THE
RUBBER RESEARCH INSTITUTE OF SRI LANKA (CEYLON)

ANNUAL REVIEW FOR 1972

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Establishment Clerk	..	D. G. Udawatta
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Estate Superintendent	..	S. de S. Daluwatta
Assistant Estate Superintendent		D. H. Ariyaratne

Office Assistant	..	A. C. Swaris
Chief Clerk	..	B. H. Rodrigo
Accounts Clerks	..	D. A. Rajapakse B. H. Withanachchi
Junior Assistant Clerks	..	G. S. Doolwela G. Kannangara
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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
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Asst. Nursery Manager	..	L. H. Samaranayake

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

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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.)
J. N. Kumarasena, B.A. (Cey.)
W. Leelaratne, B.A. (Cey.)
K. N. Peiris, B.A. (Cey.)
K. S. Peiris, B.A. (Cey.)
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L. T. Perera, B.A. (Vidyalankara, Cey.)
K. G. D. Piyasena, B.A. (Cey.)
S. D. Ranasinghe, B.A. (Cey.)
Miss W. Ranasinghe, B.A. (Cey.)
S. K. Silva, B.A. (Cey.)
Miss K. K. Vithana, B.A. (Cey.)
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THE RUBBER RESEARCH INSTITUTE OF SRI LANKA (CEYLON)

DIRECTOR'S REVIEW FOR 1972

BY

O. S. PERIES

General

The country experienced a severe drought during the first quarter of the year. This, together with the low prices prevailing during the first three quarters of the year, resulted in a fall in production of rubber, far below the estimated figures. The Government fixed a floor price for rubber in mid-1972 at 80 cts per lb, this was increased to 83 cts in November, in the Finance Minister's budget speech. This was an urgently required aid to the industry, which had grappled with low prices in the world markets over a long period.

The last quarter of 1972 brought some welcome relief to the rubber industry. Starting the quarter at about 18½ U.S. cts, the rubber price reached 21¼ U.S. cts in October, and 21 3/8 U.S. cts by the end of the year — the highest price paid for natural rubber (NR) since mid - 1970. The present outlook is very promising, and there is every indication that the current prices will hold well into 1973.

The consumption of NR in the United States was 10 — 12% higher than in 1972, surpassing the 9% increase in consumption of synthetic rubber (SR). This should be the strategy for NR : to gain an ever increasing proportion of the growth of the consumption of all rubber in the world market. More NR must be produced at competitive prices, and there is no doubt that it will be sold. This subject was dealt with in some detail in the corresponding review for 1971, and the following paragraph from that report will bear repetition because of the urgent message it carries :

" In this price war there is no doubt that the rate of replanting in high yielding clones of rubber must be stepped up in Ceylon. Here we come up against the disincentive of reigning low prices for the product — nevertheless, in the long term, the stability of the industry lies in replanting. The 1971 figure of below 10,000 ac. (4,047 ha.) replanted, compares very unfavourably with the early years of the Rubber Replanting Subsidy Scheme, when more than 20,000 ac. (8,094 ha.) were replanted per year. If the present trend in replanting continues, by 1985, when all the old rubber was scheduled to be replanted, there will still be about 200,000 ac. (80,940 ha.) to be replanted. The Government must take cognizance of this fact and take remedial action."

Despite this urgent plea, the area replanted in 1972 was only a little above 5,000 ac. (2,024 ha.). This will have its repercussion in later years, when our production will drop, and consequently our foreign exchange earnings. This will be even more regrettable, if the price of NR increases in the years to come as there is every possibility of it doing. The fundamental fact in replanting is that it is the certain way to increasing production and reducing the cost thereof. The NR industry being a national asset, the Government is justified in taking any reasonable action to ensure that rubber is replanted at an acceptable rate, to complete the first cycle of replanting and start another by 1985. This matter is recommended as one requiring the urgent attention of the Government for immediate action.

Pale Crepe

The price of pale crepe fluctuated violently during 1972. Pale crepe is a product which commands a premium price in the world markets. It is universally accepted that Sri Lanka produces the best pale crepe in the world. Therefore, it is incumbent on the rubber industry of this country to study the manufacture and marketing of this commodity and take every possible action to preserve our domain and command premium prices for it. Any commodity is sold in the world market on its : (1) availability, (2) price (3) technical properties and consistancy of quality (4) presentation (5) sales promotion and (6) follow up service - technical advice.

Availability : the consumption pattern of Sri Lanka pale crepe has changed over the last few years. In the mid-sixties the U.S. and Britain bought practically all our pale crepe ; but now Russia and the East European countries buy about 40% of our crepes. Many of these countries with centrally planned economies place orders for large quantities of crepe at a time, so that if this material is taken off the market at once, the traditional small user may not get his requirements when he wants them. It is important to ensure that the consumer gets his requirements in the quantity, at the time, in the place where he requires it, at a reasonable price. Large off takes, at any particular time, create temporary shortages which tend to increase the price of a commodity. Therefore, it would be useful to increase pale crepe production marginally and ensure that large orders are supplied over a period of time, without creating temporary shortages in supply.

