (L.B. Chandrasekera & D. R. Colonne)

Clones RRIC 45, 88, 89, 90, 91 and RRIM 600 are planted in 50-tree plots replicated three times. Tapping commenced in 1973 and the average yields recorded for the various clones in the first year are given in Table 19.

TABLE 19

YIELD IN GRAMMES DRY RUBBER PER TREE PER TAPPING
(TAPPED S/2, d/2, 100% FROM JUNE 1973)

Clone	Trees tapped 1973	Girth 1973		Yield g/tree/tapping
		in.	cm	
RRIM 600	107	21.7	55.1	43.5
RRIC 90	84	19.9	50.5	43.1
RRIC 89	88	20.9	53.1	34.0
RRIC 45	103	22.0	55.9	31.7
RRIC 91	101	24.9	63.2	27.4
RRIC 88	125/127	23.9	60.7	21.6

Clone RRIM 600 has recorded the highest yields in this trial.

Field Experiment No. 25—1957 Clone trial—Estate A—Kalutara District :
(L. B. Chandrasekera & I. H. Stephen)

All clones are planted in plots of 300 trees per clone. The yields of the best selection IRCI 2 is compared with PB 86 in Table 20.

TABLE 20

YIELD OF DRY RUBBER PER TREE PER YEAR (140 TAPPINGS)
OF CLONE IRCI 2, COMPARED TO CLONE PB 86
(TAPPED S/2, d/2, 100% FROM MARCH 1964)

Clone		Yield								
		1965	1966	1967	1968	1969	1970	1971	1972	1973
IRCI 2	lb	8.4	8.3	12.4	12.6	14.8	14.7	17.7	14.4	14.1
	kg	3.81	3.77	5.63	5.72	6.72	6.67	8.04	6.53	6.38
PB 86	lb	5.3	5.1	7.2	8.0	8.4	8.2	11.0	10.7	10.7
	kg	2.41	2.32	3.27	3.63	3.81	3.72	4.99	4.85	4.87

Field Experiment No. 26—1957 Clone trial—Estate B—Kalutara District :
(L. B. Chandrasekera & I. H. Stephen)

This trial is planted in two blocks of 10 acres and 20 acres in plots of 300 trees per clone. Test tapping results of the best selections are compared with clone PB 86 in Tables 21 and 22.

TABLE 21

YIELD OF DRY RUBBER PER TREE PER YEAR (140 TAPPINGS)
OF RRIM 623 AND WR 101, COMPARED WITH PB 86
(TAPPED ON S/2, d/2, 100% FROM MARCH 1964)

Clone		Yield								
		1965	1966	1967	1968	1969	1970	1971	1972	1973
RRIM623	lb	10.3	12.1	9.9	12.0	11.9	12.1	12.3	10.6	11.0
	kg	4.68	5.49	4.49	5.45	5.45	5.49	5.58	4.81	4.98
WR 101*	lb	5.9	8.7	11.4	10.0	10.2	9.2	9.4	11.8	12.2
	kg	2.68	3.95	5.18	4.54	4.63	4.18	4.27	5.35	5.52
PB 86	lb	6.1	7.2	7.9	8.4	8.5	8.5	9.7	8.9	10.7
	kg	2.77	3.27	3.95	3.81	3.86	3.86	4.40	4.04	4.84

*The clone WR 101 is found to be sensitive to Brown Bast on the S/2, d/2, 100% tapping system.

TABLE 22

YIELD OF DRY RUBBER PER TREE PER YEAR (140 TAPPINGS) OF CLONE AVROS 1734, AS COMPARED WITH CLONE PB 86 (TAPPED FROM APRIL 1964 ON S/2, d/2, 100%)

Clone		Yield								
		1965	1966	1967	1968	1969	1970	1971	1972	1973
AVROS 1734	lb	12.5	12.3	11.3	14.4	16.4	12.7	11.8	9.3	10.4
	kg	5.68	5.58	5.13	6.54	7.45	5.77	5.36	4.22	4.70
PB 86	kg	7.3	9.0	10.4	9.9	8.7	9.5	11.7	11.9	11.5
	lb	3.31	4.09	4.72	4.49	3.95	4.31	5.31	5.40	5.22

Field Experiment No. 27—1958 Clone trial—Estate B—*Kalutara District*
(L. B. Chandrasekera & I. H. Stephen)

All clones are planted in plots of 300 trees per clone. Test tapping results of the better selections are given in Table 23.

TABLE 23

YIELD OF DRY RUBBER PER TREE PER YEAR (140 TAPPINGS) OF THE BEST YIELDING CLONES—(TAPPED S/2, d/2, 100% FROM APRIL 1965)

Clone	Yield							
	1966	1967	1968	1969	1970	1971	1972	1973
IRCI 2	lb 6.7	8.1	8.6	7.4	12.0	13.3	11.8	13.1
	kg 3.04	3.68	3.90	3.36	5.45	6.04	5.35	5.94
RRIC 36	lb 8.6	8.5	9.1	9.4	13.7	12.6	13.0	11.3
	kg 3.90	3.06	4.13	4.27	6.22	5.72	5.90	5.13
RRIC 55*	lb 10.1	9.8	8.5	7.8	9.5	9.6	8.8	10.5
	kg 4.59	4.55	3.86	3.54	4.31	4.36	4.00	4.77
PB 86	lb 7.1	7.1	7.0	7.1	8.1	9.6	10.8	11.0
	kg 3.22	3.22	3.18	3.22	3.68	4.36	4.90	4.99
RRIC 45	lb 6.8	8.7	8.7	7.6	6.9	7.2	8.1	9.1
	kg 3.09	3.95	3.95	3.45	3.13	3.27	3.67	4.11
RRIM 605	lb 6.9	8.6	7.4	7.4	7.3	6.4	8.1	9.9
	kg 3.13	3.90	3.36	3.36	3.31	2.91	3.67	4.47
RRIC 52	lb 4.6	4.7	4.9	5.7	6.0	5.6	6.1	6.2
	kg 2.09	2.13	2.22	2.58	27.2	2.54	2.77	2.82

*The clone RRIC 55 is susceptible to *Oidium* leaf disease

Field Experiment No. 29—1964 Yield trial, Salawa Estate:
(L. B. Chandrasekera & U. K. D. Lewis)

Clones Nab 15, RRIC 45, 86 and 88 are planted in 150-tree plots replicated three times. Comparative yields of the four clones in the first three years of tapping are given in Table 24.

TABLE 24

YIELD OF DRY RUBBER PER TREE PER YEAR (140 TAPPINGS)
(TAPPED S/2, d/2, 100% FROM 1971)

Clone	Yield			
		1971	1972	1973
Nab 15	lb	7.2	10.2	12.6
	kg	3.27	4.60	5.71
RRIC 45	lb	6.6	8.9	17.3
	kg	3.00	4.02	7.85
RRIC 86	lb	5.4	7.1	8.9
	kg	2.45	3.23	4.04
RRIC 88*	lb	4.9	5.8	8.0
	kg	2.22	2.63	3.90

*Clone RRIC 88 is susceptible to wind damage.

Field Experiment No. 38—1966 Yield trial—Kiribatgalla Group :
(L. B. Chandrasekera & U. K. D. Lewis)

Clones RRIC 45, 88, 91 and AVROS 427 are planted in 134-tree plots replicated three times. Test tapping results for the first two years in tapping are given in Table 25.

TABLE 25

YIELD OF DRY RUBBER PER TREE PER YEAR
(TAPPED S/2, d/2, 100% FROM MARCH 1972)

Clone	Yield			g/tree/tapping
		1972	1973	1973
AVROS 427	lb	11.3	10.8	34.9
	kg	5.14	4.90	
RRIC 45	lb	6.9	7.7	25.1
	kg	3.14	3.49	
RRIC 91	lb	6.4	7.5	24.3
	kg	2.92	3.40	
RRIC 88	lb	5.9	6.0	19.6
	kg	2.69	2.72	

Field Experiment No. 41—1966 Yield trial—Yatawatta Estate:
(L. B. Chandrasekera & D. R. Colonne)

This experiment is sited in the Matale district under relatively dry conditions. Clones RRIC 36, 41, 86 and PB 86 are planted in 265-tree plots replicated three times. Tapping commenced in 1973 and the test tapping results for the first year are given in Table 26.

TABLE 26

YIELD IN GRAMMES DRY RUBBER PER TREE PER TAPPING
(TAPPED S/2, d/3, 67% FROM MARCH 1973)

Clone	Trees tapped 1973	Girth 1973		Yield g/tree/tapping
		in.	cm	
RRIC 36	421	18.7	47.5	27.3
PB 86	352	18.8	47.8	17.3
RRIC 41	530	20.1	51.0	15.7
RRIC 86	401	18.5	47.1	14.1

Clone RRIC 36 is yielding very well in this district. There have been no instances of panel diseases so far.

Field Experiment No. 44—1967 Yield trial, Udapolla Group, Polgahawela :
(L. B. Chandrasekera & D. R. Colonne)

Clones RRIC 36, 45, 89 and RRIM 600 are planted in 135-tree plots replicated three times. Tapping commenced in August 1973 and the test tapping results for the first five months are given in Table 27.

TABLE 27

YIELD IN GRAMMES DRY RUBBER/TREE/TAPPING
(TAPPED S/2, d/2, 100% FROM AUGUST 1973)

Clone	Trees tapped 1973	Girth 1973		Yield
		in.	cm	
RRIM 600	292	21.3	54.1	31.5
RRIC 36	255	20.0	50.8	31.1
RRIC 89	261	20.6	52.3	28.2
RRIC 45	247	20.6	52.3	21.4

Highest yields have been recorded for the two clones RRIM 600 and RRIC 36.

Field Experiment No. 51—1966 Yield trial, Dalkeith Group : (L. B. Chandrasekera & U. K. D. Lewis)

Clones RRIC 45, 75, 88 and 89 are planted in 150-tree plots replicated three times. Tapping commenced in June 1973 and the test tapping results for the first seven months are given in Table 28.

TABLE 28

YIELD IN GRAMMES DRY RUBBER PER TREE PER TAPPING
(TAPPED S/2, d/2, 100% FROM JUNE 1973)

Clones	Trees tapped 1973	Girth 1973		Yield
		in.	cm	
RRIC 75	154	19.0	48.3	21.2
RRIC 45	95	16.7	42.4	20.7
RRIC 89	110	17.2	43.7	20.4
RRIC 88	258	19.3	49.0	14.5

Spacing trials

Field Experiment No. 24—Spacing trial, Kuruwita: (L. B. Chandrasekera & J. D. Karunatilleke)

Each of the clones RRIC 41, 45 and 52 are planted in 150-tree plots at spacings of 8' × 30' and 12' × 20' and replicated three times. Tapping commenced in 1971. The average yields and girths of clones in 1973 are given in Table 29.

TABLE 29

YIELD IN g. DRY RUBBER PER TREE PER TAPPING IN THE THIRD YEAR

Clone	Planting spacing 8'x30'			Planting spacing 12'x20'		
	Girth 1973		Yield 1973 g	Girth 1973		Yield 1973 g
	in.	cm		in.	cm	
RRIC 45	20.4	51.7	41.8	20.7	52.6	48.1
RRIC 41	22.9	58.2	38.1	23.3	59.1	35.1
RRIC 52	25.0	63.5	32.9	25.0	63.6	25.6
Mean	22.8	57.8	37.6	23.0	58.4	36.3

The two spacings have so far had no significant effects on either the rate of growth or yields of the three clones.

Immature areas

The following are the statistics of immature areas :

Field expt.	Year planted	Extent		Clones	Points per Clone	Average girth 1973	
		ac.	ha			in.	cm
37	1966	10	4.05	RRIC 5	(150x3)=450	21.1	53.7
				,, 45	,,	16.8	42.6
				Nab 15	,,	18.8	47.7
				RRIM 701	,,	15.3	38.9
45	1967	10	4.05	RRIC 36	(175x3)=525	12.2	30.9
				,, 45	,,	10.3	26.1
				,, 89	,,	11.5	29.1
				PB 86	,,	12.7	32.3
48	1969	10	4.05	RRIC 45	(135x3)=405	12.5	31.8
				,, 100	,,	11.5	29.2
				,, 101	,,	13.1	33.2
				AVROS 1734	,,	12.0	30.5
49	1969	27	10.93	RRIC 45	(165x3)=495	12.6	32.1
				,, 88	,,	11.2	28.4
				,, 89	,,	13.3	33.9
				,, 90	,,	10.7	27.3
				,, 91	,,	14.0	35.6
				,, 100	,,	11.1	28.2
				,, 101	,,	13.4	34.0
				RRIM 600	,,	13.2	33.5
				PB 86	,,	12.0	30.4
64	1971	35	14.16	RRIC 13	(300x3)=900		
				,, 45	,,		
				,, 48	,,		
				,, 50	,,		
				PR 252	,,		
				IRCI 2	,,		
				AVROS 1734	,,		
69	1970	10	4.05	RRIC 100	(150x3)=450		
				,, 101	,,	11.4	29.0
				AVROS 1734	,,	11.4	29.0
				RRIC 45	,,	10.8	27.4
75	1972	10	4.05	RRIC 13	(75x6)=450	10.0	25.4
				,, 48	,,		
				,, 103	,,		
				PB 86	,,		
77	1973	10	4.05	RRIC 102	(150x3)=450		
				,, 103	,,		
				IRCI 9	,,		
				PB 86	,,		

Intercropping trials

Field Experiment No. 71—1972 Intercropping trial—Farnham Estate :
(L. B. Chandrasekera & U. K. D. Lewis)

This trial consists of two sections, both planted with clone RRIM 600 in 1971 at a spacing of 8'x30'.

(a) Twelve plots with a plot size of approximately 90'x120' were selected at random and interplanted with passion fruit seedlings in July 1972. Twelve similar plots serve as the controls. A single row of passion fruit was planted centrally between the rubber rows at a spacing of 25 ft within each row. The creepers are trained on to a single strand of barbed wire fixed to wooden poste approximately 6 ft above ground level. The passion fruit creepers were regularly fertilized.

(b) Twelve plots with a plot size of approximately 90'x120' were selected at random and interplanted with bananas in June 1972. Twelve similar plots with rubber only serve as the controls. A single row of bananas was planted centrally between the rubber rows at a spacing of 12 ft within the row. Tho bananas were fertilized regularly.

At the end of 1½ years in 1973 the average girth of rubber in the two areas is given below :

TABLE 30

AVERAGE GIRTH OF RUBBER IN INTERCROPPING TRIALS

Crop Interplanted	Interplanted plots		Control plots	
	in.	cm	in.	cm
Bananas	6.3	15.9	6.1	15.5
Passion fruit	6.3	16.0	6.0	15.2

The interplanting of bananas and passion fruit has not depressed the growth of rubber during the 18 month period.

Field Experiment No. 78—Intercropping trial—Yatawatta Estate :
(L. B. Chandrasekera & D. R. Colonne)

Clone RRIC 45 was planted at spacings of 8'x30' in October 1973. In the same year the area was divided into six blocks each with 250 rubber planting points. Three blocks selected at random were interplanted with bananas, while the balance three blocks serve as the control. The bananas were planted centrally between each pair of rubber rows spaced 12 ft along the row.

Field Experiment No. 79—1973 Intercropping trial—Yatawatta Estate :
(L. B. Chandrasekera & D. R. Colonne)

The purpose of this trial is to investigate the possibility of establishing cacao under mature rubber in the fairly dry rubber planting districts. Clone PB 86 is planted at spacings of 8'x30'. Three tappers' tasks of approximately 250 trees per task selected at random were interplanted with cacao seedlings in November 1973, while three tasks serve as the controls. A single row of cacao seedlings were planted centrally between each pair of rubber rows spaced 7 ft along the row.

Grains and pulses

Experimental plots of the following crops were planted at Dartonfield in October November 1973 in order to evaluate their fertilizer requirements, timing of planting and their suitability for growing in the wet zone.

Green gram, cow pea, soya bean, tur dhal, maize and sorghum.

Preliminary observation have indicated their suitability for planting in the wet zone during the October/November planting season. The dry weather during the months of January and February provide adequate sunshine for ripening of grains.

Stock experiments

Field Experiment No. 34—1966 Small scale stock experiment—Nivitigalkele :
(A. C. I. Samaranayake & W. T. Silva)

In this trial, stock seedlings of eight clones are tested for their suitability as rootstocks, the scion clone being PB 86. The trees have been in tapping since March 1972 on the S/2, d/2, 100% tapping system. The mean girth of trees and the average yields recorded for the various rootstocks in 1973 are summarised in Table 31.

TABLE 31

MEAN GIRTH AND AVERAGE YIELDS IN g DRY RUBBER PER TREE PER TAPPING

Rootstock	Scion	Mean girth		Yield
		cm	in.	
Tjir 1	PB 86	30.8	12.1	58.3
H. spruceana	,,	31.4	12.4	51.3
RRIC 7	,,	36.0	14.2	66.8
,, 41	,,	31.7	12.5	63.1
,, 52	,,	35.1	13.8	63.1
,, 86	,,	32.8	12.9	63.6
,, 88	,,	32.5	12.8	64.9
,, 89	,,	35.2	13.9	60.6

The yields recorded for all rootstocks of recommended clones compared very favourably with those of clone Tjir 1.

Field Experiment No. 47—1968 Small scale stock experiment, Nivitigalakele :
(A. C. I. Samaranayake & L. S. S. Pathiratne)

In this trial, stock seedlings of clone RRIC 7, 41, 52, 86, Glen 1, Wagga 6278 and Tjir 1 are compared, the scion clone being RRIC 45. The average girth of budgrafts at 5½ years of age are given in Table 32.