Price : a fair price for pale crepe would be about 10 — 15 cts above the price of RSS No. 1. When the price of any commodity is too high, the consumer always looks out for substitutes. Once he changes his compounding and machinery and adapts himself to using a substitute he is not likely to revert to the use of the original raw material, even at a lower price. Therefore, it is important to maintain a reasonable price for pale crepe, by a slight increase in production and using that as a buffer stock.

Technical properties and consistancy of quality : the technical properties of pale crepe can be specified and consistancy of quality ensured by this means, just as in the case of SMR. However, it is the considered opinion of this Institute that it would be unwise to technically specify pale crepe — it is a premium product, and by specifying its properties we could be bringing it down to the level of standard rubbers. It would be more advisable to specify the methods of production and give the major properties of the rubber *e.g.* fast or slow curing, high or low viscosity on the basis of production methods.

Presentation : crepes are now sold in various types of packages *e.g.* paper or burlap, or in wooden chests. The chests in which crepe is packed have been found to be inferior, with many *Albizzia* chests being damaged in transit. Pale crepe too should ideally be pressed into block of suitable size, wrapped in polythene and packed in paper bags or plywood chests. This will give it a better appearance, and ensure that the material arrives at the consumer's factory without contamination with dirt or splinters, which would nullify all the care in preparation of the article.

Sales promotion : at present pale crepe sells itself. It would be useful to advertise the care and attention that is taken in the preparation of high quality crepe, its purity, consistancy in quality, availability and make every effort to sell it actively ; rather than wait for the customer to come to the producer.

Technical follow up service : there must be a free and easy dialogue between the manufacturer and consumer of pale crepe. Therefore, it is essential to contact users of pale crepe, study their problems and give them the solutions to them. This Institute is now in a position to make a start in this direction.

These factors must be carefully studied and implemented without delay, in order to ensure that pale crepe remains a premium product. There is no doubt that there will be a special demand for pale crepe for a long time to come ; but it is not advisable to be complacent about it. The product must be sold in this age of competitive aggressive salesmanship, it cannot be expected to sell itself, as in the past.

Research

General : The buildings to house the Central Specifications Laboratory, the Rubber Chemistry Department and the Extension Services are being constructed at Ratmalana. The work on the Central Specifications Laboratory will be completed by mid - 1973 and the other buildings by the end of 1973. The staff of the Rubber Chemistry Department are gradually returning after post graduate studies abroad and by 1974, the full complement of staff will be available to surge ahead with the studies on new rubbers and new uses for NR.

Botany : The more recent high yielding selections were included in the Institute's Planting Recommendations for 1972. It appears that tapping can be continued without the normal winter rest in the wet districts without adverse effects on yield or growth. Continuous tapping with the use of polythene rainguards has depressed average yields per tapping in clones RRIC 7, 45, 52, and PB 86 in 1971. The yields improved in 1972 after the removal of rainguards. Tapping on the S/1, d/4, 100% system has depressed yields of clones RRIC 7, 45 and 52 in the second year. Clone PB 86 however has continued to maintain high yields during this period. Upward tapping on " V " cuts has given higher yields than tapping upwards on two quarter spiral cuts or ladder tapping at 100 in. above ground level.

In preliminary small scale trials, the high yielding clones RRIC 13, 48, 50, IRCI 9 and PR 252 have failed to give an increased yield response to Ethrel stimulation on panel C. All large scale trials with Ethrel on panel C of clone PB 86 continue to show good yield responses in the second year.

Early results of stock experiments indicate the possibility of using seeds of most recommended clones as stocks for budgrafting. The first year yields of clone PB 86 budgrafted on seedling stocks of clones RRIC 7, 41, 52, 88 and 89 have been similar to those budded on selfed Tjir. 1 stocks. In good weather, trials have given better budding successes with 1 in. polythene strips than the conventional budding tape.

Preliminary results with a gutter type rubber rainguard developed at the Institute have been promising, This rainguard has two advantages over others in that it can be fixed on to the tree with field latex and it can be removed and refixed close to the tapping cut periodically. This rainguard is being tested on large scale trials on commercial estates at present.

Studies on the bacterial coagulations of latex at initial concentration are being continued. This process has been found to be suitable for coagulation of latex for block rubber production. The specific strains of bacteria can be added to the latex as dried cells or as liquid cultures.

Genetics & Plant Breeding : More information was available on the large scale performance of RRIC 101, 102 and 103. A 169 tree plot of RRIC 101 at Kuruwita showed yields of over 1000 kg/ha. (1121 kg/ha. = 1000 lb/ac.) in the first and second years of tapping when opened at five years. RRIC 102 and RRIC 103 were opened on a large scale on a commercial basis in an outside estate at four years and nine months, along with RRIM 623 as control ; 700 kg/ha. per yr was recorded from RRIC 102 ; this was approximately equal to that obtained from earlier recordings for this clone in RRIC estates. The initial yields of RRIC 103 were lower on this estate but the growth was better than equivalent plots in the RRIC estates.

Plant Pathology : Studies on the production of Phytoalexins (plant antibodies) were continued whenever rubber pods were available. It is known that phytoalexins are produced as a result of the interaction of the host and the parasite. There appears to be a correlation between the amount of phytoalexin produced and the resistance of the host to the pathogen concerned.

Intensive studies are being carried out on the biological control of White Root disease, including investigations on the action of sulphur, the rate of decay of rubber wood, selection of fungi causing rapid wood decay and testing their ability to act as antagonists to the pathogen.

A survey of the soil fungi present in the different rubber growing soils of Sri Lanka has also been completed, to assist in the studies on the biological control of White Root disease.

Soils Chemistry : A study on commercial rubber productivity in relation to soils, weather, management *etc.* was initiated in 1972. The data collected from this study is expected to be the frame work on which, a programme of fertilizer recommendations based on soil and foliar analysis is to be implemented. A study of the variation in leaf nutrient content throughout the year and the position of the leaf on the tree, was also carried out for the same purpose.

More field experiments were started to find out the suitability of substituting urea as a source of nitrogen in rubber fertilizer mixtures. Pot experiments were initiated to test the suitability of using the locally available Eppawela Apatite as the source of phosphorus in rubber fertilizer mixtures.

A new advisory circular on manuring was prepared and is being printed at present.

Rubber Chemistry : The Rubber Chemistry Department continued to give advice to large estates on problems connected with the manufacture of raw rubber. Sri Lanka must keep pace with changing market requirements and be prepared to change her RSS and pale crepe manufacture to meet consumer requirements and to market in block form if necessary. Work has been done at the RRIC on manufacturing easy processing RSS by adding 11% mineral oil and 0·3% peptiser to the rubber at the latex stage before coagulation.

Over 1000 tons of rubber seeds were collected in 1972 for the extraction of oil which was used in alkyd resin manufacture. There is a large prospective market for rubber seed oil. The manufacture of alkyds provide an opening for the exploitation of the thousands of tons of rubber seeds which are allowed to go waste on rubber estates at present.

A significant development has been the work on the use of formaldehyde as the stabilizer for field latex and the manufacture of centrifuged latex from formaldehyde stabilized field latex. This development has enabled the RRI to file Patents on manufacture of chlorinated rubber, use of natural rubber latex as general purpose adhesives, use of natural rubber latex-resin blends as adhesives for plywood and the use of NR latex - Portland cement mixes.

Extension : The two Extension Departments continued to give an efficient advisory service to all sections of the rubber planting industry. The Smallholdings Department has done yeoman service in the organisation of Group Processing Centres (GPC) for the collection and processing of smallholders' latex. Twenty GPCs were constructed or under construction by the end of the year.

Staff

The Director, the Heads of Departments and all Senior and Intermediate Staff officers were on duty throughout the year, except Dr. R. S. John, who was away from service from 7th January 1972 and discontinued from service in September 1972.

The Director, in addition to his normal duties, served as Director of the New Process Rubber Unit and overlooked the work of the Plant Pathology and Soils Chemistry Departments throughout the year.

The following officers were appointed to the Intermediate Staff Grade III during the year.

Mr. D. H. Ariyaratne, Assistant Estate Superintendent — 1st April
Mr. J. A. Amaraweera, Librarian & Publications Officer — 9th October

The following officers resigned from the services of the Institute during the year.

Mr. M. R. T. Mendis, Assistant Estates Superintendent — 29th February
Mr. T. H. Wickremasekera, Assistant Advisory Officer — 30th November
Mr. B. Boyd Cooray, Assistant Rubber Chemist — 1st September

The following officers proceeded abroad on scholarships during the year :—

Mr. S. K. W. Jayasuriya, Assistant Economist to Australia on 14th January for post graduate studies in Agricultural Development Economics at the Australian National University, Canberra, Australia;
Mr. N. Yogaratnam, Assistant Soils Chemist to U.K. on 4th June for post graduate studies in Tree Nutrition at the East Malling Research Station, Kent, U.K.;
Mr. L. M. K. Tillakeratne, to U. K. on 1st October for post graduate studies in analytical chemistry at the University of Aston, in Birmingham, U.K.

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

Mr. A. Coomarasamy, Assistant Rubber Chemist, at the University of Aston ;
Mr. A. de S. Liyanage, Assistant Plant Pathologist, at Wye College Univeristy of London ;
Mr. U. P. de S. Waidyanatha, Assistant Botanist, at the Imperial College, University of London ;

Mr. G. Varatungarajan, Assistant Rubber Chemist, at the University of Aston ;
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.