TABLE 32

AVERAGE GIRTH OF RRIC 45 BUDDINGS

Rootstock	Mean girth	
	cm	in.
RRIC 7	46.9	18.5
,, 41	44.6	17.6
,, 52	45.1	17.8
,, 86	44.6	17.6
Glen 1	46.3	18.2
Wagga 6278	42.4	16.7
Tjir1	43.0	16.9

Field Experiment No. 61—1969 Stock experiment, Nivitigalakele :
(A. C. I. Samaranayake & L. S. S. Pathiratne)

The clone RRIC 45 has been budded on seedling stocks of clone RRIC 5, 41, 52, 89, RRIM 623 and Tjir 1. The mean girths of budgrafts at 4½ years of age are given in Table 33.

TABLE 33

MEAN GIRTH OF RRIC 45 BUDDINGS

Rootstock	Mean girth	
	cm	in.
RRIC 5	35.2	13.9
,, 41	34.9	13.7
,, 52	33.6	13.2
,, 89	33.1	13.0
RRIM 623	34.6	13.6
Tjir 1	31.7	12.5

The growth of clone RRIC 45 on all stocks tested has been better than the control Tjir 1. In this trial a study of the effects of different clonal rootstocks on uptake of nutrients, by analysis of leaf samples, is being carried out in collaboration with the Soils Chemistry Department.

Field Experiment No. 62—1971 Stock experiment, Nivitigalakele :
(*A. C. I. Samaranayake & L. S. S. Pathiratne*)

Seedling stocks of clones RRIC 5, 7, 36, 45, 52, RRIM 623, AVROS 427, Glen 1, Tjir 1, PB 86, TR 1406, WR 101 and Wagga 6278 were budded with clone RRIC 45. Mean girths of budgrafts at 2½ years of age are given in Table 34.

TABLE 34

MEAN GIRTHS OF RRIC 45 BUDDINGS

Rootstock	Mean girth	
	cm	in.
RRIC 5	17.3	6.8
,, 7	17.3	6.8
,, 36	17.1	6.7
,, 45	15.6	6.7
,, 52	17.4	6.9
RRIM 623	16.5	6.5
AVROS 427	17.9	7.0
Glen 1	15.9	6.3
Tjir 1	16.6	6.5
PB 86	16.7	6.6
TR 1406	15.1	5.9
WR 101	16.8	6.6
Wagga 6278	16.9	6.7

Other investigations

Rainguards: (*R. Satchuthananthavale, G. de Mel & C. Weerasinghe*)

Field trials on the use of rainguards conducted at Dartonfield Estate on two tapping blocks have once again confirmed that the gutter type of rubber rainguard could be used to minimise losses of tapping days as well as increase normal tapping days. For the year 1973 the rainguard blocks had 50 days additional tapping and 54 more days of normal tapping than the control blocks. This resulted in an increased crop intake of 633.6 lb dry rubber for the two tapping tasks. No adverse effects such as a higher incidence of dry cuts or panel diseases were observed. The tapping data for the various months of the year are given in Table 35.

TABLE 35

RAINGUARD TRIAL—DARTONFIELD 1955/56 CLEARING
CLONES GT 1 AND AV 385

TAPPING AND CROP RECORD—FEBRUARY 9TH TO DECEMBER 31ST

Month	Possible Tapping Days	CONTROL				RAINGUARD					
		Normal Tapping	Late Tapping	Rain Interference	Rain No Tapping	Normal Tapping	Late Tapping	Rain Interference	Rain No Tapping	Additional Tapping	Additional Crop lb
Feb. 9-28	20	18	2	—	—	20	—	—	—	—	—
Mar.	27	18	9	—	—	25	2	—	—	—	—
Apr.	27	16	7	—	4	25	2	—	—	4	41.6
May	28	10	6	1	11	17	9	—	2	9	103.53
June	30	11	1	—	18	13	8	—	9	9	119.12
July	31	15	5	1	10	18	8	—	5	5	78.17
Aug.	31	19	5	2	5	25	6	—	—	5	71.22
Sept.	30	21	4	—	5	26	1	—	3	2	20.05
Oct.	30	7	9	—	14	16	10	1	3	11	133.87
Nov.	30	17	4	—	9	17	8	1	4	5	66.02
Dec.	31	20	10	—	1	24	6	—	1	—	—
Total	315	172	62	4	77	226	60	2	27	50	633.58

Number of additional tapping days for rainguard task = 50

Number of additional normal tapping days for rainguard tasks = 54

Extra crop for rainguard tasks = 633.58 lb

Bacterial coagulation of latex (R. Satchuthananthavale in collaboration with V. Satchuthananthavale, Plant Pathologist, & R. Tharmalingam, Assistant Rubber Chemist)

Bacterial cultures used for the coagulation of latex were maintained. A bench model 'fermentator' for the mass culture of bacteria in coconut water medium was made and initial trials carried out.

Tissue culture : (R. Satchuthananthavale, G. de Mel & C. Weerasinghe)

Experiments were carried out to establish callus cultures from young stem sections. Callus cultures established from young stem sections of mature plants exhibited very slow growth in contrast to callus cultures from anthers which were fast growing.

Physiology of disease resistance: (R. Satchuthananthavale in collaboration with V. Satchuthananthavale—Plant Pathologist)

Studies on phytoalexins were continued. A method was devised for the screening of clones for disease resistance/susceptibility to *Phytophthora* Bark Rot. Field trials on artificial induction of Bark Rot by this method in different *Hevea* cultivars were successful. In such trials, a few clones such as RRIC 100, 102 and 103 have indicated a resistance reaction. These should form valuable supplementary data in recommending planting material for the different agroclimatic zones.

Nursery techniques: (A. C. I. Samaranayake, W. T. Silva & R. B. Gunaratne)

A number of growth regulators tested has had no effect on the sprouting of buds in *Hevea* budgrafts. A commercial preparation containing —Naphthyl acetic acid has had no influence on the rate of regeneration of roots in bare root budded stumps.

ACKNOWLEDGEMENTS

The author acknowledges with thanks the valuable assistance given by Mr. W. G. V. Fernando, the Senior Technical Assistant of the Botany Department, in preparation of summaries and analysis of data from field experiments.

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19	1962 Clone Trial	— Nivitigalakele
21	1964 Yield Trial	— Nivitigalakele
23	1965 Clone Trial	— Dartonfield
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25	1957 Clone Trial	— Estate A—Kalutara District
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34	1966 Stock Experiment	— Nivitigalakele
37	1966 Yield Trial	— Udapolla Group, Deraniyagala

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38	1966 Yield Trial	— Kiribatgala Group, Nivitigala
41	1966 Yield Trial	— Yatawatta Estate, Matale
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45	1967 Yield Trial	— Zion Estate, Rattota
47	1968 Stock Experiment	— Nivitigalakele
48	1969 Yield Trial	— Salawa Estate, Hanwella
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51	1966 Yield Trial	— Dalkeith Group, Latpandura
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REVIEW OF THE SOILS CHEMISTRY DEPARTMENT

BY

C. G. SILVA

(*Soils Chemist*)

SUMMARY

The methods used by the Department for soil and leaf analysis were refined, as a result of which, the analytical output was increased and it was also possible to initiate a pilot project of discriminatory fertilizer recommendations for 2000 acres (810 ha) of mature PB 86 rubber in the Kalutara District.

A polybag experiment with apatite has indicated that apatite may not be as suitable as imported rock phosphate for rubber seedlings.

A field experiment with different amounts of the same fertilizer mixture in a 1949 replanted area showed that significantly better yields could be obtained by the addition of 4 lb (1.8 kg) per tree per year of the standard fertilizer mixture. Another experiment on Boralu series soil continued to show responses to potassium for the fourth year. A cover crop experiment in a 1970 replanted area with clone RRIM 623 showed that the addition of phosphorus to the cover and/or to the rubber helps in the growth of the rubber. Another experiment to determine the best cover crop policy, has shown that legume covers are essential for the optimum growth of rubber. Even when extra nitrogen is applied to areas under natural covers, the growth of the rubber is much poorer than that associated with legumes.

DETAILED REVIEW

Staff

Mr. C. G. Silva, Soils Chemist, was on duty throughout the year. Mr. N. Yogaratnam, Assistant Soils Chemist, continued his post graduate studies at East Malling Research Station, U.K.

Mr. E. Bellis the Colombo-Plan Consultant to the Soils Chemistry Department revisited the Department in January and left in February 1973.

Mr. M. H. Sulaiman, Experimental Officer, Mr. T. Kanthasamy, Senior Technical Assistant, Messrs. H. A. Seemon, A. M. A. Perera, B. P. M. Arsecularatne, V. Gunasekera, G. Jayawardene, Technical Assistants, and Messrs. W. M. Abeysinghe, M. A. Mendis, A. D. M. Karunaratne, K. S. A. C. Peiris and J. Wijenayake, Field Assistants were on duty throughout the year. Mr. F. P. W. Silva was away in the Netherlands on training during the year.

Visits

The following visits were paid for advisory, experimental and other purposes by the Soils Chemist.

Advisory	10
Experimental	38
Miscellaneous	31
Total ..	79

Meetings and conferences

The Soils Chemist, Mr. C. G. Silva, attended the following meetings :—

Working Group on Fertilizers
Annual Sessions of the Ceylon Association for the Advancement of Science (CAAS)

Publications

The following papers were prepared for publication :—

1. Management of the Rubber Soils of Sri Lanka for Maximum yields.
   C. G. Silva

2. Manuring of Rubber.
   C. G. Silva & E. Bellis:

Advisory work

The amount of advisory work undertaken during the year was reduced appreciably, mainly due to the shortage of staff. Wherever possible advice was given through correspondence and when this was not considered possible the estate was visited.

Research investigations

The research investigations of the Department were conducted on the following topics:-

1. Commercial rubber productivity survey
2. *Hevea* leaf nutrient content variation investigations
3. Soil survey of selected estates
4. Analysis of soil and plant materials
5. Soil and foliar survey of 2000 ac. (810 ha) in the Kalutara District
6. Field experiments.

Commercial rubber productivity survey:

30 estates were selected for this study. But progress was slow and only seven estates were studied. The slow progress was initially due to the fact that it is a time consuming job and staff was not available. Towards the latter half of the year priority was given for the soil foliar survey of 2000 ac. (810 ha.) and work on the commercial rubber productivity survey was done whenever staff was available.

Hevea *leaf nutrient content variation study:*

The trees in this area were severely attacked by *Oidium* leaf disease and at the first leaf count it was possible to decide on the dates of sampling of the PB 86 trees only. The sampling of leaves of clone RRIC 45 was started only towards the latter half of the year and that too could not be done according to schedule, because of the dearth of leaves and also due to unexpected weather conditions.

Soil survey of selected estates:

Soil survey of a field at Olympus Estate, Galle, and another at Elgiriya Estate Dodangoda, were completed. Soil and leaf samples were also removed from these areas. The Soil survey of a section of Nakiadeniya Group for Oil Palm cultivation was also completed.

Collection and analysis of soil and plant materials:

The number of samples collected were :

1045 leaf samples
848 soil samples.

The number of determinations were as follows :—

Soil

Acid extractable phosphorus	—	318
Exchangeable hydrogen	—	216
Total nitrogen	—	353
Carbon	—	353
Exchangeable aluminium	—	144
Exchangeable manganese	—	96
Cation exchange capacity	—	168
Exchangeable calcium	—	602
Exchangeable magesium	—	602
Moisture	—	113
p^H	—	72
Exchangeable potassium	—	192
Acid extractable potassium	—	324

Leaf

Nitrogen	—	1060
Phosphorus	—	1021
Potassium	—	1204
Calcium	—	1537
Magnesium	—	1537
Manganese	—	744
Boron	—	4

Latex

Nitrogen	—	62
Phosphorus	—	63
Potassium	—	63
Calcium	—	62
Magnesium	—	40

The collection of leaf and soil samples was speeded up because the services of the Technical Assistants and that of the Experimental Officer were used for this purpose, and this was mainly during the second half of the year. The output of analytical work was increased because the Atomic Absorption Spectrophotometer of the Geological Survey Department was utilised for most of the determinations. The amount of soil samples analysed was great during the first half of the year and that of leaf samples greater towards the latter half of the year. It is now quite evident that the output of analytical work is almost the maximum which could be attained with the present cadre of Technical Assistants and that if more samples are to be analysed not only would more staff be necessary but an Atomic Absorption Spectrophotometer of our own is essential.

Soil and foliar survey of 2000 acres of mature rubber in the Kalutara District:

About 2000 ac. (810 ha) of mature PB 86 rubber in the Kalutara District were selected for study for discriminatory fertilizer recommendations. These areas were separated broadly into different soil phases on the basis of slope and depth; soil and leaf samples from each such area were removed for analysis. The analysis of leaves were more or less completed and the analysis of soils was also started. Fertilizer for these areas in 1974 would be based on these analytical data.

Polybag experiment with Apatite

A polybag experiment to test the possibility of using apatite as a source of phosphorus for rubber, showed that apatite may not be as suitable as the imported rock phosphate as the source of phosphorus for rubber seedlings. Another experiment was started to confirm this finding, because it is important for us to know whether the locally available apatite could substitute for the imported saphos.

Field experiments

Experiment No. 9 : Elduwa Estate, Kalutara District, 1949 Replanting, Clone PB 86 (W. M. Abeysinghe).

The girth data of this experiment do not show any significant effects due to the treatments. The mean yields however show that there are significant differences in yields between the treatments as given in Table 1.

TABLE 1

MEAN YIELD OF DRY RUBBER IN G

Treatment	Yield	L.S.D.
Control	36.66	
2lb R.463+Mg	41.26	
4 lb R.463+Mg	43.92	6.95
6 lb R.463 +Mg	49.19	
D P treatment	39.33	

These data show that while 4 lb (1.81 kg)and 6 lb (2.72 kg) of R.463+Mg per tree give higher yields over the control there is no significant difference between 4 lb and 6 lb. This clearly indicates that it is economical to spend money in fertilizing trees which are even 24 years old, with 4 lb (1.81 kg) per tree of R.463 + Mg.

Experiment No. 11: Kuruwita Sub-station, 1961 Replanting, Clone PB 86 (K. S. A. C. Peiris).

This experiment tests the effect of two levels of the three nutrients nitrogen, phosphorus and potassium with magnesium as a basal application. The yield data do-not show any significant difference due to the treatments. The girth data however show that there is a significant response to potassium. The results are given in Table 2.

TABLE 2

MEAN GIRTH OF THE DIFFERENT TREATMENTS

Treatment	Mean girth in cm	L. S. D.
N_0	24.69	
N_1	25.13	
P_0	24.59	2.04
P_1	25.23	
K_0	23.70	
K_1	26.11	

Similar responses to potassium have been shown in this experiment for the last four years and essentially based on these results, a fertilizer mixture rich in potassium *viz.* R. 465 + Mg is now being recommended for these (Boralu) soils.

Experiment No. 12: Levels of nitrogen and phosphorus, Kuruwita Sub-station, 1961 Replanting, Clone PB 86, (K. S. A. C. Peiris).

Three levels of nitrogen and of phosphorus are being tested. The yield and girth data do not show any difference in yield or growth due to the different levels of these two nutrients.

The interaction totals of the yields as given in Table 3, show that the effects of these two nutrients on yield are dependent on their respective levels and the highest yield is obtained at the highest level of nitrogen with the middle level of phosphorus. This result suggests that better yields may be achieved by increasing nitrogen or that phosphorus is a limiting factor to higher yields. A discriminatory fertilizer study would elucidate this, and is being undertaken.

TABLE 3

INTERACTION MEANS

	N_0	N_1	N_2
P_0	54.44	59.4	60.8
P_1	57.0	58.1	68.2
P_2	65.1	63.6	50.8

Experiment No. 22 : Response of mature rubber to fertilizers, Malaboda Estate, Matugama, 1947 Replanting, Clone PB 86 (W. M. Abeysinghe).

The relative importance of the three nutrients, nitrogen, phosphorus and potassium are being tested with a uniform application of magnesium. The yield and girth data do not show any significant difference due to the treatments. This experiment has not yielded any positive results since it was started four years ago. It will however be continued for a few more years because the residual effects of certain fertilizers added in the past may be effecting the present results.

Experiment Nos. 24, 25 and 26 :

The effects of manuring rubber in relation to ground covers, are studied in these experiments, which are aimed at determining whether the application of extra nitrogen in areas with non-legume covers could result in good growth during immaturity and higher yields during early maturity.

Experiment No. 24: Pussella Group, Parakaduwa, 1972 Replanting, Clone RRIM 623, (K. S. A. G. Peiris).

The analysis of girth measurements taken after three years has shown that the plants will grow significantly better if phosphorus is added. This response to phosphorus is better if the phosphorus is added to the cover than when it is added to the rubber and it is best when phosphorus is added to both the cover and the rubber. The results are given in Table 4. The practice of broadcasting phosphorus to the cover and the application of a phosphorus containing fertilizer mixture to the young rubber should therefore be continued.

TABLE 4

MEAN GIRTH OF PLANTS

Treatment	Mean girth in cm	L.S.D.
P_o	11.20	
P_r	12.20	0.71
P_c	12.76	
P_{rc}	13.27	

Experiment No. 25 : Paiyagala Estate, Kalutara, 1970 Replanting, Clone RRIM 701, (A. D. M. Karunaratne).

This experiment was terminated in 1973, because the area was re-budded at ground level, as the clone originally planted, RRIM 701, was found to be susceptible to die back. This made the conditions of the experiment inapplicable to the normal situation; therefore the utility of the experiment was minimal.

Experiment No. 26 : Hedigalla Division, Dartonfield Group, 1970 Replanting, Clone RRIC 101, (A. D. M. Karunaratne).