The following officers who were sent abroad earlier on Colombo Plan scholarships returned to the Island on completion of their training :—

Mr. R. P. M. de Zoysa, Deputy C.A.O.S. — 30th January
Mr. K. Ekanayake, Rubber Instructor, NRPU — 30th January
Mr. L. M. K. Tillakeratne, Assistant Specifications Officer — 28th February.
Mr. S. K. Samaraweera, Senior Technical Assistant — 20th July
Mr. E. G. Mendis, Senior Technical Assistant — 11th August
Dr. P. A. J. Yapa, Assistant Rubber Chemist — 10th October
Mr. R. Tharmalingam, Assistant Rubber Chemist — 18th October
Dr. (Miss) A. C. I. Yahampath, Assistant Botanist — 17th October.

Mr. W. S. E. Fernando, Assistant Development Officer, who was attached to the New Rubber Process Unit was transferred to the Rubber Chemistry Department with effect from 2nd October.

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

Officers in Grade I & II	..	14
Officers in Grade III	..	26
Officers in Grades IV to IX	..	233
Officers in Grades X to XIII	..	141
Total	..	414*

*includes the Institute staff seconded for service at New Process Rubber Unit.

Visitors

Visitors to the Institute from overseas included :—

Dr. M. T. A. Brouwers, FAO Expert attached to the Ministry of Plantation Industries
Mr. David Packhurst, FAO, Rome
Professor Ganther Franké, Karl Marx University, G.D.R.
Dr. R. A. Neve, Wye College, England.
Dr. R. K. Matthan, 150, Mount Road, Madras
Mr. K. S. Rao, Chief Statistician, Tata Economic Consultancy, Bombay
Mr. H. R. Marz, Chevron Chemical Industries, Singapore
Mr. Dieter Elz, World Bank, U.S.A.
Mr. F. N. B. Bennett, Messrs H. W. Cave & Co. Ltd., Croydon
Mr. H. C. Baker, Park Avenue North, Harpenden, Herts, U.K.
Mr. Philip Van Gelder, Director General, Cintel, France. & party
Mrs. Barbara Agostini, Commodity Economist, FAO, Rome
Mr. D. Carritt, Director of Gow Wilson Ltd., London
Dr. John Caseley, Weed Research Organisation, Oxford, U.K.
His Excellency, H. G. Marshall, High Commissioner for Australia in Sri Lanka

Dr. P. K. Narayanan, Rubber Board, Kottayam, India
Mr. E. Sivaraman, Shaw Wallace & Co., Madras, India
Mr. A. Selvaraj, Shaw Wallace & Co., Madras, India
Mr. S. W. Sin, R.R.I.M., Malaysia
The Asian Development Bank Mission on the Urea Project

Visits

The Director attended the International Rubber Research & Development Board meetings held in Medan, Indonesia in October 1972, followed by the International Rubber Study Group meetings held in Bangkok, Thailand, also in October 1972.

Messrs Camillus G. Silva and A. Dahanayake, Soils Chemist and Assistant Estates Advisory Officer, attended the 1972 Planters' Conference, held in Kuala Lumpur, Malaysia in July 1972.

Dr. R. Satchuthananthavale, visited the Rubber Research Institute of Malaya for a period of two weeks to study Ethrel stimulation.

The Director attended the following conferences and seminars :—

Annual Sessions of the Ceylon Association for the Advancement of Science (CAAS),
General Research Council of the CAAS,
Research Planning Committee of the Ceylon Institute of Scientific & Industrial Research, (CISIR),
Steering Committee on Crop Diversification,
General Committee meetings of the Planters' Association of Ceylon,
District Planters' Associations,
Committee meetings of the Institute of the Rubber Industry,
Seminars organised by the CAAS,
Rubber Replanting Advisory Board,
Standing Committee meetings on agrochemicals and fertilizers,
Ad hoc meetings of the Ministry of Plantation Industries,
Ad hoc meetings of the Ministry of Industries & Scientific Affairs,
Standing Committee on coconut pest control,
Committee on land capability studies,
Coconut Research Board.

Research scholars

We are happy to record that Mr. L. Weerakoon, who worked under the supervision of Dr. O. S. Peries, Director, submitted his thesis entitled : " Studies on the Biology and Control of *Eupatorium odoratum* Linn "., to the Vidyodaya Campus, University of Sri Lanka, and was awarded the degree of M.Sc. on the recommendation of Dr. John C. Casely, of the Weed Research Organisation, Oxford, U.K., who was the external examiner.

Mr. K. J. Wanasinghe, whose studies on pineapple fertilization was supervised by Dr. O. S. Peries, Director, has now been appointed Research Officer at the Plywoods Corporation, Gintota. Therefore, there will be some delay in the submission of his thesis for the degree of M.Sc. The Vidyodaya Campus, of the University of Sri Lanka, has granted an extension of the study period in order to enable Mr. Wanasinghe to complete the thesis.

Mr. S. D. Wimalaratne, who worked under the supervision of Mr. L. B. Chandrasekera, Head of Botany Department, on tapping of *Hevea*, submitted his thesis for the degree of M.Sc. to the Vidyodaya Campus, of the University of Sri Lanka and is awaiting the results of the assessment of the thesis.

A number of final year Chemistry (Hons.) and Engineering degree students spent six to eight weeks at the Institute studying various problems, getting valuable in plant training.

Workers from Overseas

Professor Gerald Scott of the University of Aston in Birmingham, U.K., our consultant in polymer science and technology, visited the Institute in January 1972, for a period of three weeks to assist the Rubber Chemistry Department.

Mr. E. Bellis, worked in the Soils Chemistry Department, formulating a suitable research programme, from October 1971 to February 1972.

Mr. S. Hansen, completed his assignment as the Chief Advisor to the F.A.O. block rubber project at Mawanella, and left the Island in February 1972. Mr. Ellis Findlay took over from Hansen, as Chief Adviser to the project.

Mr. H. C. Baker who was Chief Specifications Officer attached to the RRIM earlier, visited the Institute in July 1972, and worked for four weeks as adviser on the setting up of the new Specifications Laboratories.

Lectures

Messrs. M. Nadarajah and S. W. Karunaratne, Head of Rubber Chemistry Department and Rubber Chemist, respectively, assisted the Katubedde Campus of the University of Sri Lanka, by lecturing and conducting practical classes for the L.I.R.I. students.

Visiting Officers

It is a pleasure to record our thanks to Mr. V. Abeywardena, Biometrician, Coconut Research Institute, who continued to visit the RRIC to help us with biometrical studies. The assistance given to us by the CRI in this connection is greatly appreciated.

Publications

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

PERIES, O. S. Studies on the relationship between weather and incidence of leaf diseases of *Hevea*. A Symposium on Plant Diseases in South East Asia. Published by the University of Malaya (in Press).

PERIES, O. S. Incidence, symptoms and control of *Oidium* leaf disease of *Hevea*. Contribution to " Guide on Tropical Diseases " edited by the Tropical Institute, University of Geissen.

PERIES, O. S. *Phytophthora* leaf disease of *Hevea*, its incidence symptoms and control. Contribution to " Guide to Tropical Diseases " edited by The Tropical Institute, University of Geissen.

PERIES, O. S. Director's Review for 1971.

PERIES, O. S. Review of the Plant Pathology Department for 1971.

PERIES, O. S. Review of the Soils Chemistry Department for 1971.

PERIES, O. S. The progress of the Rubber Research Institute in 1971. For the Planters' Association, Annual Report.

Institute Publications

General :

Annual Review for 1971 (English)
Annual Report of the Rubber Research Board for 1971 (trilingual) Part I
Quarterly Journal Vol. 49, Parts 1 - 2
Quarterly Journal Vol. 49, Parts 3 - 4 (in press)
R.R.I.C. Bulletin (New Series) Vol. 7, Nos. 1 & 2
R.R.I.C. Bulletin (New Series) Vol. 7, Nos. 3 & 4
" Rubber Puwath " Sinhala Bulletin Vol. 3, Nos. 1 & 2

Papers :

ABEYESEKERA, C. M. Cost effectiveness of Ethrel stimulation — a point of view — *R.R.I.C. Bulletin* (New Series) **7,** 31 — 38.

ANON — Advisory Circular prepared by MR. C. G. SILVA AND MR. E. BELLIS.

BATEMAN, L. Science, sociology and change in the plantation industry. *R.R.I.C. Bulletin* (New Series) **7,** 1 — 20.

CHANDRASEKERA, L. B. Sale of bud wood. *R.R.I.C. Bulletin* (New Series) **7,** 29—30.

CHANDRASEKERA, L. B. Recommended planting material — 1972. *R.R.I.C. Bulletin* (New Series) **7,** 39 — 47.

CHANDRASEKERA, L. B. Recommended planting material — 1973 — *R.R.I.C. Bulletin* (New Series) **7,** 85 — 93.

NADARAJAH, M. Speciality rubbers and plastic derivatives, based on natural rubber. *R.R.I.C. Bulletin* (New Series) **7,** 76 — 84.

NADARAJAH, M., BARTHOLOMEUSZ, P. A. AND MUTHUKUDA, D. S. Proposals to increase quality production of RSS in Sri Lanka. *R.R.I.C. Bulletin* (New Series), **7,** 50 — 63.