The girth measurements to date do not show any significant effect of the type of ground cover on growth.

Experiment No. 27: Effect of different levels of nitrogen, phosphorus and potassium of yield and growth; Lowinont Estate, Kalutara, 1964 Replanting, Clone RRIM 623 (J. Wijenayake).

The yield and girth data do not show any difference due to the treatments. Because the main purpose of this experiment is to assess the effect of nutrients,mainly potassium, on bark regeneration, the relation between treatments and the thickness of the renewed bark as well as the yields, when tapped on the renewed bark,only will give any meaningful results. Therefore, the experiment will be continued until the area is tapped on renewed bark for sometime.

Experiment No. 28 : Effect of three levels of the standard fertilizer mixture R.463+Mg on a tree area replanted with rubber, 1971 Replanting, Clone PB 217 (J. Wijenayake)

The girth measurements given in Table 5 show that the addition of half the amount of the standard fertilizer mixture gives the same growth as the full dose of fertilizer. Both treatments give significantly better growth than the control where no fertilizer has been added. Therefore, in areas brought into rubber from tea, half the normal dose of fertilizer recommended, appears to be sufficient for the growth of rubber. This observation will be confirmed in the next few years.

TABLE 5

MEAN GIRTH OF PLANTS IN CM

Treatment	Girth in cm	L.S.D.
Control	19.42	
½ the standard application	21.29	1.39
Standard application	21.82	

Experiment No.29: Urea comparison trials on Boralu soils.

The fertilizer schedule of one replicate in these trials was changed on to a discriminatory fertilizer procedure based mainly on the results of leaf analysis in 1972. However no responses have been observed to any of the fertilizers added. A discriminatory fertilizer procedure will be continued this year also, based on the analysis of leaves sampled in 1973.

Experiment No. 30 : Management of ground covers, Katuhena Division, Sorana Group, Horana, 1972 Replanting, (A. D. M. Karunaratne).

This experiment is designed to study the management of ground covers in immature rubber areas for an evaluation of the cover crop policies for rubber lands.

The five treatments in this experiment are as follows :—

1. Sown mixed legume cover. L
2. Selective removal of non legumes from the natural cover. L:S
3. Non selective control (slashing) of natural cover, without supplementary nitrogen to tree rows. N: NS
4. Non selective control of natural cover, with supplementary nitrogen applies to the tree rows according to standard practice. N:NS N_1
5. Non selective control of natural cover with manuring of the rubber, controled by leaf analysis, to the levels of sown mixed legume cover areas. N: NS N_2

The results show that the best growth of rubber is attained by having a stand of sown legume covers. The growth is poorest in areas where a non-selective control of natural covers is adopted, without any supplementary nitrogen. It is also interesting to note that there is no significant improvement in growth in the natural cover areas as a result of any additional nitrogen application. The girth data are given in Table 6.

TABLE 6

MEAN GIRTH IN DIFFERENT COVER CROP AREAS

Treatment	Mean girth in cm	L.S.D.
L	3.62	
L:S	3.42	
N:NS N_1	3.31	0.35
*N:NS N_2	3.18	
N:NS	3.06	

*The manuring based on leaf analysis according to the treatment 5, was not carried out, because more data are required; therefore the treatments (4) N:NS and (5) N:NS N2 are similar.

The results also indicate that there may be no specific advantage in respect to the growth of the rubber whether extra nitrogen is applied to areas under natural covers; perhaps, because the naturals compete for the nutrients and moisture and do not release the former rapidly.

Experiment No. 31 : The use of locally available Apatite as the source of phosphorus for rubber, Dartonfield, 1973 Replanting, (W. M. Abeysinghe).

The growth measurements recorded at the end of the year, in this experiment started in 1972, show that there is not significant difference in growth as a result of the different sources of phosphorus. This result is contrary to that of the polybag experiment with apatite, where it was seen that apatite may not be as suitable as saphos for the growth of seedlings in sand. These widely different results from the same two sources of phosphorus may be caused by the fact that, in this field experiment where no difference was observed, the phosphorus reserves in the soil would have supplied the necessary phosphorus requirements of the plants. In the polybag experiment with sand there were no such reserves.

Miscellaneous

Mr. E. Pushparajah, the Head of the RRIM Soils Chemistry Division, paid us a short visit and we were glad at the opportunity we had of discussing certain aspects of our work with him and grateful to him for his suggestions.

The second quarter of the year was to a large extent devoted to the collection of data and the preparation of a paper entitled "Management of the Rubber Soils in Sri Lanka for maximum yields" which was presented by the Soils Chemist at the International Rubber Conference—Sri Lanka in June 1973.

REVIEW OF THE ESTATES ADVISORY DEPARTMENT AND ECONOMIC RESEARCH UNIT

BY

A. B. DISSANAYAKE

(Head of The Estate Advisory Department)

General

The Department continued to be of service to plantation owners in the acreage group of 25—500 acres (10.1—202.4 ha) by carrying out advisory visits.

The Economic Research Unit continued to function at a reduced scale due to the absence on study leave abroad of the Assistant Agricultural Economists.

Staff

The Head of Department, two Assistant Estates Advisory Officers and one graduate trainee Technical Assistant were on duty throughout the year. One Assistant Agricultural Economist was on study leave abroad at the Wye College, London. The other Assistant Agricultural Economist who returned after his M.Sc. from the Australian National University, resigned his post with effect from 30.11.1973.

Four graduate trainee Technical Assistants were transferred to the Department with effect from June 1973 for field survey work.

ESTATE ADVISORY DEPARTMENT

Visits

Routine visits: A total of 179 routine visits were made during the year. A break up of visits would be as follows :—

ROUTINE VISITS

Category	No. of visits
Small estates	99
Medium estates	80
Total ..	179

Request visits : A total of 36 visits on request have been made.

REQUESTS VISITS

Category	No. of visits
Small estates	15
Medium estates	15
Large estates	06
Total ..	36

Whilst routine visits entailed the inspection of each estate in all its aspects from cultivation to manufacture and grading, the request visits were more for specific purposes although discussions invariably tended to spread to all aspects. Visits were followed by reports and where necessary advisory circulars too were sent.

Other visits: The officers of this Department also attended discussions, seminars, Committee Meetings, Staff Meetings and other offices and Institutions in connection with the work of the Department and the Institute. A total of 84 such visits have been made.

Training: Mr. R. A. Wijewansa, A.E.A.O. was trained in Extension Methods in Japan from May to June.

Transport: Transport has always been a problem as no Institute vehicles were attached to this Deparrment. Private vehicles have been used to do official work but now on account of the very high cost of petrol, oils, repairs and servicing, officers are not able to continue using their private vehicles.

ECONOMIC RESEARCH UNIT

Surveys

Economics of smallholders: This survey started by Dr. Barlow of the Australian National University was completed and the data handed over to the Statistics Unit for analysis.

Income levels availability and utilization of time saved and employment opportunities by smallholders in the Mawanella area:

This survey was started for Mawanella Block Rubber project. The survey was completed in September after collecting data from 627 smallholdings. The draft report has been handed over to the New Process Rubber Unit.

Economics of Group Processing Centres

The above survey was started during the third quarter and completed by the end of the year. Some data have yet to be collected before tabulation of the data for study.

Talks: Three talks on "An Economic Analysis of the present condition of the Rubber Industry with special reference to the improvement of smallholdings" were given in Sinhala at the Smallholders' Conference held at Ratnapura, Galle and Getahetta by the writer.

(i) A talk on "The present economic condition of the NR industry in Sri Lanka" was given at the Kegalle District Planters' Association by the writer.

(ii) A talk on "Rubber Cultivation" was given at the "in-service" training of extension workers of the Minor Export Crops Department at Gannoruwa by Mr. R. A. Wijewansa, A. E. A. O.

(iii) A talk on "Improving the viability of the NR industry of Sri Lanka" was given at the International Rubber Conference on 21-22nd June by the writer.

(iv) Two talks for the Indian Rubber Conference to be held at Kottayam in January 1974 were also submitted by the writer.

Articles: (i) The study of the supply of all elastomers done for the ANRPC/ ECAFE Expert Group on rubber was revised and submitted for consideration at the 4th Expert Group Meeting.

(ii) One article on "The Association of NR producing countries (ANRPC)" and another on —

(iii) "How viable is the NR industry of Sri Lanka" were published in the News paper supplement on the occassion of the International Rubber Conference.

Conferences & Seminars

(i) The Officers of the Department helped in organising the International Rubber Conference at the Bandaranaike Memorial International Conference Hall. The writer along with the Deputy C. A. O. (S). was incharge of organising the Exhibition of locally manufactured rubber goods held for three days during the period of the Conference.

(ii) The writer attended the 4th Meeting of the ANRPC/ECAFE Expert Group held at Kuala-Lumpur, Malaysia.

(iii) The officers of the Department attended the sessions of the Ceylon Association for the Advancement of Science (CAAS) in December 1973.

Pale Crepe Factory Project

Badureliya Pale Crepe Factory Project

A site of five acres (2.02 ha) was acquired for the above and the trees in a part of the land was felled. Tenders were called and the construction work was handed over to Messrs. Walker Sons & Co. Ltd.

A mass *Shramadana* campaign for levelling the site where officers from the Ministry of Plantation Industry, Rubber Research Institute, State Rubber Manufacturing Corporation and people of the area will participate, will be held in early January 1974. The three day proceedings will end with a stone laying ceremony. Construction work is expected to start immediately thereafter. The factory is expected to be completed by mid 1974.

Waharaka Pale Crepe Factory Project

A site of six acres was acquired. Tenders were called and the construction work was handed over to Messrs. Walker Sons & Co. Ltd. Trees were felled and a one day *Shramadana* campaign inaugurated the levelling of the site. The stone laying ceremony was held on 21.12.1973. Construction work is expected to start as early as possible. Factory is expected to be completed by mid 1974.

Silverdale and Yataderiya Factories

Both factories were accquired. Repairs to factory building and machinery have been started at Yataderiya while repairs to machinery only has been started at Silverdale.

Five tentative sites for collecting centres for latex for each factory have been selected and quotations have been called for the construction of sheds for the collecting centres. Once these are constructed the two factories will function as central factories by about February, 1974.

Kuruwita Central Factory Project

The contract for the construction work was awarded to two firms, Messrs. Browns Group and Walker Sons & Co. Ltd.

However, the existing factory of Paradise Estate which was acquired under the Land Reform Commission Laws have been offered for conversion to a central factory. A decision is expected very soon on this matter.

My sincere thanks are due to the Director, RRISL for his confidence in me by recommending me for appointment as a Director of the State Rubber Manufacturing Corporation. From 1.1.1974 the Pale Crepe Factory Project will be vested in the above Corporation.

REVIEW OF THE SMALLHOLDINGS DEPARTMENT

BY

H. H. PEIRIS

(Head of The Smallholdings Department)

SUMMARY

The year under review was one of the most favourable years to the smallholder. Prices offered to RSS Grade 1 and 2 were always higher than the fixed floor price. The field officers used considerable time to organise Group Processing Centres (GPCs) and in improving the quality of smallholders' sheet rubber to Grade 1 RSS.

The required assistance and advice were given to new rubber planting smallholders. All new rubber planting applications received by the Rubber Controller and referred to this Department for preliminary reports were attended to. All new rubber planting areas have been visited for free lining for soil conservation works and planting holes and to advise owners in planting their lands according to rubber control regulations.

A considerable time of the field staff was also devoted for subsidy replanting work.

The publicity unit of the Department operated in the field during the year under review.

The large scale sulphur dusting was curtailed and dusting was confined to holdings that were situated at elevations over 300 ft. above mean sea level.

Besides the normal duties the field officers collected data and located collecting centres for the proposed Crepe Rubber factories at Waharaka and Dodangoda (Silverdale) and also centres for collecting latex for the Ceyesta factory.

DETAILED REVIEW

General

The year under review was favourable to the smallholders. The total number of tapping days were more when compared with 1972. The price offered to RSS Grade 1 improving during the year and the smallholder devoted much time in improving their holdings.

The field officers devoted a great deal of their time in trying to organise co-operative group processing centres and improving the quality of smallholders sheet rubber to grade 1 RSS.

Staff

Mr. H.H. Peiris, The Chief Advisory Officer Smallholdings and Mr. R. P. M. de Zoysa, Deputy Chief Advisory Officer Smallholdings were on duty throughout the year. Mr. A. J. L. de Silva, Rubber Instructor, Ratnapura was promoted to the post of

Divisional Advisory Officer with effect from 1.1.1973 and was assigned to Galle Division as from that date. Mr. K. I. Ariyaratne, Rubber Instructor, Bandaragama, was appointed acting Divisional Advisory Officer with effect from 1.1.1973 and was assigned to Matugama Division as from that date. Mr. K.S. Peiris, Graduate trainee, was transferred to this Department with effect from 1.3.1973 and was attached to group processing centres work operating from Smallholdings Headquarters. Mr. K. Ekanayake, Rubber Instructor, attached to New Rubber Processing Unit, Mawanella too was transferred to the Department for group processing centres work operating from Smallholdings Headquarters. Mr. G. P. G. S. Hapugoda, Rubber Instructor, Rumbukkana, resigned his post on 4.9.1973. Miss D. S. Elvitigala was transferred from Head Office to this office with effect from 1.10.1973. Mrs. N. M. K. Welikanna who was assisting sulphur dusting clerk resigned from her post on 8.10.1973. Ten Rubber Instructors were interviewed on 26.3.1973 for promotion to higher grade of salary and Messrs. W. E. W de Mel, Rubber Instructor, Ingiriya, S. D. Athukorala, Rubber Instructor, Kiriella and R. Gunadasa, Rubber Instructor, Galagedera, were promoted to a higher grade of salary scale on 17.7.1973, 18.4.1973 and 2.11.1973 respectively. The services of Mr. P. I. N. Fernando, Rubber Instructor, Palawela, were terminated on 10.5.1973. Mr. C. J. de S. Amaratunga, Rubber Instructor, resigned from his post on 1.2.1973.

The following ranges were vacant during the year 1973 :—

Kahawatta, Ayagama and Palawala ranges in Ratnapura Division, Deraniyagala and Parakaduwa ranges in Avissawella Division, Rambukkana and Aranayake ranges in Kegalla Division.

The office of the Smallholdings Department was shifted from Bambalapitiya to our own new Rubber Research Institute premises at Telawela Road, Ratmalana, Mt. Lavinia on 20.12.1973.

Loans: During the year 1973, Rs. 45,258.50 was granted to 15 officers for the purpose of purchasing vehicles and 9 officers obtained Rs. 13,235.00 as loans for repairing their motor vehicles. Three officers borrowed Rs. 600/- to purchase cookers.

Correspondence

General : Inward 7704

Outward 9137

With Rubber Controller:

Inward. . . 2164 (applications for new planting, unregistered rubber lands and new planting permits)

Outward 2198. . . (preliminary reports, final inspection reports and special reports *etc.*)

From Rubber Instructors to permit holders—1590

Visits

New planting : All required assistance and advice were given to new planting permit holders. All new rubber planting applications that were received by the Rubber Controller have been referred to this Department for a report on the suitability of such lands for new planting before a permit is issued to owner. These applications that were in turn referred to the respective Rubber Instructors for preliminary reports after visits to such lands and in this manner 183 preliminary reports have been submitted to the Rubber Controller during the year under review. Further, 1692 final inspection reports and special reports on new rubber planted lands too have been furnished to the Rubber Controller at his request. A total of 94 new planting permits covering an extent of 219 ac (88.7 ha) have been issued by the Rubber Controller during the period to new planting smallholders. Free lining is done by the Rubber Instructors for soil conservation and planting holes at the request of the owners. Accordingly they have lined a total of 32 new planting areas for planting for the year 1973 covering an extent of 42 ac. (17.0 ha), for soil conservation, and 38 permit areas covering an extent of 52 ac. (21.0 ha), for planting holes. They have also lined a further total of 10 permit areas of the previous year's permits covering an extent of 6 ac. (2.45 ha), for soil conservation measures and 8 permit areas covering an extent of 12 ac. (4.9 ha), for planting holes.

Twelve first visits and 31 subsequent visits too were made by Instructors to new planting and new planted areas of 1972 and 1973. Further, a total of 6605 subsequent visits too were made by them to permit areas for which permits have been issued prior to 1972.

Rubber Instructors have marked a total of 1381 tappable trees in 40 new rubber planted smallholdings as demonstrations and marking for tapping.

Soil Conservation: A sum of Rs. 559.27 was paid to 10 peasant-class permit holders for conserving soil in their lands.

Five permit areas, covering an extent of 7 ac. (2.8 ha), have been checked in the field by Divisional Advisory Officers.

Replanting; A considerable amount of the time of the field staff was also devoted to subsidy replanting work. A total of 1767 rubber replanting subsidy scheme permits covering an extent of 2402 ac. (972.0 ha), have been issued by the Rubber Controller in respect of smallholdings during the year. Copies of these permits were received by this department from time to time from the Rubber Controller in respect of smallholdings during the year and were in turn forwarded to respective Rubber Instructors to visit these lands and give necessary advice and assistance to the owners. Every one of the permit areas has been visited by a Rubber Instructor. In all 3337 visits to subsidy replanting permit areas of this year and 35131 visits to subsidy repalnted permit areas of the previous years have been made by Rubber Instructors during the period. Rubber Instructors have lined a total of 695 subsidy replanted permit areas of this year covering an extent of 907 ac. (392.5 ha), for soil conservation works and 859 subsidy replanting permit areas covering an extent of 1156 ac. (467.8 ha), for planting holes. Further, 216 subsidy replanting permit areas covering an extent of 383 ac. (155.0 ha), and 242 subsidy replanting permit areas covering an extent of 398 ac. (161.1 ha), of previous year's permits were lined by Instructors for soil conservation works and planting holes respectively during the period under review.