NADARAJAH, M. AND NARANGODA, H. Easy processing natural rubber. *Q. Jl. Rubb. Res. Inst. Ceylon*, **49,** parts 3 & 4 (in press).

NADARAJAH, M., PIERIS, HEMAL AND DE SILVA, K. P. N. Natural rubber-Portland cement mixes for practical application, *R.R.I.C. Bulletin* (New Series) **7,** 71 — 75.

*PERIES, O. S. AND FERNANDO, T. M. Studies on the biology of *Phytophthora meadii*. *Q. Jl. Rubb. Res. Inst. Ceylon.* **49,** 13 — 27.

SILVA, C. G. AND SILVA, F. P. W. The cultivation of Oil Palm in Ceylon. *R.R.I.C. Bulletin* (New Series) **7,** 21 — 28.

WAIDYANATHA, U. P. DE S. AND FERNANDO, D. M. Studies on a technique of micro-tapping for the estimation of yield in nursery seedlings of *Hevea brasiliensis*. *Q. Jl. Rubb. Res. Inst. Ceylon.* **49,** 6 — 12.

WEERARATNE, W. G., ELIYATAMBY, D. A. R., AMARASINGHE, U. P. P., LIYANAGE, W. AND NADARAJAH, M. The use of natural rubber latex-resin blends as an adhesive for plywood. *Q. Jl. Rubb. Res. Inst. Ceylon.* **49,** parts 3 & 4 (in press).

WICKREMASINGHE, W. Use of natural rubber latex in leather finishing. *Q. Jl. Rubb. Res. Inst. Ceylon.* **49**, 1 — 5.

YOGARATNAM, N. AND KARUNARATNA, A. D. M. Fertilizer responses in *Hevea brasiliensis* seedlings grown in the field nursery. *Q. Jl. Rubb. Res. Inst. Ceylon*, **49**, 28 — 36.

* Reprinted from *Trans. Br. Mycol. Soc.* **49**, 311 — 325 (1966).

Social and sports activities

Cricket : We did well to enter the semi-finals in the Government Services Cricket Tournament (" D " Division), beating more fancied teams. We were unfortunate to lose in the semi-finals.

We did not fare well in the Kalutara District Cricket Tournament. In the annual encounter against the Tea Research Institute, we lost the " Gun Trophy ". The annual encounter against the Coconut Research Institute was revived after many years.

Annual Club Tournament : The annual club tournament was conducted successfully. Mr. Doric de Souza, Secretary, Ministry of Plantation Industries, was the Chief Guest at the prize distribution and the year ending party, which was held on 22nd December, 1972.

Picnics : A special word of thanks is due to Mr. Manik R. Dias, Superintendent, Farnham Estate, Puwakpitiya, for a very enjoyable day spent at Farnham, at his kind invitation.

REVIEW OF THE BOTANY DEPARTMENT

BY

L. B. CHANDRASEKERA

SUMMARY

In all experiments where Ethrel is used as a yield stimulant on panel C of clone PB 86 and tapped at 100% intensity, the degree of yield response to stimulation has been lower than that of the first year. However, this yield depression is not evident where tapping is done on a reduced intensity of 67 per cent. In one trial tapping at 150% intensity has given higher yields per acre than tapping at 100% intensity with Ethrel stimulation, during the first year of the experiment. In small scale trials the clones RRIC 13, 48, 50, IRCI 9 and PR 252 have failed to give an adequate yield response to Ethrel stimulation on panel C.

There has been no adverse effects either on growth or yield during nine years of tapping clones Nab 12 and PB 86 without the usual rest during the wintering period. These observations are applicable to conditions that prevail in the wet districts.

Tapping every day of the year with the use of polythene rainguards has depressed the average yields recorded per tapping. The average yields per tapping have improved after the removal of rainguards when no tapping was done in wet weather. Daily tapping of clones RRIC 7, 45, 52 and PB 86 has resulted in a higher incidence of dry trees as compared with alternate daily tapping on a half spiral cut. Full spiral third daily and fourth daily tapping has resulted in a general decline in yields in the second year in clones RRIC 7, 45 and 52. This decline in yields has not been evident in clone PB 86.

Tapping of clone RRIC 52 with the Jebong knife has been comparable with that of the Michie-Golledge knife in terms of yield and rate of bark consumption during the second year of the experiment.

In a small scale trial on clone RRIC 52, tapping upwards on a " V " cut above the normal panels has given higher yields per tapping as compared with tapping upwards on two quarter spiral cuts and ladder tapping downwards on a half spiral cut opened at 100 in. above ground level. The following new clone selections have continued to maintain satisfactory yields and freedom from diseases :

RRIC 13, 48, 50, 89, AVROS 1734, PR 252, IRCI 2, 7, 9.

The yields of clone Nab 15 has been very promising. It is a vigorous grower and possess good vegetative characters. The early yields, particularly during the first two years of tapping, of clone RRIC 52 have been unsatisfactory. However the yields have exceeded those of more popular clones in later years.