A total of 7976 trees in 251 holdings have been marked for tapping by Instructors for demonstration purposes. Random checks on planting material issued to subsidy replanting smallholders by the Rubber Controller at various Commodity Purchase Depots were carried out by Rubber Instructors on their visits to these depots. A total of 6172 plants were checked at 36 random inspections by Instructors during the two planting seasons May/June and October/November this year.

Mature holdings : Visits to mature areas are being now done on request from owners for special reasons, diseases and sulphur dusting work *etc.*

Special inspections for Rubber Control Department :

Visits for preliminary reports	138
Visits for final inspection/special reports (new planting)	1692
Visits for special reports (replanting)	552
Visits for recommendation of subsidy payments by Divisional Advisory Officers and senior Rubber Instructors	470

Meetings and Conferences

Village propaganda : The publicity unit of the department operated during the year under review. A total of 81 publicity meetings cum film shows were held during the year by this unit. The films projected were the "Success Story" produced by the Rubber Research Institute, "This is Rubber" and "Naturally it's Rubber" along with other films of agricultural interest.

Meetings and conferences attended by the Chief Advisory Officer and the field staff

1. The Chief Advisory Officer Smallholdings attended a conference of Heads of Departments and Officers of New Rubber Processing Unit at the Ministry of Plantation Industries on 23.2.1973.

2. The Chief Advisory Officer and Deputy Chief Advisory Officer attended a conference on group processing centres at the Ministry of Plantation Industries on 2.3.1973.

3. The Deputy Chief Advisory Officer along with officials of Co-operative Development and officials of the Planning Ministry attended a conference on group processing centres at the Ministry of Plantation Industries on 29.3.1973.

4. Rubber Instructor, Dehiowita, attended a District Development Board meeting at the office of the village committee, Panawela.

5. Rubber Instructor, Weliveriya, attended a conference of the Mahara District Development Committee at the Mahara District Revenue Office on 10.4.1973 and discussed the shortcomings of the area.

6. Rubber Instructors, Getahetta, Ruwanella and Eheliyagoda proceeded to participate in a conference convened by the member of the National State Assembly for Kiriella at Eheliyagoda Village Committee on 7.6.1973.

7. International Rubber Conference was held at the Bandaranaike Memorial International Conference Hall on the 21st and 22nd June. All field staff of this Department attended the proceedings.

8. Ratnapura Division Smallholders' Rubber Conference was convened by the Smallholdings Department and was held on 7.4.1973 at St. Lukes College Hall, Ratnapura. A large gathering of rubber growers were present. The members of the National State Assembly representing Ratnapura Division were present. The Director, Head of Estate Advisory Department, Chief Advisory Officer Smallholdings and Senior Research Officers of the Institute addressed the conference.

9. Rubber Instructor, Dehiowita, attended a conference of Panawala Korale Development Committee on 18.8.73 at Panawala Village Committee Office.

10. Mr. A. Abeysekera, Senior Officer of the Department for Co-operative Development visited this office for discussion with the Deputy Chief Advisory Officer Smallholdings, regarding registration of Co-operative Societies.

11. Galle Division Smallholders' Rubber Conference was held on 1.9.1973 at the Town Hall, Galle, for the benefit of the Smallholders. The members of the National State Assembly representing Galle Division were present. The Hon. Minister of Plantation Industries presided. The Director, Head of Estates Advisory Department, Chief Advisory Officer Smallholdings, and Heads of Scientific Departments addressed the large gathering of smallholders.

12. The Rubber Instructor, Elpitiya, attended a meeting organised by the Land Development Department, presided over by Miss Chandrika Bandaranaike and the Hon. Deputy Minister of Plantation Industries was also present. The meeting was convened to discuss the take over of Ahikorale Kanda Estate.

13. The Smallholders Conference—Avissawella, was held at Uduwaka School in Getahetta Range on 20th October 1973 from 2 to 6 p.m. This was the first conference to be held at basic village level and proved to be a great success. The Chief Advisory Officer Smallholdings presided over this conference which was addressed by several Institute Officers including the Director.

Publications

Rubber Puwath, Vol. 3 Nos. 1 & 2 June/December 1972 was issued to field staff for distribution among smallholders during the fourth quarter 1973, copies were sent to the smallholders who have registered themselves at Smallholdings Department. No leaflets were published or re-printed during the year.

Experiments

Sulphur dusting : This year as in 1971 and 1972 large scale dusting was curtailed and dusting was confined to holdings that were situated at elevations above 300 ft. (91.5 m) over mean sea level. A total of 6 dusting groups comprising of 657 ac. (265.9 ha), were formed and 4 groups comprising of 377 ac. (152.6 ha), were successfully dusted during the year. The average acreage of dusting group was 94 ac. (38.0 ha). The smallest holding to be dusted was 1½ ac. (0.61 ha), in extent and the largest holding was 18 ac. (7.3 ha). The average cost of dusting an acre including the cost of sulphur was Rs. 11/68. A number of groups had to start dusting as early as 1.00 a.m. in order to complete the days dusting programme by 8.00 a.m.

Arrangements are being made to dust the smallholdings in Palmadulla this year.

Improvement of smallholders' sheet : Every possible effort has been made and necessary advice and assistance given to smallholders by field staff to improve the sheet to Grade 1 RSS. The attention of the Department was mostly focussed on organising Group Processing Centres.

Societies at Hataraliyadde, Kahagalla, Milleniya, Yatalamatta, Nugadanda-Ihalagama, Govinna, Dangampola, Palugama, Rantotuwila, Kalalgoda/Talawatugoda, Maliduwa, Homagama, Etnawala, Karapagala, Walagedera, Olaboduwa, Kandana, Yatigampitiya, Tambadiya, Galatura and Kumbuke are now in production.

Centres at Pinnawala, Amaragedera, Warakapola/Tholangamuwa, Ittapana, Haththella, Teppanawa and Iddamalgoda are nearing completion and are due to open for production.

Eleven centres commenced building operations during the year and further 18 centres have completed all preliminaries and arrangements are being made to release funds for the commencement of building operations. Feasibility surveys in respect of other centres and on places proposed for the establishment of centres are being carried on by the field staff.

A total of 5033 visits to rubber co-operative societies and 708 visits to commodity purchase depots were made by the field staff to advise smallholders on the defects of their sheet. Altogether 1568 sheet making demonstrations were given by the Rubber Instructors to smallholders as an inducement to produce better quality sheets.

Three strainers and 654½ sq. ft. (60.78m^2), of monel mesh were sold to smallholders at subsidised rates to encourage them to produce better quality sheets.

A survey to ascertain the percentage of various grades of RSS purchased from small holdings and small estates by commodity purchase depots and by rubber dealers commenced during the first quarter 1973 and continued in the second third and fourth quarters. Nine reports on the suitability of places suggested for the establishment of Commodity Purchase Depots were made to the Commissioner, Commodity Purchase Department during the year.

Tapping training classes: Thirty tapping training classes were organised during the year under review. 16 classes were concluded and 14 classes are now in the final stages of completion.

Fertilizer demonstration plots: At the request of the Fertilizer Corporation the Director instructed the Smallholdings Department to select two suitable smallholdings ½ ac. (0.2 ha), each, in some of the 52 Rubber Instructor ranges for a demonstration in the use of the fertilizer mixture where urea has replaced sulphate of ammonia as the source of nitrogen.

In this connection 52 fertilizer demonstration plots commenced during 1972 May/June and October/November planting seasons of 1972 and these plots were maintained during the year under review.

Exhibitions: The Department participated in exhibitions held at Wesley College, Colombo and at Maha Vidyalaya, Ittapana.

Demonstrations: The following demonstrations were given by the field staff during this year.

Sheet making	..	1568
Tapping	..	774
Disease control	..	542
Miscellaneous	..	963

General assistance: Rubber Instructors gave necessary advice and assistance to smallholders on planting and maintaining their lands in keeping with the Rubber Control regulations.

Visitors: A group of Australians visited the Group Processing Centre, Kalupahana on 2.1.1973. Mr. Austin Perera, Assistant Secretary, Ministry of Plantation Industries, visited Govinna and Kalupahana Group Processing Centres. The Secretary, Ministry of Plan Implementation and Dr. Annesly Fernando visited the group processing centres in Gampaha and Kegalla Divisions on 14.11.1973.

REVIEW OF THE RUBBER CHEMISTRY DEPARTMENT

BY

S. W. KARUNARATNE

(Rubber Chemist)

SUMMARY

This year's Annual Review takes a new shape in its presentation. It is described under the following sub-heads :—

(1) Staff

(2) Pure Research < (a) Polymer Chemistry (b) Biochemistry

(3) Applied Research and Technology

(4) Analytical work < (a) Technical Specification for NR (b) Miscellaneous Analyses

(5) Advisory work

(6) Conferences, publications and public lectures

(7) Other activities.

The Department continued to work with almost the same staff as in the previous year. The number of staff, however, increased towards the end of the year and the impact of this change will only be felt in the new year.

Pure Research on the biochemical side was aimed at further work on non-rubber constituents in latex, mainly phenolic compounds which cause discolouration of rubber in the presence of thiols. Pure research on rubber seed oil was another line of investigation reported in the review. Purification of rubber seed oil was successfully carried out with Fuller's earth and Xylyl Mercaptan. Papain was tested further as a coagulant for NR latex. Preparation of cellulose from rubber wood was looked into mainly to explore the possibilities of grafting cellulose from rubber wood on to rubber (in latex form). Procedures for the isolation of cellulose were carefully scrutinised. Attempts were made to prepare NR derivatives by new techniques.

In the field of Applied Research and Technology, innovation in block rubber production such as the production of block rubber *via* the GPC route and the production of block rubber from conventional crepe rubber are being carefully studied. Further work was done on the preparation and uses of formaldehyde stabilized NR latex. It was found that the addition of either sodium sulphite as a 5% solution or sodium hydroxide as a 3% solution, at the rate of 0.05 to 0.1% on the latex, enables latex to be collected on a wet day for the preparation of formaldehyde stabilized NR latex. The sodium hydroxide-formaldehyde stabilized NR field latex is suitable for mixing with Portland

cement in constructing factory floors and in the construction of damaged cement structures and successful advice and demonstrations have been given in this connexion. The sodium sulphite-formaldehyde stabilized centrifuged NR latex was successfully used as a part replacement of urea formaldehyde resin as the adhesive in plywood manufacture. Formaldehyde stabilized centrifuged latex appears to be more suitable than the ammonia preserved latex in the manufacture of bottle teats, giving a harder product and of gloves, giving a better finish. Formaldehyde stabilized latex, mixed with suitable vulcanising compounding ingredients, is a suitable room temperature adhesive for wood. Cyclised rubber prepared from 60% centrifuged latex and blended with 10% of methyl methacrylate grafted latex before coagulation is a suitable binder for emulsion paints. Methyl methacrylate grafted NR latex blended with an emulsion of urea formaldehyde resin gives a suitable binder for use in the screen printing of textiles. This material will be very much cheaper than the imported binder.

Use of leather waste as a substitute for High-styrene resin and also as a filler in rubber compounding was carried out successfully and a patent has been filed on this new technique. First fraction NR proved to be a satisfactory raw material for the production of stereo rubber.

Analysis of data obtained over a year from a number of recommended clones has shown that the most significant response due to Ethrel stimulation is in the increase in nitrogen levels of stimulated latex coagula. Discolouration of crepe rubber produced from Ethrel stimulated areas is suspected and an experiment was designed towards the end of the year to get more information.

A survey of properties of pale crepe was initiated during the year. Evaluation of colour retention during storage, "hardening" of fractionated and unfractionated rubber and mill break-down characteristics are being studied carefully with a view to guiding the future marketing policy for pale crepe which is accepted by the consumers, throughout the world, as a special grade of NR.

The Specifications Unit, which functioned under the Rubber Chemistry Department was overburdened with work. Judging from the results of the Round Robin Tests this Unit has done extremely well, and our Laboratory is now fully recognised for arbitration testing. This Unit also coped up with additional work connected with specifications for conventional grades such as pale crepe, samples from the research side and also carried out analytical work of a varied nature. The organisation of new Laboratory at Ratmalana, in the outskirts of Colombo, is not yet complete and it is hoped that this Unit will be able to shift at least during the 1st quarter of 1974.

The Rubber Chemistry Department continued to give advice to large estates on problems connected with the manufacture of raw rubber. It would appear desirable for Sri Lanka to step up pale crepe production by working pale crepe factories on at least two shifts instead of the one shift as done at present, taking latex from small estates and from smallholders at present producing RSS. If this is done concurrently with research into uses and market promotion of pale crepe, then Sri Lanka could continue to be the largest producer of this speciality rubber and divert more and more of her RSS into pale crepe manufacture. Rubber seed was collected on the largest scale so far in Sri Lanka, the amount collected exceeding 5000 tons. The price paid for the seeds

ranged from Rs. 9/- to Rs. 16/- per cwt. The spraying of a 0.1% solution of Santobrite (sodium pentachlorophenate) on bales of unpacked RSS appears to be a simple method of controlling mould growth in the stores.

Collaborative work was initiated by Mr. M. Nadarajah, whilst on a FAO fellowship at the RRIM, with Mr. C. K. John of the RRIM on (a) latex preservation and (b) enzymic treatment of natural rubber latex to obtain rubber with improved technological properties.

DETAILED REVIEW

Staff

The Head of the Rubber Chemistry Department was on duty till the end of the 3rd quarter. During the last quarter he was on a FAO fellowship doing work in collaboration with the RRIM in Malaysia. The Rubber Chemist, Mr. S. W. Karunaratne, was on duty throughout the year except for two breaks when be lead a delegation to China in May and participated in the ISO/TC45 meetings in Paris in September. Mr. S. W. Karunaratne was appointed Acting Head of the Rubber Chemistry Department in the absence of the Head of the Department. He was also appointed a Director of the State Rubber Manufacturing Corporation and Head of the New Process Rubber Unit (which functioned under the UNDP aid programme) in addition to his duties as the Chief Specifications Officer. The Assistant Rubber Chemists, Mr. R. Tharmalingam and Dr. P. A. J. Yapa were on duty throughout the year. Mr. W. S. E. Fernando, Assistant Rubber Chemist, joined the University of Aston in Birmingham in late September, for postgraduate studies along with Messrs. A. M. A. Amarapathy, M. R. N. Fernando and L.M.K.Tillekaratne who continued to study at Aston. Dr. A. Coomaraswamy and Dr. G. Varathungarajan joined the Department very late in the year after successfully completing their post graduate studies at Aston. Mr. C. G. Balasingham, Expriemental Officer and Mr. W. C. Dayaratne, Senior Technical Assistant, were on duty throughout the year.

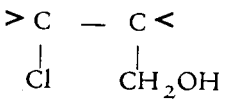
Technical Assistants, Messrs. A. S. Dekumpitiya, W. D. Dharmasena, L.Goonewardena, P. P. Jayasinghe, S. Kasinathan, J. K. Kirubakaran, D. D. Madagama, H.Narangoda, and K. A. Piyadasa were on duty throughout the year. Miss K. N. Peiris who was initially taken in as a graduate trainee worked mainly in the Specifications Unit along with the other Specifications Assistants, Messrs. T. M. Ahamadeen, D. Peiris, M. D. C. Seneviratne and W. A. S. Wijesekera.

PURE RESEARCH

Preparation of NR derivatives by new techniques (*S. Kasinathan, M. Nadarajah & R. Tharmalingam*):

Rubber hydrochloride was prepared at the Paranthan Chemicals Corporation using formaldehyde stabilized, centrifuged NR latex. A 40% solution of formaldehyde was added at a concentration of 0.3% formaldehyde on field latex (35%d.r.c.). Vulcastab LW (an ethylene oxide/fatty alcohol condensate) was used at 2% based on field latex (35% d. r. c.) as the stabilizer. Hydrochlorination was performed by passing hydrochloric acid from the tower for about 21days at low pressure. Towards the end

of the reaction a distinct violet colour was observed and a pale white precipitate of rubber hydrochloride was obtained when the reaction product was poured into a boiling, saturated solution of sodium chloride. It is probable that the product obtained with formaldehyde stabilized latex has the following structure :



and hence this method is not recommended for the preparation of rubber hydrochloride.

Isolation of cellulose from rubber wood (*S. W. Karunaratne & K. A. Piyadasa*):

This work was undertaken to explore the possibilities of grafting cellulose on to NR and in the preparation of cellulose derivatives.

(a) Pulping of rubber wood using mineral acids (nitric and hydrochloric).

Digestion with 5% nitric acid brought about the softening of the rubber wood linters effectively. After further treatment with 4% NaOH, filtration and washing the pulp in a Buchner funnel the product appeared slightly brown in colour.

HCl caused the enbrittlement of the linters instead of pulping.

(b) Chlorine gas generated from $KClO_3$, and conc. HCl was used to bleach the pulp.

Phenolic compounds in NR latex (*P. A. J. Yapa*):

Phenolic compounds are known to react, after enzymatic oxidation, with thiol compounds to form colourless products. It would, therefore be expected that PB 86 has a higher thiol content than clones such as RRIC 7 which is well-known for its latex discolouration. This was found to be the case in preliminary studies; PB 86 has a slightly higher thiol content than RRIC 7.

Amino acid analysis by two dimensional paper chromatography showed that both clones contain almost equal quantities of cysteine (visual estimation). The addition of cysteine HCl to latex yielded a colourless product whilst glutathione behaved rather indifferently. However, both cysteine HCl and glutathione improved the PRI.

Experiments were carried out to examine the occurrence of phenolic compounds in NR latex. Five such compounds were detected by paper chromatography in RRIC 7. Most of them appears to be amino phenols. Further work on their identification and role in discolouration of rubber is in progress.

Enzymatic discolouration of rubber (P. A. J. Yapa):

Studies on enzymatic discolouration of rubber were continued. Some phenolic compounds were detected in the clone PB 86, by paper chromatography. The total phenolic content of PB 86 appeared to be considerably lower than that of RRIC 7. Only the tyrosine spot was identified, the main reason being the lack of authentic samples.

Antioxidants in rubber seed oil (P. A. J. Yapa):

Preliminary studies were carried out on tochopherols and tocotrienols in rubber seed oil.

Purification of rubber seed oil (R. Tharmalingam):

Fuller's earth was partially satisfactory in increasing the rate of sedimentation and improving the colour of the oil. Addition of xylyl mercapton (RPA 3) effectively reduced the dark yellowish colour of the product.

Use of Papain as coagulant for natural rubber latex (M. Nadarajah, P. A. J. Yapa, C. G. Balasingham & S. Kasinathan):

The papain used in the experiments was commercially available crude papain obtained by sun drying or oven drying papaya latex. The use of papain alone was satisfactory for latex crepe manufacture, but for RSS manufacture a mixture of formic acid and papain is necessary to dry the sheet within a reasonable period. The nitrogen content of the rubbers obtained show a reduction of the order of 50% and in the case of latex crepe this would result in a purer product. In the case of RSS, which is used mainly in tyre manufacture, if there were to be an improvement in dynamic properties in the vulcanised product by the use of papain then there should be a possibility for commercial usage. The use of papain as a coagulant costs about 5 times that of formic acid and its use can only be justified if there is a significant improvement in the properties of the prepared rubber. Papain was also used in the coagulation of skim latex, after neutralisation of the ammonia with sulphuric acid. In the case of estates which produce their own papain, raw papaw milk could be used instead of the dried papain. The results of the above work were reported in a paper presented at the International Rubber Conference held in Colombo in June, 1973.

The proteolytic action of papain on proteins in Hevea latex (P. A. J. Yapa & C. G. Balasingham)

The pH of the serum after overnight coagulation with papain was 6.2 to 6.4 and the proteins have been hydrolysed to some extent to the amino acid stage, there being an increase of the amino acids, glutamic acid, serine-1-alanine, tryptophan, phenylalanine, valine and leucine. Hydroxylamine had no inhibitory effect on papain and hence the latter can be used as a coagulant in the manufacture of CV rubber. Soaking of papain coagulated creped lace in a papain suspension resulted in a decrease in nitrogen content of the rubber. The decrease is of the order of 64% whilst a reduction of about 50% is obtained when papain is used as the coagulant. However, still lower nitrogen levels can be obtained by successive milling and soaking treatments. A paper on this work has been accepted for publication in the RRISL Journal.

The use of raw papaw milk for deproteinisation was investigated. Sodium bisulphite added to the raw papaw milk helped in preserving it and improved the PRI and colour of the rubber produced by using this mixture as the coagulant. Raw papaw milk is a more effective coagulant than dried papain.

APPLIED RESEARCH

NR latex as a binder for pigments in textile printing (*S. W. Karunaratne & K. A. Piyadasa*):

Most of the work was done in collaboration with the National Textile Corporation (Mr. Tilak Goonawardena). Mr. S. W. Karunaratne participated in a seminar on textile auxilliaries and chemicals, at the Veyangoda Mills, and it was pointed out at this seminar that local substitutes should replace imported chemicals to conserve foreign exchange. Work was immediately initiated in the use of NR latex as a binder for pigments to latex. Initially, the following raw materials were tried out (a) NR latex grafted with polymethyl methacrylate (20%) as described by Muthurajah (1960), (b) High ammonia field latex (1.0% NH_3 on the latex phase), (c) formaldehyde stabilized concentrated latex and (d) waste turpentine containing about 25% dissolved rubber. The binder that is commonly used now is of acrylic polymer type and partial replacement of this acrylic polymer was thought to be the first step to take, and grafting the acrylic polymer to NR was the best way to start the project. The dye slurry prior to its actual application, is prepared in a medium of kerosene oil (80%) the other constituents being emulsifier (1%), dye (0.5%) binder (5%) and the rest is water (13.5%)

Experiments were tried out by partially replacing the imported binder with the NR based binders described under (a), (b), (c) and (d) alone. The samples were subsequently dried at 140°C and tested with the crock-meter for rub-fastness (standard method described in both ASTM and BS). A 50:50 mixture of (a) and the imported binder was found to be satisfactory towards rub-fastness. Complete substitution did not materially improve the rub-fastness of the product. It was therefore, quite obvious that the adhesion is not very satisfactory according to the method described above. Further trials were carried out at the textile mills using varying proportions of urea and formaldehyde ranging from 6:3 to 3:1 (urea to formaldehyde ratio). The other compositions tested were (a) prevulcanized latex (b) cyclised rubber (c) chlorinated rubber (d) low ammonia-zinc diethyl carbamate stabilized latex (e) cationically stabilized latex prepared by first adding 0.5% of Vulcastab LW (a non ionic stabilizer) to formaldehyde stabilized concentrated latex and then mixing in a 1% solution of cetyl trimethyl ammonium bromide (CTAB) (1% based on latex). The results were not very promising with any of the above binders.

Further work was carried using NR latex grafted with different amounts of polymethyl methacrylate, and the following observations were made :

(a) An increase of the polymethyl methacrylate content in the grafted latex did show some improvements in binding up to an optimum limit of methyl methacrylate. MG 30 was better than MG 20 but MG 50 showed on improvement.

(b) Rub-fastness was further improved by using 15% of the binder instead of the 5% used before.

A large scale trial was carried out using MG latex (30% PMMA). Even though sharp prints were obtained the rub-fastness was not too satisfactory. It is the opinion of the authors that the rub-fastness test too needs modification because of the obvious loopholes in the test.

This work also led to the discovery for a technique for emulsifying kerosene in water by one of the authors (K. A. Piyadasa) using ammonium salts of coconut oil fatty acids.

This project has led to some research into the grafting of cellulose derivatives to NR latex, and this work is described under the section on pure research.

NR latex-Urea formaldehyde resin blends as binders for pigments in screen printing on textiles (*M. Nadarajah & K. P. N. de silva*)

Screen printing is based on the principle of the stencil and is widely used in Sri Lanka as it is labour intensive. The print paste is prepared and then forced through the open mesh of the screen by means of a squeegee and so transferred to the fabric. In preparing the print paste, the binder and pigment are dispersed in water, and kerosene added as a thickener and penetration controller. This results in an oil in water emulsion.

The binders which are mainly aqueous dispersions of cross-linking thermoplastic resins are imported and costs Rs. 5/- to Rs. 10/- per lb and Sri Lanka imports annually about Rs. 1 million worth of these binders. If a cheaper binder based on NR latex could be found, it would be a great boon to the screen printing industry.

In our experiments we have used MMA grafted NR latex (40 MMA:60 NR) and urea formaldehyde resin in the ratio of 1: 1 dry weight. The pigment is added to the MMA latex and then the UF resin is added in the dispersed phase. An emulsifying agent is added followed by kerosene at about 5 times the weight of the grafted NR latex, until the required viscosity is obtained. The print paste was used for screen printing and the sample air dried and heated at 160°C for 1 min. in an oven. The product had satisfactory wash-fast qualities.

Bleached rubber wood pulp for the preparation of blotting/filter paper (*S. W. Karunaratne & K. A. Piyadasa*):

Prevulcanised latex and carboxymethyl cellulose were tried out as binders for the bleached pulp and both these chemicals were effective in the preparation of a paper with satisfactory strength properties.

TECHNOLOGICAL RESEARCH

Research in block rubber production

(a) *Block rubber via the GPC route* (*S. W. Karunaratne*): Studies are in progress to determine the effectiveness of a scheme where smallholders' latex, after coagulation and rolling is processed into block rubber by any one of the comminution methods. Preliminary studies have shown that the nature of rolling and maturation time have an effect on the Initial Wallace Plasticity (P_0) and the colour of the final product.

The other advantage of this process is that of the percentage dry rubber can be assessed on the wet rolled coagulum more accurately than taking a metrolac reading. If this method works, GPCs need not have smoke houses.

The work of the GPC at Kalupahana was closely scrutinised and periodic reports were sent to Community Aid Abroad, an Australian Agency, which sponsored and financed this project. A new system of keeping records was formulated.

(b) *Block rubber from conventional crepe rubber (R. Tharmalingam, M. Nadarajah & A. S. Dekumpitiya):* Preliminary experiments have given an indication that one way of processing pale crepe into block form, if this is a consumer requirement, is heating the crepe in the form of thin lace at 95—100°C for about 25 min. in a device similar to the unidrier used for drying pelletised wet rubber and subsequent pressing of the heated crepe at about 4000 p.s.i. for 4 minutes. The present indications are that the heating process does not affect the P_0, PRI or V_R. It has been estimated that the reduction in bulk volume by processing crepe in this form will be about 20%. The commercial possibility of converting scrap and fraction laces to block rubber is being explored.

Use of NR/bitumen mixes for paving roads (M. Nadarajah, K. P. N. de silva & G. W. Goonesena):

Formaldehyde stabilized NR field latex is suitable for mixing with bitumen and the change in consistency of the bitumen with 2% rubber is considerable. 135 gal of high ammonia latex, 135 gal of formaldehyde stabilized field latex, 180 gal of formaldehyde stabilized field latex and 270 gal of formaldehyde stabilized latex were supplied to the Ratmalana, Horana, Dompe and Jaffna division of the Department of Highways for use in roads.

Rubber latex—Portland cement mixes (M. Nadarajah, K. P. N. de silva & G. W. Goonesena)

Rubber latex—portland cement mixes were found to be suitable adhesives for bonding floor tiles to portland cement floors. Pozzolona cement which is made exclusively from local raw material and is cheaper than portland cement was found to give higher reinformcement with NR latex.

The use of NR latex—portland cement mixes in industrial flooring was demonstrated at Wellawatte Spinning & Weaving Mills and at Ceylon Trading Company floors.

NR latex as an adhesive (P.P. Jayasinghe & J. Kirubakaran)

Field latex mixed with UF resin with and without vulcanising chemicals was used satisfactorily for bonding paper and wood.

Preparation of chlorinated rubber (J. Kirubakaran & P. P. Jayasinghe)

A method of obtaining soluble chlorinated rubber from NR field latex is by introducing rubber solvents such as toluene, benzene and carbon tetrachloride upto 10% on the latex phase. Field latex is stabilized with Vulcastab LW (0.5%) and formalin (0.3%), then toluene (10%) is added and stirred well for about 30 minutes.

The correct dosages of conc. HCl followed by potassium chlorate solution is added while stirring. No cooling is required and no offensive smell was noticed during the preparation of the chlorinated rubber. The mixture is allowed to stand overnight and the chlorinated rubber powder is filtered and dried.

Chlorinated rubber in paints (J. Kirubakaran & P. P. Jayasinghe):

Chlorinated NR samples prepared in this laboratory by *in situ* chlorination using potassium chlorate and hydrochloric acid was dried and dissolved in a solvent such as toluene. To this solution (containing 30 parts by weight of chlorinated rubber) was added, kaolin (25 parts), alkyd resin based on rubber seed oil (20 parts) whiting (30 parts) and an organic dye (1 to 5 parts). These were mixed in a ball mill for 24 h and tried out on road surfaces (tar surfaces). This work was done in collaboration with the Public Works Department (P.W.D.) research centre. Both adhesion and ageing was found to be satisfactory.

Leather waste as a filler in rubber compounding and as a substitute for U/S resin (W. S. E. Fernando & C. G. Balasingham):

A patent has been filed on this application. Chrome shavings ground to the particle size of buffing dust has been used to increase the hardness of floor tiles and file covers. Experiments on the use of leather waste in battery cases are in progress and trials are being conducted on a factory scale.

Preparation of Stereo Rubber (M. Nadarajah & D. D. Madagama):

First fraction NR proved to be a satisfactory raw material for the production of stereo rubber. The following formulations (to give variable hardness to the compound. proved to be very satisfactory and it was in high demand by a number of printing firms)

	Formula A	*Formula B*
1st Fraction NR	100.0	100.0
Zinc Oxide	5.0	5.0
Stearic Acid	1.0	1.0
Sulphur	1.2	1.2
Cyclo hexyl benzthiazyl sulphenemide	1.4	1.4
Mercapto benzthiazole	1.4	1.4
Process oil	5.0	2.5
Kaolin	30.0	70.0
Diphenyl guanidine	1.0	1.0

NR latex as an adhesive in plywood (M. Nadarajah):

Two factory trials were successfully carried out at the Kosgama Plywood Factory using NR/UF resin in the ratios 1: 1 and 2: 1 and using wheat flour at 30% as the extender. Factory scale trials at 1: 1 blend with d.r.c. of latex at 50% gave an average bond strength of 213 psi and 2: 1 blend with d. r. c. of latex at 55% gave an average bond strength of 190 psi. The substitution of 60% of UF resin by NR gave a 35% increase in spread.

In a large scale factory trial, acrolite was extended to 75% using wheat flour and kaolin which is the normal glue mix for tea chest panels. A known volume of the glue mix was manually worked into an equal volume of natural rubber formaldehyde stabilized latex of d.r.c. 55%. This mixture was used on one shift and one spreader at the Plywoods Corporation, Kosgama, with the usual pressing time, temperature and pressure. An average bond strength of 200 psi was obtained.

Rubber seed (M. Nadarajah, R. Tharmalingam & W. C. Dayaratne):

Rubber seeds were milled by millers who undertook this work in 1972 and other new millers also. The amount of seeds milled was considerably greater than in 1972. The price of seed purchased has fluctuated between Rs. 14.50, at the commencement of the seeding season, Rs. 9/- during the peak and Rs. 16/- during the end of the seeding season, per cwt of undecorticated seed.

The dry spell which was prevelant during the seeding season facilitated seed collection. About 5000 tons of rubber seed were collected.

Effect of Ethrel stimulation (S. W. Karunaratne, C. G. Balasingham & A. S. Dekumpitiya):

Analysis of data obtained over a year from a number of recommended clones such as RRIC 45, RRIC 52, RRIC 89, PB 28/59, RRIC 7 and PB 86 has shown that the most significant response due to Ethrel stimulation is in the increase in the nitrogen levels of stimulated latex coagula. However, the levels of nitrogen recorded were well below the limits specified for TSR, and the other changes in the raw rubber properties are statistically insignificant. They are influenced by such factors as the size of the plot, clonal variations and the location of the trees. Discolouration of crepe rubber produced from Ethrel stimulated plots is suspect and an experiment was designed towards the end of the year at Culloden Group, Neboda, to get more information.

A number of estates have also reported that the latex from Ethrel stimulated plots did give rise to check roll differences due to inaccurate readings obtained, using the Metrolac and the usual ready reckoner.

Evaluation of local raw materials in rubber manufacture

Use of hydrochloric acid and acetic acid (S. W. Karunaratne & K. A. Piyadasa):

(a) Raw rubber properties of HCl coagulated rubber after storage for over one year is extremely satisfactory and the results indicate that the raw rubber properties are even better than in the case of formic acid coagulated rubber. Pure gum vulcanizates (with and without antioxidents) also showed better retention of tensile strength after accelerated ageing. A paper on this subject was presented at the International Rubber Conference held in Sri Lanka in June 1973.

(b) Phenols in acetic acid, derived from coconut shells, have an antioxidant effect, but the smoked sheets turned dark brown in colour, probably due to the oxidation of phenols to quinones and other coloured products.

Properties of pale crepe (S. W. Karunaratne & L. Goonawardene):

A survey of properties of pale crepe from five estates was initiated during the year. Evaluation of colour retention during storage, 'Hardening' of fractionated and unfractionated rubber and mill breakdown characteristics are being studied carefully with a view to guiding the future marketing policy for pale crepe which is accepted by the consumers, throughout the world, as a special grade of NR.

Collaborative research with Rubber Research Institute of Malaysia (M. Nadarajah):

Collaborative work was done, whilst on a FAO fellowship with Mr. C. K. John of the RRIM on :

(1) Microbial degradation of field latex and its control by using secondary preservatives in field latex.

(2) Enzymic treatment of *Hevea* latex to obtain rubber with improved technological properties.

ANALYTICAL WORK

Technical specification for NR

The Specification Unit, which functioned under the Rubber Chemistry Department was controlled by the Acting Head of the Rubber Chemistry Department with Mr. A. S. Dekumpitiya as the only Technical Assistant doing full time work in this Unit. In addition to a few helpers the Unit consisted of only four regular assistants and judging from the results of the Round Robin Tests, this Unit has done extremely well, and our Laboratory is now recognised for arbitration testing. The Unit also coped with additional work, connected with specification for conventional grades such as pale crepe samples from the research side and also carried out analytical work of a varied nature. The main task, in addition to the routine testing, was to organise the New Laboratories at the new site at Ratmalana in the outskirts of Colombo. It was expected that this Laboratory would be ready by the end of the year, but due to unforeseen circumstances and inspite of the presence of Mr. H. C. Baker the Foreign Adviser on the project, this work has lagged behind due entirely to delays in building and the installation of equipment and it is now expected that the Unit will shift only during the latter half of the first quarter of 1974.