Dieback of trees have been reported in small scale plantings of clone RRIM 701. In most instances heavy incidence of leaf diseases have preceded the onset of dieback. clones RRIC 41 and 88 have been subject to wind damage.

All stock experiments have indicated the possibility of using seed of most recommended clones as rootstocks.

At the end of seven years from planting, there has been no significant difference in growth rate or yield of clones RRIC 41, 45 and 52 for the two planting spacings of 8′ × 30′ and 12′ × 20′.

With the use of cheap rubber rainguards it had been possible to increase considerably the number of tappings in the wet districts.

Callus cultures from *Hevea* anthers continued to maintain good growth in subculture. However, no differentiation or organ formation from callus was observed. Callus cultures from young stem sections have been established.

DETAILED REVIEW

Staff

Mr. L. B. Chandrasekera, Head of Botany Department and Dr. R. Satchuthananthavale, Botanist, were on duty throughout the year. Dr. (Miss) A. C. I. Yahampath successfully completed her post graduate studies and assumed duties as Assistant Botanist with effect from 17th October, Mr. U. P. de S. Waidyanatha, Assistant Botanist was on overseas study leave. Mr. S. D. Wimalaratne, research student continued his studies on tapping of *Hevea*.

The Senior Technical Assistant, Mr. W. G. V. Fernando and Technical Assistants, Messrs, L. S. S. Pathiratne, I. Amarasinghe, J. G. de Mel, and Field Assistants, Messrs D. R. Colonne, U. K. D. Luwis Udawatta, D. A. Brahmana, W. T. Silva, S. Kodikara, R. B. Gunaratne, S. Wilbert were on duty throughout the year. Graduate Trainees, Mr. T. C. Weerasinghe and Miss C. W. Ranasinghe were absorbed to the Department with effect from 1st July.

Visits

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

Publications

1. Annual Review of the Botany Department for 1971
2. Sale of budwood.
   L. B. Chandrasekera, *RRIC Bulletin* **7**, 29 — 30.
3. Recommended Planting Material—1972.
   L. B. Chandrasekera, *RRIC Bulletin* **7**, 39 — 47.
4. Studies on technique of micro-tapping for the estimation of yields in nursery seedlings of *Hevea brasiliensis*. U. P. de S. Waidyanatha and D. M. Fernando. *Q. Jl. Rubb. Res. Inst. Ceylon* **49**, 6 — 12.

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 1½ 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 served as the controls.

Tapping is on the S/2, d/2, 100% system and the yields are recorded by the estate on the basis of daily yield per each tapping block. During the period immediately following application, when the yield response was highest, collection of latex was delayed till 1.00 p.m. on each day. Any latex drip after this was collected on the next tapping day as cup lump. The experimental area had been regularly manured in previous years with R. 4 : 6 : 3 mixture at the rate of 200 lb/ac./yr. (224·2 kg/ha.). In 1972, R. 4 : 6 : 5 mixture was applied at 2 lb per tree (0·9 kg) and an additional 420 lb (190·5 kg) of the following mixture for the stimulated area calculated on the basis of 130 lb of extra fertilizer for every 1000 lb increase in yield per year.

60 parts sulphate of ammonia
32 parts saphos phosphate
25 parts muriate of potash
12 parts kieserite

The experiment commenced in March 1971 and the average yields recorded from March to November 1971 and December 1971 to November 1972 are given in Table 1.

TABLE 1

YIELDS OF ETHREL STIMULATED BLOCKS COMPARED WITH CONTROL BLOCKS

	Stimulated		Control	
	Block I	Block IV	Block II	Block III
Trees tapped (1972)	217	203	162	200
*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
Percentage Scrap (1972)	19·8	20·3	9·2	8·3
Brown Bast trees				
Partial dryness	14	5	—	—
Total ,,	2	6	10	16

*Inclusive of scrap

The overall response to Ethrel stimulation appears to have declined in the 2nd year. However, an accurate assessment of the results of this trial as weal as other Ethrel trials had been difficult due to periodic losses of trees from wind damage and *Fomes* infections.

Field experiment No. 63 — Ethrel stimulation experiment, Eladuwa Estate (*L. B. Chandrasekera & D. A. Brahmana*).

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 $1\frac{1}{2}$ in. strip of scraped bark below the tapping cut once every two months and tapped on 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. The area had been manured regularly in previous years with R. 4 : 6 : 3 mixture at the rate of 200 lb/ac. (224 kg/ha.). Extra fertilizer was applied to stimulated plots in 1972 based on the increased yields recorded during the first twelve months of stimulation. During the period of peak response after each stimulation, two to three collections of latex were made on each day with the last collection made around 2.30 p.m. The experiment commenced in June 1971 and the data recorded for 1971 and 1972 are summarised in Table 2.