EQUIPMENTS AND GLASSWARE RECEIVED UNDER COLOMBO PLAN AS GIFTS FOR SPECIFICATIONS LABORATORY, RATMALANA

Actual imports from January 1st to September 30th, 1973—Rs. 342,741/46

Expected imports from October 1st to December 31st, 1973—Rs.233,421/46

Expected imports on licences issued in 1973 and earlier January 1st to December 31st, 1974 —Rs. 330,319/97

Charges for testing Technically Specified Rubber (S. W. Karunratne):

The following suggestions have been approved by the Rubber Research Board and the scheme went into operation from 1st october, 1973.

Free testing will be done during the first three months of production.

Subsequently a nominal fee of Rs. 10/- per sample will be charged for testing, in order to cover a part of the working expenses.

On the basis of 10% sampling as in the case of the lot system of sampling, a factory producing 10 metric tons of rubber a day is expected to send a maximum of 30 samples and a minimum of six samples. Therefore the cost of testing to the producer can vary from 2.5 cts. to 0.6 cts per Kg (1.36 cts to 0.37 cts per lb) depending on the intensity of sampling.

In the quality control system, sampling intensity may be further reduced in which case the cost of testing may be even less than 0.6 cts per Kg (0.27 cts per lb). In the extreme case, if the production is less than 325 Kg (717 lb) the cost of testing can rise to 1.81 cts per lb.

The rates suggested above are embodied in the attached table.

TABLE I

CHARGES FOR TECHNICALLY SPECIFIED RUBBER

Batch weight	No. of samples on which a fee may be levied at Rs. 10/- per sample		Cost of testing	
	Min.	Max.	cts/Kg	cts/lb
≤250 Kg (551 lb)	0 to 1	1	No fixed charge	No fixed charge
251-500Kg (552-1102 lb)	1	1	2 to 4	0.91-1.81
501-1000Kg (1103-2205lb)	1 to 2	2	2 to 3	0.91-1.36
1001-1500 Kg (2206-3308 lb)	3	3	2 to 3	0.91-1.36
1501-2000 Kg (3309-4410 lb)	4	4	2 to 2.66	0.91-1.21
> 2000 Kg (4410 lb)	6	*Variable	≤2.5	≤1.36

Note : 1. Batch weight refers to a days' production for a specific grade of rubber. If the batch weight falls below 250 Kg (551 lb), the certifying authority will decide whether a fee should be levied for testing.

2. Number of samples tested may not necessarily be the same as the number of samples for which a fee is charged.

* This will depend on the sampling frequency as stipulated by the certifying authority.

Standard Lanka Rubber (SLR) (S. W. Karunaratne & A. S. Dekumpitiya):

As in the previous year the testing facilities at the RRI Head quarters at Dartonfield were under heavy strain, due to shortage of personnel and lack of space. Four Specifications Assistants were responsible for carrying out the routine analyses under the charge of one Technical Assistant. Samples were tested regularly, from 2 factories currently engaged in Block Rubber production. A breakdown of the routine analyses undertaken is given in table 2.

TABLE 2

DISTRIBUTION OF ROUTINE ANALYSES

Sample type	No. of samples analysed	No. of individual tests
Heveacrumb	657	3944
Comminuted	2310	11088
Research	1020	3523

The production of SLR in Sri Lanka up to the end of the 4th quarter 1973 is given in Table 3.

TABLE 3

*SLR Production

(TONNES)

	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr
Heveacrumb	5L — —	—	—	—
	5 — —	—	—	—
	10 — 25	10	25	15
	20 — —	—	—	—
	50 — —	—	—	—
Comminuted	5L — —	—	—	—
	5 — 180	35	85	80
	10 — —	—	—	—
	20 — —	30	10	20
	50 — 130	25	—	40

*The nomenclature of TSR, was changed to SLR with effect from 1st October, 1973.

These have been shipped to the United Kingdom, Federal Republic of Germany the country representatives of Italy and France.

Preparation of CV rubber (S. W. Karunaratne, L. Goonewardena & D. D. Madagama):

This study was undertaken to evaluate CV characteristics of rubber prepared from small holders' latex in the Mawanella area. Representative samples of latex were collected from three collecting centres namely Dehimaduwa, Randiwela and Talgamuwa, established to feed the Mawanella Block Rubber Factory (MBRF). These were treated with hydroxylamine sulphate (0.15% on dry rubber), coagulated with formic acid, sheeted and dried. The Mooney viscosity (V_R) was determined on an air dried sample of rubber. The ammonia content of the latex was kept below 0.05% prior to coagulation. Wallace Plasticity Number (WP) and raw Mooney viscosity (V_R) of rubber derived from latex collected from Mawanella during the period September, 1972 to December, 1973 are given in Tables 5 and 6.

TABLE 5

WP OF RUBBER DERIVED FROM LATEX IN THE MAWANELLA AREA

Collecting Centre	Modified Conventional Process		Block Rubber Process
	Normal	Viscosity stabilised	*Normal
	(Av. of 16 batches)		(Av. of batches)
Dehimaduwa	54	43	36**
Randiwela	51	42	
Talgamuwa	57	46	

TABLE 6

V_R OF RUBBER DERIVED FROM LATEX IN THE MAWANELLA AREA

Collecting Centre	Modified Conventional Process		Block Rubber Process
	Normal	Viscosity stabilised	*Normal
	(Av. of batches)		(Av. of Process)
Dehimeduwa	81	69	73**
Randiwela	84	70	
Talgamuwa	79	69	

*These figures relate to the commissioning period only, as the factory went into operation only in December, 1973.

**WP & V_R of block rubber is a collective figure on bulked latex from all the 3 centres.

TABLE 4

TECHNICAL DATA ON PALE CREPE SAMPLES RECEIVED FROM EACH ESTATE

(Refer code for the identity of the estate)

Technical property	WPA			WPB			WPC			WPD			WPE			WPF			CPA			LPA			VPA			CCPA		
	1X	1	1A	1X	1	1A	1X	1	1A	1X	1	1A	1X	1	1A	1X	1	1A	1X	1	1A	1X	1	1A	1X	1	1A	1X	1	1A
Dirt %	0.011	0.012	—	0.012	0.013	—	0.010	0.010	—	0.009	0.010	—	0.010	0.011	—	1.007	0.010	—	0.008	0.012	—	—	0.007	—	0.008	0.010	0.008			
Ash %	0.118	0.141	—	0.147	0.171	—	0.116	0.133	—	0.081	0.123	—	0.134	0.157	—	0.116	0.163	—	0.077	0.097	—	—	0.116	—	0.100	0.077	0.078			
Volatile matter %	0.319	0.291	—	0.275	0.260	—	0.367	0.264	—	0.235	0.248	—	0.254	0.250	—	0.259	0.273	—	0.267	0.267	—	—	0.251	—	0.260	0.253	0.265			
Nitrogen %	0.322	0.302	—	0.280	0.306	—	0.330	0.332	—	0.330	0.382	—	0.353	0.396	—	0.391	0.351	—	0.376	0.226	—	—	0.449	—	0.276	0.195	0.262			
P_o	44	40	—	56	52	—	43	43	—	48	44	—	51	42	—	43	54	—	60	43	—	—	45	—	54	50	51			
PRI	63.6	65.0	—	69.6	68.5	—	72.1	67.4	—	66.7	72.7	—	66.6	71.4	—	44.2	40.7	—	78.0	33.7	—	—	57.8	—	41.0	40.0	41.2			
Acetone extract %	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
MOD value	4.56	4.90	—	5.87	5.58	—	5.01	5.31	—	5.51	5.20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			

CODE—

WPA —Pallegoda Estate
WPB —Golinda Group
WPC —Maha Oya Group
WPD —Dewalakanda Group
WPE —Pitiakande Estate
WPF —Kiriwanaketiya Group
CPA —Kepitigala Group
LPA —Sapumalkanda Estate
VPA —Millewa Estate
CCPA —Peenkande Group

Technical Specifications of Pale Crepe (S. W. Karunaratne & A. S. Dekumpitiya):

(a) *Sampling of pale crepe in the estate factories*

A method of sampling is proposed whereby a strip of rubber is removed from the opposite sides of the 3rd blanket from both top and bottom of a (50 Kg) bale of rubber. The weight of the rubber thus sampled should be between ¼ and ½ Kg. Every 10th bale of a batch of rubber should be sampled in this manner.

(b) An identification code is being established for manufacturers of pale crepe giving due recognition to the Agency House and the identity of rubber. Samples have been selected arbitrarily from estates and sent to us for technical specification reports. Some of these results are given in Table 4. We are now in the process of formulating a scheme for identifying pale crepe as a grade of rubber, far "superior" to any other grade of NR, based on a system somewhat different to the TSR scheme. The ultimate objective is to give the consumer what he wants and thereby press on the producer that an uniform product can only be achieved by following a disciplined code of practice and better "house keeping". It is a common practice to blame the clone for the colour of the rubber, but certain practices such as the use of brick powder as a colouring agent for panel fungicides should be discontinued forthwith, if the correct image of pale crepe is to be perpetuated.

MISCELLANEOUS ANALYSES

Analysis of Pale Crepe (S. W. Karunaratne & L. Goonawardane):

Analysis of crepe samples for residual xylyl mercaptan, the bleaching agent used during crepe manufacture was undertaken in collaboration with MRPRA (formally NRPRA). The question remains to be answered even if a trace of the compound is left behind in the rubber, whether the compound remains unchanged or whether it is converted to its disulphide. Disulphides are normally coloured products and this may be one of the causes of discolouration of crepe rubber during prolonged storage. It is reported in the literature that the cause of discolouration of crepe rubber is due to reactions among amine compounds present as non-rubber constituents in the rubber. Studies are in progress to determine the colour stability on exposure to light (UV and direct sunlight) with and without covering the sample in grades of polythene (black and white) of different thicknesses.

Complaints on Pale Crepe (S. W. Karunaratne):

A manufacturer of bathing caps using Sri Lanka pale crepe complained that the colour-fastness of his product varied from batch to batch of rubber. It is natural for the consumer to blame the manufacturer of the raw material for this sort of behaviour, but it must be clearly understood that the manufacturing process may also be a contributing factor.In this instance bathing caps were vulcanised using sulphur monochloride (S_2CI_2) and on adverse and non-uniform reaction between (S_2CI_2) and the dye used for colouring cannot be entirely ruled out. A careful analysis will show that more than 75% of the complaints are due to factors other than the "non uniformity" of the raw natural rubber.

Acid floats (S. W. Karunaratne & L. Goonawardene):

Acidfloats, to check the concentration of formic acid are made from compounded rubber to density specifications. The densities are identified by a colour code. The floats can be reused until the colour is bleached or the surface is etched and it is estimated that each float may be used for 10 density determinations. These acid floats may be useful to check the concentration of formic acid against any adulturation by dilution with water.

Metrication in the Rubber Industry (S. W. Karunartne):

The Acting Head of the Rubber Chemistry Department also acted as the Liaison Officer on Metrication with the Metrication Authority established by the Government of Sri Lanka.

Conversion of scales, guages, charts and measuring vessels to metric units (SI units) and rewriting of product specifications and processing instructions are presently engaging our attention. A special committee on bale and pallet sizes on raw natural rubber has been appointed by the Bureau of Ceylon Standards, with Mr. S. W. Karunaratne as the Chairman, to formulate sizes for both commercial grades and new forms of block rubber.

Since many technical journals have adopted SI we will have to get acquainted with it sooner or later. Careful planning is stressed at all stages of conversion, since new or modified equipment has to be obtained well in advance.

ADVISORY WORK

Chemical control of mould growth (S. W. Karunaratne & W. C. Dayaratne):

Contamination of sheet rubber by fungi was studied in the laboratory and in the field, to control the spread of fungal growth by incorporating chemicals into the rubber at the latex stage.

Paranitrophenol (PNP), a strong fungicide was screened to evaluate its efficacy to control mould growth on sheet rubber. Samples of rubber using PNP incorporated into the rubber, at the latex stage, were prepared at the RRI substation, Nivitigalakale and at the group processing centre at Yatalamatte. Nivitigalakale samples were subjected to laboratory tests, and the samples from the group processing centre were given storage tests at the government rubber depot at Yatalamatte, where frequent fungal contaminations had been observed on the rubber bought and stocked.

Materials and Methods: 200 cc. of 0.1% paranitrophenol in water with necessary acid (PNP was dissolved in 1% formic acid solution, which saved time, and the addition of water to the latex) was added to field latex and the normal procedure was adopted in making the sheet. Two sets of samples (1) treated (2) untreated were prepared from the same batch of latex. After normal smoke drying, the sheets were tested for mould resistance.

Lab tests: Samples (3 in. sq.) from the treated and untreated sheets were sprayed with a spore suspension which contained *Penicillium citrinum, Aspergillus niger, Aspergillus ochraceus* and *Penicillium steckii,* samples were then stored in a high humid chamber.

Observations: On the 13th day the control samples was infected by the fungus first patch appearing on the bottom surface of the last sheet in contact with the floor.

On the 27th day after storage a corner of a PNP treated sheet had a fungal patch—during this time mould growth was spreading on the control sheets.

Day	PNP treated	Control
13th	No contamination	Bottom sheet under surface contaminated
27th	One corner of the bottom sheet contaminated	Bottom sheet completely covered with moulds, and spreading to others
35th	Colonies spreading	Very high contamination on the bottom sheet
38th	Colonies spreading on to the upper surface	Spread come up to the top sheets
43rd	Light patches on the top sheets, middle sheet and bottom sheet	Heavy spread up to the 4th sheet
45th	Only two out of six sheets without mould growth	All sheets contaminated
48th	Contaminated patches were much lighter than those on the controls	

Proxel CRL an organic fungicide dissolved in water was incorporated into latex, at concentrations ranging from 0.02 to 0.12%. This being a very alkaline chemical extends the coagulating time of latex unless more acid is introduced. The fungicide showed some antifungal activity at concentrations of 0.08 to 0.1%; unfortunately, during these trials the weather was too dry to provide any natural infections during storage of this rubber. These experiments will be continued, to screen the fungicide more effectively.

Mould growth in RSS (*W. C. Dayaratne* & *M. Nadarajah*):

Fungicidal trials were initiated in a number of GPCs and Shippers' go-downs in Colombo using Santobrite or Sodium pentachlorophenate. Whilst this chemical is inferior to PNP when used in latex or to treat freshly milled sheets because of the acidity present from the acid used as the coagulant, this drawback would not be there in RSS. Santobrite dissolved in water was sprayed on the bales of rubber immediately after unloading at the warehouse. Concentrations above 0.07%, *e.g.* 0.1% give fairly good protective from fungal infection. These trials will have to be repeated during wet weather.

Bale coating Material (W. C. Dayaratne & S. W. Karunaratne):

A few complaints were received from consumers especially from the Peoples' Republic of China that the bale coating used does not carry the stencil marks satisfactorily.

Industrial talcum powder supplied by the State Trading Corporation was tested at the CISIR Laboratories according to the 'Green Book' specifications.

'Green Book' requirements for powders are :

1. 100% penetration through a standard U.S. sieve No. 100
2. 93% penetration through a standard U.S. sieve No. 325

All the samples from the State Trading Corporation failed the above test and no further work was carried out to use it as a bale coating solution. Experiments were conducted both at shippers' go-downs, Torbay Stores and Mackie's Stores using the locally available kaolin as the filler. The stencil marks were found to be unsatisfactory due to flaking and fading when rubbed. Both turpentine and disel oil were used as solvents for kaolin, and pale crepe cuttings which were initially used as the binder, was compared with RSS cuttings. Diesel oil took a long time to dissolve the rubber (about 48 h) and the colour of the bale coating was not very satisfactory when kaolin was used. Several mixes were made and compared with 'Green Book' specifications but none were found to be very satisfactory.

A rubber/kaolin mixture prepared by M/B form and dissolved in waste turpentine appeared to be satisfactory except for the objectionable smell.

Latex technology (W. D. Dharmasena) :

30 advisory visits were made to latex based industries in Colombo. Altogether 20 demonstrations were given on the basis of latex technology at Dartonfield, our main Research Centre. An article was published in the *Rubber Puwath* Sinhala Journal of Institute on uses of NR latex.

Most of the work on latex centred around the use and development of our latest recommended formaldehyde stabilized latex for the manufacture of dipped articles. Experiments were carried out during the last quarter to find out suitable substitutes for acrylic ink fillers based on NR latex, on NR solution and on derivaties of NR such as rubber hydrochloride.

Advisory visits in New crepe factories (D. S. Muthukuda):

THE ADVISORY VISITS IN CONNECTION WITH THE ORGANISATION OF NEW CREPE FACTORIES ARE AS FOLLOWS:

Badureliya factory site	5
Waharaka factory site	1
Silverdale factory	5
Yataderiya factory	7
Kuruwita factory	3
Smallholdings Dept., NPRU Plantations Ministry	30

Advisory visits (D. S. Muthukuda):

Details of the advisory visits made in connection with the manufacture of raw natural rubber are given in table 7.

TABLE 7

ADVISORY VISITS DONE DURING THE YEAR 1973

District	No. of visits	Advice on RSS manufacture	Advice on crepe manufacture	Latex weighing
Colombo	10	7	3	—
Kegalle	19	6	7	6
Kalutara	70	20	37	13
Kalani Valley	28	14	8	6
Kurunegala	4	—	2	2
Ratnapura	21	3	3	6

Conferences, publications and public lectures

Conferences:

The followcng papers were presented at the International Rubber Conference held in Sri Lanka in June,

1. The preparation and uses of cyclised rubber and chlorinated rubber by M. Nadarajah, H. Narangoda, C. G. Balasingham and P. P. Jayasinghe.

2. Papain as a coagulant for NR latex by M. Nadarajah, P. A. J. Yapa, C. G. Balasingham and S. Kasinathan

3. The Cenat Proocess for upgrading rubber by D. C. Wickramesinghe and S. W. Karunaratne

4. Use of HCl as a coagulant for NR by S. W. Karunaratne and K. A. Piyadasa

The above papers will be published in a special issue covering the Conference.

A conference on pale crepe was held during the year and the contribution from the Rubber Chemistry Department was, by far, the most informative. The following papers were read at this conference.

1. Prospects for pale crepe a point of view by S. W. Karunaratne

2. Grading of pale crepe with a bias to method of manufacture by M. Nadarajah and D. S. Muthukuda.

3. The manufacture of pale crepe in central factories in Sri Lanka byM. Nadarajah.

After attending the ISO/TC 45 meeting in Paris, Mr. S. W. Karunaratne prepared a paper on the ISO/TC 45 conference for internal distribution and for the information of the Bureau of Ceylon Standards.

Mr. S. W. Karunaratne also published a confidential report on his visit to the Peoples' Republic of China to initiate a dialogue on technical matters connected with NR, mainly on the presentation of NR in its various forms.

Prevocational studies on 'The Rubber Industry'

It has been widely felt that the highly academic approach associated with present school curricula tends to alienate pupils from the realities of the employment situation. They learn little about the productive possibilities of agriculture, horticulture and small scale industries and partly for this reason seek white collar work. The Curriculum Division of the Department of Education approached us and requested us to give them some guidelines for preparing pupils for prevocational studies in the 'Rubber industry'.

A committee consisting of Dr. P. A. J. Yapa, Asst. Rubber Chemist as Chairman with Messrs. W. C. Dayaratne, W. D. Dharmasena, H. Narangoda and K. A. Piyadasa. Technical Assistants, prepared a report on the chemistry and technology of the rubber industry and this report has been highly commended. Mr. S. W. Karunaratne co-ordinated the activities which culminated in this report, after having initial discussions with the curriculum officials.

Three undergraduate students were employed on a temporary basis for a period of over 2 months during the latter part of the year. Two of the students (Miss S. Gamage and Mr. A. K. Withana) carried out a series of analytical tests and another (Mr. B. A. C. Abeywardena) designed an effective exhaust system for the muffle furnances used for dry ashing of NR.

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Public lectures

Mr. S. W. Karunaratne attended the first meeting of a series of smallholders conferences and spoke on the factors affecting the coagulation of latex. The substance of this talk appeared in the Sinhala Journal of the RRISL, *Rubber Puwath*, **3,** 7 on "Facts about rubber".

After his visit to China Mr. S. W. Karunaratne addressed the I.R.I. of Sri Lanka (Ceylon) on "The requirements of NR for the Chinese Rubber Industry".

Mr. D. S. Muthukuda addressed a number of smallholders meetings conducted throughout the Island during the course of the year.

A talk was given by Dr. P.A. J. Yapa on 13.7.73 at Vidyodaya Campus, University of Sri Lanka on "Recent advances in the biochemistry of phloem transport".

A talk on post graduate work carried out at Bedford College, University of London was given by Dr. P. A. J. Yapa to the Scientific staff of the Rubber Research Institute on 10.10.73.

A lecture on the post graduate studies carried out by him at the University of Aston was given by R. Tharmalingam to the staff of the Institute.

Other activities

Mr. M. Nadarajah functioned as a committee member of the I.R.I. (Ceylon Section) throughout the year. RRISL extended its fullest corporation to the Bureau of Ceylon Standards in the drafting of a number of the standards relating to both elastomeric and plastic products. The main activity was in the field of natural rubber (NR). Mr. S. W. Karunaratne was the Chairman of the following drafting committees.

(a) Revision Committee on NR
(b) Drafting Committee on NR latex
(c) Drafting Committee on braided fabrics
(d) Drafting Committee on vulcanized rubber products
(e) Drafting Committee on the packaging of rubber.

Mr. M. Nadarajah chaired the drafting committee on NR bottle teats and valves.

Mr. R. Tharmalingam participated in the drafting committee on plastic containers and packaging of rubber.

The Revision Committee for NR completed its work and a scheme for the technical specification of NR in block forms was finally accepted for publication. The test methods, embodied in this standard fall in line with the latest ISO recommendations and also fall in line with the SMR scheme. The local equivalent of which is the Standard Lanka Rubber Scheme (SLR Scheme). Formerly it was referred to as the SCR Scheme.

The Rubber Chemistry Department organised a short course of training for Rubber Inspectors from the Rubber Control Department during November, 1973. The training was mainly on the manufacture of raw rubber.

Classes in Rubber Technology

Messrs. M. Nadarajah (A.I.R.I.), S. W. Karunaratne (A. I. R. I.). H. Narangoda (L.I.R.I.) and K. A. Piyadasa (L.I.R.I.) assisted the Institute of the Rubber Industry (Local Branch) to conduct classes in Rubber Technology in order to prepare students for the LIRI examination conducted by the IRI (London Section).

Mr. S. W. Karunaratne also assisted the University of Sri Lanka in organising Polymer Laboratory and he also accepted the invitation to assist the University of Sri Lanka Vidyodaya Campus, to draw up a syllabus of 16 lectures to be delivered to undergraduate students, starting early 1974.

Publications

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Dharmasena, W.D. (1973). Use of natural rubber latex as an industrial raw material. *Rubber Puwath,* **3,** 1-6, (in Sinhala)

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Jayasinghe, P. P. (1973). The future of natural rubber in adhhsives. *RRISL Bulletin* **8,** Nos. 3 & 4 (in press).

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Patents

The following patents have been filed.

1. Use of leather waste in dry rubber compounding. W. S. E. Fernando and C. G. Balasingham (Complete specification).

2. Use of cyclised rubber in emulsion paints. H. Narangoda and M. Nadarajah (complete specification).

REVIEW OF THE ESTATE DEPARTMENT

BY

S. DE S. DALUWATTA

(Estate Superintendent)

SUMMARY

The Institute's Group of Estates, know as Dartonfield Group, comprised of Dartonfield Division at Agalawatta, Nivitigalakele Division at Matugama and Hedigalla Division at Lathpandura. The total extent of the Group including the jungle area of 377 acres, 3 roods and 38 perches (152.97 ha). stood at 1,548 acres 0 roods and 30 perches (626.53 ha). The planted acreage stood at 991¼ acres out of which 788¾ were in tapping during the year. The immature areas and nurseries amount to 175 acres and 27½ acres respectively.

The weather conditions especially at Hedigalla Division were not at all favourable for tapping and harvesting of crop. Heavy rainfall recorded in the months of May, June, July, October and November interrupted tapping.

The crop harvested 475,635 lb represented an average yield of 559 lb/ac and fell short of the estimate by 16.56%.

The incidence of *Oidium heveae* during refoliation of early winterers was very light, but late winterers at Hedigalla Division were adversely affected, resulting in a mild attack. Extra spot dustings of sulphur were carried out at Hedigalla to achieve a satisfactory control.

The incidence of *Phytophthora* and *Gloeosporium* leaf fall was negligible this year. A few scattered cases of Bark Rot were treated in the Group.

A lower demand for budwood was noticed during the year.

Routine weeding, manuring, disease control and other agricultural operations were carried out in both mature and immature areas of the Group.

Estimates for 1974 in connection with the working of the Group, were prepared and submitted to the Rubber Research Board for approval.

DETAILED REVIEW

Staff

The Estate Superintendent, Mr. S. de S. Daluwatta, was on duty throughout the year. Mr. D. H. Ariyaratne, the Assistant Estate Superintendent who was on duty during the year gave notice of resignation on 15th December, 1973 terminating his services with the Institute from 31st January, 1974.

Mr. B. H. Withanachchi, Accounts Clerk was promoted as Internal Audit Clerk on 2.2.73 and the post remained vacant. Mr. L. H. Samaranayake, Asst. Nursery Manager who was under interdication was reinstated on 3rd July 1973. Mr. S. Soysa was appointed as K.P. to Hedigalla Division on 1st January. Mr. K. A. Sadiris the Estate Office Peon was promoted as Head Peon to Head Office and Mr. L. K. B. Gunasekera was transferred from Head Office as Peon to Estate Office on October 1st.

The Estate Department cadre stood at 28 at the end of the year, made up as follows :—

Senior Staff	...	1
Intermediate Staff	...	1
Assistant Staff	...	17
Minor Staff	...	9
		28

Correspondence

Inward	...	398
Outward	...	1050

Acreage Summary

	Dartonfield			Nivitigalakele			Hedigalla			Total		
	A.	R.	P.	A.	R.	P.	A.	R.	P.	A.	R.	P.
Mature ..	103	0	00	83	1	00	602	1	35	788	2	35
Immature ..	15	0	00	48	2	00	111	2	00	175	0	00
Nurseries ..	6	2	00	9	3	07	11	1	04	27	2	11
Total ..	124	2	00	141	2	07	725	0	39	991	1	06
Abandoned ..	2	0	00	13	3	19	61	3	08	77	2	27
Building sites *etc.* ..	45	0	15	15	1	33	8	1	18	68	3	26
Pinewood plantation	—	—	—	—	—	—	1	0	34	1	0	34
Roads ..	6	2	22	—	3	27	9	0	04	16	2	13
Swamp areas ..	—	—	—	0	2	08	0	2	20	1	0	28
Streams reservations ..	—	0	29	—	—	—	13	0	29	13	1	18
Jungles *etc.* ..	—	—	—	1	3	38	376	0	00	377	3	38
	178	1	26	174	1	12	1195	1	32	1548	0	30

Visiting Agent

The Visiting Agent, Mr. M. R. C. Peiris paid two visits to Dartonfield Group on 5th and 6th January and 24th and 25th July.

Weather (estate guage)

Month	Dartonfield 1973 in.	Dartonfield 1972 in.	Nivitigalakele 1973 in.	Nivitigalakele 1972 in.	Hedigalla 1973 in.	Hedigalla 1972 in
January ...	2.32	4.95	3.27	4.89	2.45	6.74
February ...	4.70	2.68	4.26	0.38	14.59	3.22
March ...	17.77	8.72	13.78	6.01	18.67	7.64
April ...	14.73	11.36	9.26	10.46	12.02	11.70
May ...	18.82	29.11	15.19	27.10	18.58	26.14
June ...	20.24	33.19	18.04	30.09	24.32	29.87
July ...	23.04	6.12	21.66	5.68	19.39	6.87
August ...	4.99	8.03	10.88	7.62	8.06	8.13
September ...	7.10	20.44	5.39	17.94	7.74	24.40
October ...	20.44	15.59	23.38	14.38	25.97	24.40
November ...	22.55	17.46	14.16	16.42	17.71	22.31
December ...	10.33	5.95	7.08	9.47	18.51	6.13
	167.03	163.60	146.35	150.44	188.01	177.55
Average (five-year period) ..	169.02 in.		154.27 in.		183.43 in.	
Total No. of wet days ...	231	216	196	195	235	186

The total rainfall for the year at Dartonfield, Nivitigalakele and Hedigalla Divisions amounted to 167.03", 146.35" and 188.01" on 231, 196 and 235 days respectively. The second and the fourth quarters of the year were wetter than the other two quarters. The wettest months for the group were May, June, July, October and November. The highest rainfall recorded was in October/ at Hedigalla Division and, amounted to 25.93"

Crop

The weather conditions, especially at Hedigalla Division, were unfavourable for tapping and collection of harvest. The factors which contributed to the short fall in crop during the year were :

(1) Unusual and uneven rainfall during the cropping months of May, June, July, October and November.

(2) Very poor out-turn of village tappers, especially at Hedigalla Division during paddy cultivating and harvesting seasons and on late tapping days. There was also a drop in out-turn due to food production work.

(3) The intensification of the replanting programme at Hedigalla Division resulted in uprooting a higher acreage which caused a loss of about 20,000 lb in crop.

	1973	1972
Estimated	570,000 lb	585,000 lb
Harvested ...	475,635 lb	452,77 lb
Deficit ...	94,365 lb	132,223 lb

The crop harvested for the year was 83.44% of the season's estimate.

Comparative yield records of individual fields

		Acreage in	Total yield in lb		Yield in lb per acre	
Dartonfield		tapping	1973	1972	1973	1972
1950/51	Replanted area	12¾	3708	4748	290.8	208.7
1952	,, ,,	27	18674	18921	691.6	700.8
1953	,, ,,	8	4984	4690	623.0	586.3
1954	,, ,,	2½	1735	1788	694.0	715.2
1955	,, ,,	5	3445	2807	689.0	561.4
1955/56	,, ,,	4¾	3555	3084	748.4	649.3
1960/61	,, ,,	31½	24255	21428	770.0	680.3
1965	,, ,,	11½	4839	1435	420.8	124.8
		103	65195	58901	633.0	521.2
Nivitigalakele						
1946	Clearing	—	—	2581	—	234.6
1953	,,	10	5414	6119	541.4	611.9
1954	,,	10	5886	5954	588.6	595.4
1962	,,	16¾	18999	18297	1134.3	1092.4
1963	Replanted Area	14	12369	10740	883.5	767.2
1964	,, ,,	8	7172	6344	896.5	793.0
1965	,, ,,	10	7224	4564	722.4	456.4
1966	,, ,,	5¾	3054	2183	531.1	379.6
1967	,, ,,	8¾	3139	550	358.7	62.8
		83¼	63257	57332	759.8	670.5
Hedigalla						
1949	Clearing	34¾	11813	26635	339.9	766.5
1950/51	,,	18	8990	8688	499.4	482.7
1952	,,	79½	65342	48087	821.9	604.8
1953/1965	,,	144	91080	62354	632.5	433.0
1954	,,	171	79673	89283	465.9	522.1
1955	,,	78	37473	49727	480.4	637.5
1956	,,	60	40436	39418	673.9	657.0
1957	,,	17¼	10943	12352	634.4	716.1
		602½	345750	336544	573.9	558.6
Earth Scrap	..	—	1433	—	—	—
Total for the Group	..	788¾	475635	452777	603.0	559.2
Other sources	..		129246	82121		
Total	..		604881	534898		

Tapping

Tapping was continued throughout the year including the 'wintering' period.

All tapping panels in experimental areas were treated with Antimucin but not in the commercial areas. Tapping cuts were marked with appropriate guide lines for bark consumption on the recommendations of the Scientific Departments.

The following fields due to be replanted in 1974 ceased to be tapped :

Dartonfield	...	1950/51	...	10 acres
Nivitigalakele	...	—	...	—
Hedigalla	...	1949—1950/51	...	52 acres

Analysis of tapping rounds on Dartonfield Group for 1973 (1972 figures in brackets)

Dartonfield

	Early Tapping		Late Tapping	Winter rest	Rain	No Tapping Holidays	Strike
1st Qtr.	70	(79)	15 (11)	— (—)	— (—)	1 (1)	4 (—)
2nd ,,	37	(43)	15 (11)	— (—)	33 (26)	6 (5)	— (—)
3rd ,,	55	(63)	17 (4)	— (—)	20 (25)	— (—)	— (—)
4th ,,	44	(59)	23 (22)	— (—)	24 (10)	1 (1)	— (—)
	206	(244)	70 (54)	— (—)	77 (61)	8 (7)	4 (—)

Nivitigalakele

1st Qtr.	71	(76)	15 (14)	— (—)	4 (1)	— (—)	— (—)
2nd ,,	37	(34)	14 (22)	— (—)	35 (30)	5 (5)	— (—)
3rd ,,	50	(51)	15 (19)	— (—)	27 (22)	— —	— (—)
4th ,,	44	(52)	16 (27)	— (—)	32 (13)	— (—)	— (—)
	202	(213)	60 (82)	— (—)	98 (66)	5 (5)	— (—)

Hedigalla

1st Qtr.	65	(77)	9 (11)	— (—)	16 (2)	— (1)	— (—)
2nd ,,	41	(33)	3 (19)	— (—)	39 (32)	8 (7)	— (—)
3rd ,,	62	(41)	4 (20)	— (—)	26 (31)	— —	— (—)
4th ,,	43	(37)	6 (40)	— (—)	43 (15)	— (—)	— (—)
	211	(188)	22 (90)	— (—)	124 (80)	8 (8)	— (—)

Manufacture

A summary of the various forms of manufacture during the year is given below :

Latex grades	Total lb	Percentage
Pale crepe No. 1 ..	295404	62.11
,, ,, ,, 2 ..	13716	2.88
,, ,, ,, 3 ..	95268	20.03
Latex for experiments ..	4792	1.01
	409180	86.03
Scrap grades		
Scrap crepe No. 1 ..	23732	4.99
,, ,, ,, 2 ..	25617	5.79
,, ,, ,, 3 ..	16613	3.49
Scrap for experiments ..	493	0.10
	66455	13.97
Total ..	475635	100.00
Outside sources ..	129246	
	604881	

Difficulties were encountered in the manufacture of No. 1 crepe due to the following reasons :

(1) Higher number of wet days in some months, pre-coagulation effects occurring in the latex during these periods were above normal.

(2) Over 200 varieties of budded rubber in tapping, out of which RRIC clones alone number from 1 to 99. The latex obtained from all these clones is not entirely suitable to achieve a satisfactory outturn of No. 1 crepe.

(3) The tapping intensity at Hedigalla (i.e. 72% of the total acreage) ranges from 133 to 400% due to the future replanting programme, the 'yellow' latex resulting is not suitable for manufacture of No. 1 crepe.

Rubber from outside sources

101512 lb latex collected by the Multi Purpose Co-op. Society, Lathpandura, from smallholders were manufactured for pale crepe and sold for them. A subsidised sum of -/22 cts. per lb was levied as manufacturing and transport charges. (The rate was increased from 15 cts. to 22 cts. in November). 26264 lb latex received from Barrow Dale Estate were manufactured into crepe.

Factory machinery

New copper bearings were supplied and fitted to the layshaft of the driving equipment of mill No. 2 as the existing bearing wore out.

A new 30 amp TPIC switch fuse was fitted to mill No. 6.

The starter of mill No. 7 was replaced. One 12½ hp D.C. motor and one 20 hp A. C. motor removed from the factory machinery were handed over to the Electrical Foreman to be used in the Specifications Laboratory.

Pests and diseases

Oidium heveae—An attack of *Oidium* leaf disease was recorded at Hedigalla Division in the late wintering areas, and on the advice of the Director an extra round of dusting was carried out.

Brown Bast—The incidence of Brown Bast was heavier due to the higher intensity of tapping. Remedial measures were adopted.

Storm Damage—On 27th March 1973 a gale swept across the Hedigalla Division damaging 864 trees.

Capital account—agricultural development

Dartonfield Division

1973 Replanting—15 acres

Nivitigalakele Division

1968	replanted area ..	2½ acres
1970	,, ,, ..	17½ ,,
1971	,, ,, ..	11½ ,,
1972	,, ,, ..	6 ,,
1973	,, ,, ..	11 ,,

Hedigalla Division

1967	replanted area ..	10 acres
1967	,, ,, ..	7 ,,
1968	,, ,, ..	9¼ ,,
1969	,, ,, ..	22¼ ,,
1970	,, ,, ..	26¼ ,,
1971	,, ,, ..	17 ,,
1972	,, ,, ..	20 ,,

1967 Replanted areas

(*a*) 10 *acres at Hedgalla Division:* This area is planted with clones RRIC 41, 45, 86, 88, 89, 101, Nos. 451, 1004, 1010, 1108 and 1174.

(*b*) 7 *acres at Hedigalla Division:* The old budwood nursery established in 1967 was converted to a clearing. The clones in this area are the RRIC series and RRIM 600.

1968 Replanted areas

(*a*) 2½ *acres at Nivitigalakele:* This area includes plants of clones RRIC 5, 41, 52, 89, RRIM 623 and Tjir 1. The growth is satisfactory.

(*b*) 9½ *acres at Hedigalla:* This area consists of clones RRIC 45 and RRIC 101, also Nos. 135, 451, 1004, 1152, 1174 and 1305. The growth is vigorous and ground covers are satisfactory.

1969 Replanted areas

22½ *acres at Hedigalla Division:* The clones in this area are RRIC 45, 100, 101 and Nos. 451, 1103, 1175 and 1458. The plantation is quite good.

1970 Replanted areas

(*a*) 17½ *acres at Nivitigalakele:* The plantation consists of 2 acres of stumped buddings with clone RRIC 45 and the balance of clones RRIC 13, 45, 100, 101, PR 252, IRCI 2, WR 101, AVROS 1734. The growth is satisfactory.

(*b*) 26¼ *acres at Hedigalla Division:* 8 acres are planted with stumped buddings of clones RRIC 45, the balance acreage consists of clones RRIC 100 and 101. The growth is satisfactory.

1971 Replanted areas

(*a*) 11½ *acres at Nivitigalakele*: Budded stumps of clones RRIC 50 are planted in a 4½ acre block. The balance 7 acres are planted according to the requirements of the Botany Department. The plantation is satisfactory.

(*b*) 17 *acres at Hedigalla*: This area consists of clones RRIC 15, 48, 50, 101 and PR 252.

1972 Replanted area

(*a*) 6 *acres at Nivitigalakele*: This is an experimental plantation by the Genetics and Plant Breeding Department. The clones in this area are RRIC 45, 110, No. 506 and selected seedlings of experimental material.

(*b*) 20 *acres at Hedigalla Division*: The area is planted with clones RRIC 100 and 101.

1973 Replantings

(*a*) *15 acres at Dartonfield:* 3½ acres consists of clone RRIC 101 and comes under Soils Chemistry Department experiments. 10 acres planted with clone PB 86 for the Pathology Department experiment. The balance 1½ acres planted by the Botany Department with multiple clones.

(*b*) *11 acres at Nivitigalakele:* This area which was due to be replanted in 1973 was postponed for 1974 on the advice of the G. & P. B. Department.

Nurseries

Budwood multiplication nurseries—5½ acres at Dartonfield, 7½ acres at Nivitigalakele and 7 acres at Hedigalla.

(a) Routine weeding, manuring, cleaning of drains and other agricultural operations were carried out.

(b) All over-matured budwood points were lopped off for fresh budwood.

Seedling stock nurseries—1 acre at Dartonfield, 2½ acres at Nivitigalakele and 1 acre at Hedigalla

(a) The seedling stock nurseries were maintained and routine agricultural operations were carried out.

(b) Stocks were budded to meet both experimental and commercial requirements.

(c) ½ acre was prepared for establishing a new nursery at Nivitigalakele Division.

Budwood issues

(a)	To outside estates	..	953 yards
(b)	To Nivitigalakele budgraftings	..	93 ,,
(c)	To Botany Department experiments	..	273 ,,
(d)	To Genetics and Plant Breeding Department	..	28 ,,
			1347 ,,

Budded stumps issues

(a)	Outside estates	..	1190 budded stumps
(b)	Estate Department replantings	..	1800 ,, ,,
(c)	Budwood nurseries	..	1005 ,, ,,
			3995 ,, ,,

Field and technological experiments

The Rubber Chemistry, Botany, Plant Pathology, Genetics and Plant Breeding and Soils Chemistry Departments were given labour and necessary assistance for carrying out their field and technological experiments.

Roads

All motorable roads, within the estate and approach roads were maintained in good order, effecting surface repairs where necessary.

Estimastes

Estimates for 1974 both capital and revenue in respect of Dartonfield Group were prepared and submitted to the Rubber Research Board for approval.

Labour and health

Labour force

Though the labour force was adequate, during normal periods, the outturn of tappers and sundry workers especially at Hedigalla Division was disappointing.

138 labourers at Dartonfield Division belonging to the United Corporation & Mercantile Union who went on strike on 23.3.73 returned to work on 26.3.73.

Applications for refund of E.P.F. dues in respect of 48 individuals were made during the year out of which 40 cases were settled in full. A, B & H membership forms to the E.P.F. in respect of 382 members are being cleared now.

28 labourers reaching the age limit were retired. 11 workers left on medical grounds. Retiral Gratuity dues were paid to these labourers in accordance with provisions stipulated.

Eleven labour tribunal cases were reported during the year. Five applications were dismissed and two were amicably settled. In all cases the Estate Superintendent appeared for the Management.

Three Trade Unions operated in the Group during the year. The United Corporation & Mercantile Union has the largest membership, consisting of 355 workers.

Wages

Wages were paid during the year in accordance with the Wages Board's Ordinance in force. In addition to the minimum wages the following allowances were paid :—

(1) Emergency Special Allowance
(2) Temporary Interim Allowance and
(3) Price Wage Supplement.

Dartonfield Group

Working Ceylonese	Resident	Non-resident	Total
Men	94	142	236
Women	90	102	192
Children	—	—	—
Working Immigrants			
Men	34	—	34
Women	26	—	26
Children	—	—	—
	244	244	488

Line rooms

Line room accommodation was satisfactory. Repairs to lines and labour cottages where necessary were carried out.

Annual holidays

Annual holidays with pay were given to all labourers who were entitled, in accordance with the Labour Ordinance.

Festival advances

Substantial advances were paid to all labourers to celebrate their main festivals, monies to be recovered in 10 months.

Maternity benefits

20 full and 5 alternative maternity benefit payments were made.

Workmen's compensation

11 accidents sustained to workers during working hours were reported and compensations were paid according to regulations.

Feeding children

Due to the scarcity of flour, the issue of free bread and flour ceased and from 15.11.73, the value of flour is being paid to the children.

Co-operative stores

The two Co-operative stores at Dartonfield and Hedigalla Divisions continued to cater to the needs of the resident labour force.

Workers' Councils

Two Workers' Councils, one at Hedigalla Division and one at Dartonfield and Nivitigalakele Divisions continued to function and assisted the Management.

Health

The health of the members of the Institute's Staff and of the estate labourers was satisfactory. There was among the Indian Labour population a mild incidence of Amoebic Colitis. There was also an eqidemic of a virulant form of fever among the residents at Dartonfield Division during the months of October, November and December.

The Anti T.B. Unit of Kalutara District carried out two rounds of B.C.G. vaccination on resident children. Immunisation against Polio and vaccination against small pox were also carried out.

Births

20 births were recorded in the Group during the year.

Deaths

4 deaths occurred during the year in the Group.

A list of diseases treated by the Institute's Estate Medical Assistants is given below :

Inflenza	914
Ulcers	601
Roundworm	518
Diarrhoea and enteritis	256
Eye and ear diseases	380
Other diseases	7012
Total	9681

General

Barrow Dale Estate which was acquired by the D.R.O., Agalawatta was handed over to the Estate Department for management on 16.8.73.

The Estate Superintendent visited Farnham Estate, Puwakpitiya, twice during the year at the request of the Director, Land Reform Commission. Two reports on this estate were submitted to the Commission.

REVIEW OF THE KURUWITA SUB-STATION

BY

SALIE M. DIAS

Acreage statement

MATURE RUBBER

	A.	R.	P.	Hectares
1961 Replanting	83	0	00	33.59
1962 ,, ...	38	3	00	15.68
1963 ,, ...	22	2	00	9.11
1964 ,, ...	18	0	00	7.28
1965 ,, ...	19	2	00	7.89
1966 ,, ...	10	0	00	4.05
1967 ,, ...	10	0	00	4.05
Total Acreage in tapping ...	201	3	00	81.65

IMMATURE RUBBER

	A.	R.	P.	Hectares
1968 Replanting	10	0	00	4.05
1969 ,, ...	10	0	00	4.05
Total immature acreage	20	0	00	8.10

	A.	R.	P.	Hectares
Total Rubber Acreage	221	3	00	89.74
Nurseries	2	0	20	0.86
Paddy	5	2	00	2.23
Roads, Buildings & uncultivated ..	17	1	10	7.01
Grand Total ..	246	2	30	99.84

Weather

	Rainfall	*Wet Days*
1972 ..	160.22 "	205
1973 ..	156.67 "	218

The year under review commenced with the seasonal drought which was fairly severe and crop intakes fell away towards the latter end of the drought. October and December which are normally heavy cropping months had unsually inclement weather. A freak storm towards the latter end of March resulted in the loss of nearly 10 acres rubber. Extensive work had to be carried out in clearing the storm damage.

Crop

	1972	1973
Estimate ..	165,000 lb	165,000 lb
Secured ..	142,709 lb	147,554 lb
Decrease ..	Nil	Nil
Increase ..	12,445 lb	4,845 lb

Inspite of the inclement weather conditions during the early part of the year due to dry weather conditions and rain interference during the two good cropping months October and December, coupled with the loss of nearly 10 acres due to the March freak storm, the crop harvested registered an increase of 4,845 lb over the previous season. The intake per tapper has increased to 16.14 lb as compared to 14.67 lb the previous season.

Manufacture :

The Sub-station commenced the sale of its coagulam since August to an outside manufacturer at very favourable prices and made a further useful saving on power transport and manufacturing labour. This arrangement is working satisfactorily with the outside manufacturer collecting the coagulam at the Sub-station factory. The latex will be sold to the Central Crepe Factory once this commences operation during 1974.

Buildings

The old set of abandoned lines, have been converted into a staff quarter, and two large stores for fertilizer, sulphur *etc.*

Staff

Mr. M. C. Perera continues as the Senior Field Assistant on the property.

Labour

Labour has been irregular in attendance and at times troublesome, but on the whole has been more settled. Labour was paid the price wage supplement, though in the adjoining estate now owned by the Land Reform Commission this payment was withdrawn, since the take over.

General

The property has made for the first time a small profit of approximately -/12 cts. per lb, mainly due to the manufacturing arrangements since August this season. If prices continued to be favourable the property should register a reasonably handsome profit in 1974.

Mr. M. R. C. Peiris, continues as the Visiting Agent and has been giving valuable advice and assistance.

I wish to place on record my thanks for the assistance and co-operation I have received from the Director, Administrative and Scientific staff during the year under review.

REVIEW OF THE STATISTICAL SECTION

BY

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A field experiment was commenced at the beginning of the year to study the day-to-day variation in rubber yields. Amounts of latex flowing at short intervals were also measured. Later, girth measurements of individual trees were undertaken in a young replanting, comprising of plots under differential fertilizer treatments. It is intended to study the seasonal patterns of and plot-size requirements with the data collected. Asymptotic regression curves are expected to fit latex-flow-curves and growth-curves adequately.

A small scale survey was started at Ratnapura to understand difficulties in similar work with smallholders. It was possible to continue this throughout the year with the assistance of the R.R.I. Smallholdings Department. Yields records and tapping charts of a few large estates were collected. Towards the latter part of the year leaf samples were brought from different places for further leaf area studies. (Initial studies were reported in the 1971 Annual Review of the Statistics Section). A joint research project in the analysis of long-term experiments is being undertaken together with Dr. R. D. Stern, Lecturer at the Reading University, presently attached to the Mathematics Department of the University of Sri Lanka, Colombo Campus.

Routine analyses of experimental results of other Departments were carried out Requests for new designs, regression analyses *etc.* were fulfilled and any advice in the field of statistics was given when sought for.

An evaporation gauge was installed at the Dartonfield meteorological station. An officer from the Meteorological Department assisted in installing the sun-shine records at Nakiyadeniya Estate. Pluviographs at Elpitiya, Atale and Eladuwa Estates were repaired. Considerable time was spent in tabulating meteorological data from past years at the request of research workers here and abroad. A summary of the data recorded at ihe Dartonfield meteorological station during the year is annexed.

There was no change in the staff during the course of the year. The Assistant Statistician was granted permission to attend lectures in Econometrics and Applied Stochastic Processes, a short, part-time course conducted by the Colombo Campus of the University of Sri Lanka. Messrs. S. D. Wimalaratne. Research Scholar, Botany Department and G. R. Chandrasiri, Assistant Economist acknowledged the assistance given by the Statistics Section to obtain their M.Sc. degrees.

METEOROLOGICAL STATISTICS

Longitude 60° 09'E Latitude 6°32'N Height Above Sea Level 6553.2 cm.(215')

DARTONFIELD

AGALAWATTE

Month	Precipitation			Shade Temperature				Ground Temperature									Minimum Temp. on Grass	Atmospheric Pressure		Total Hours of Sunshine
								Average at 8.30 a.m.					Average at 3.30 p. m.							
	Monthly Totals	Greatest Daily Fall and Date	No. of Rainy Days	Average Daily Max	Highest Maximum and Date	Mean Daily Min	Lowest Minimum and Date	122 cm Below	30 cm Below	20 cm Below	10 cm Below	5 cm Below	122 cm Below	30 cm Below	20 cm Below	10 cm Below	5 cm Below		Average at 8.30 a. m.	Average at 3.30 p.m.	
Jan.	61.25	45.25(29)	3	32.6	34.0(7)	20.6	19.0(22)	29.0	27.4	—	26.7	—	—	—	31.3	29.4	—	16.7	758.36	—	156.7
Feb.	147.60	41.25(2)	5	38.2	35.5(10)	22.0	29.8(28)	—	28.3	—	27.5	—	—	—	32.4	29.6	—	18.8	758.93	—	208.0
March	444.25	51.26(24)	15	32.0	35.0(5)	22.0	20.0(1)	—	28.7	—	27.5	—	—	—	—	—	—	17.8	758.09	—	189.8
April	374.75	59.75(2)	18	32.2	34.5(20)	23.9	21.5(2)	—	28.7	—	28.2	—	—	—	31.1	30.6	—	19.0	758.09	755.62	128.6
May	470.50	65.00(13)	22	31.4	32.8(2)	23.6	21.5(3)	29.7	29.4	29.2	28.2	—	29.6	29.5	31.3	29.9	—	19.4	757.01	755.88	133.5
June	506.00	52.50(4)	20	30.6	32.2(10)	23.1	21.0(29)	29.4	29.2	28,6	28.1	27.8	29.5	29.4	29.5	30.1	30.8	22.7	758.69	755.49	103.1
July	578.50	124.50(31)	18	29.6	32.2(15,16)	22.3	21.0(25)	29.1	28.4	27.8	27.4	27.2	29.1	28.8	28.9	29.8	30.8	21.3	756.50	755.35	149.9
Aug.	124.75	31.00(26)	17	30.0	31.' (6,7,8,2,3,)	22.2	21.0(5)	28.6	28.1	27.8	27.6	27.2	28.6	28.3	28.4	29.4	30.3	18.7	—	—	157.8
Sep.	178.00	44.50(26)	11	31.0	33.0(17)	21.7	20.0(5,')	28.9	28.7	28.1	27.7	27.6	29.0	28.9	29.2	30.3	31.4	19.5	758.03	755.89	193.3
Oct.	531.50	81.28(19)	24	30.3	33.0(19)	23.0	21.0(8,13)	28.7	28.2	27.7	27.4	27.5	28.9	28.4	28.5	29.7	30.2	19.3	757.93	756.51	130.4
Nov.	549.00	104.00(4)	14	31.4	34.2(14)	21.2	17.9(11)	28.2	27.8	27.2	26.8	26.6	28.3	28.0	28.4	29.3	30.2	16.7	757.45	756.74	150.9
Dec.	257.16	109.50(21)	18	29.9	34.0(10)	20.6	18.0(28)	28.2	27.5	26.9	26.7	26.5	28.2	27.9	28.0	28.9	30.3	15.1			117.4
Total	4218.26		180																		1819.4
Av.	351.53		15	31.2		22.2		28.8	28.4	27.9	27.5	27.2	28.9	28.7	29.7	27.9	30.0	18.8	757.71	755.93	151.6

All measurements are in standard metric units