TABLE 2

COMPARATIVE YIELDS OF PLOTS STIMULATED WITH ETHREL AT DIFFERENT CONCENTRATIONS

	Treatments			
	5% Ethrel	10% Ethrel	15% Ethrel	No Ethrel
*Average yield g/tree/tapping (1971)	71·6	73·6	84·5	39·3
* ,, ,, ,, ,, ,, (1972)	53·9	58·2	59·7	34·8
Percentage Scrap (1972)	17·7	19·1	20·0	11·4
Percentage Brown Bast				
Partial dryness	2·0	1·8	1·7	0·6
Total ,,	1·4	3·9	4·1	0·6

* Inclusive of Scrap

Field experiment No. 65 — Ethrel stimulation experiment, Etana Estate (*L. B. Chandrasekera & W. T. Silva*).

The experiment consists of the following treatments applied on panel C of clone PB 86 planted in 1952.

(a) Tapped on S/2, d/3, 67% and stimulated once in two months with 10% Ethrel applied to a 1½ in. strip of scraped bark below the tapping cut.

(b) Tapped on S/2, d/2, 100% without stimulation.

Each treatment is applied to three tapping tasks and the yields are recorded on the basis of daily yields brought in by the tappers. During periods of peak response, an additional collection is made in the evening of the day of tapping. In 1972 extra manuring was done on the basis of yields recorded during the first 12 months of the experiment. The experiment commenced in August 1971 and the yields recorded during 1971 and 1972 are given in Table 3.

TABLE 3

YIELDS OF AREAS STIMULATED WITH ETHREL AND TAPPED AT DIFFERENT INTENSITIES

	Stimulated	Unstimulated
Tapping system	S/2, d/3, 67%	S/2, d/2,100%
Average trees/block	217	239
*Average yield/tapping (1971) lb	25·1	11·1
kg	11·39	5·03
*Average yield/tapping (1972) lb	28·9	11·0
kg	13·1	5·0
Percentage Scrap (1972)	18·9	10·1
*Average yield (1972 lb/ac.	1715·8	975·0
kg/ha.	1923·1	1092·8
Percentage dry cuts	4·5	8·4

* Inclusive of scrap

Field experiment No. 67 — Ethrel stimulation experiment, Dewalakande (L.B. Chandrasekera & D. A. Brahmana).

This experiment compares a progressive intensification of tapping eight years before replanting with Ethrel stimulation 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 on 3S/4, d/2, 150% system without stimulation.

(2) Two blocks with 218 trees per block tapped on the S/2, d/2, 100% system with Ethrel stimulation once every two months.

The yields are recorded on the basis of daily yields per tapping block. During the period of peak response, an additional collection of latex is made around 2.00 p.m.

The data recorded for the first twelve months of the experiment (6 applications of Ethrel) are given in Table 4.

TABLE 4

YIELDS OF AREAS TAPPED AT HIGH INTENSITY AS COMPARED WITH THOSE STIMULATED WITH ETHREL FOR THE FIRST 12 MONTHS PERIOD

	No Ethrel tapped 3S/4, d/2, 150%	Ethrel stimulated tapped S/2, d/2, 100%
*Average yield/tapping (a) lb	19·2	19·1
(b) kg	8·7	8·7
Percentage Scrap	10·5	14·5
*Average yield (a) lb/ac.	1582·5	1226·2
(b) kg/ha.	1773·7	1374·3

*Inclusive of scrap

Field experiment 68 — Ethrel stimulation experiment — Eduragalla Estate, Ingiriya (L. B. Chandrasekera & W. T. Silva).

A 10% solution of Ethrel in coconut oil is applied to a $1\frac{1}{2}$ 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. The allocation of treatments are based on the average yields recorded for each block before treatments so that the mean yield per tapping for the two sets of blocks are equivalent. Tapping is on the S/2, d/2, 100% system and the yields are recorded by the estate on the basis of daily yield per each tapping block. During periods of peak response after each application of Ethrel, an additional evening collection of latex was made. The experiment commenced in November 1971 and the results recorded for the first twelve months period are given in Table 5.

TABLE 5

YIELD OF ETHREL STIMULATED BLOCKS AS COMPARED WITH CONTROL BLOCKS

	Stimulated	Unstimulated
*Average yield per tapping (a) lb	18·2	9·9
(b) kg	8·26	4·49
Percentage scrap	9·8	11·9
*Average yield (a) lb/ac.	1581	858
(b) kg/ha.	1771·98	961·65

*Inclusive of Scrap

In this trial a lower percentage of scrap is recorded for the stimulated blocks due to an extra evening collection carried out during times of peak response.

Field experiment No. 72 — 1972 Ethrel stimulation experiment, Dartonfield (R. Satchuthananthavale, G. de Mel & C. Weerasinghe).

This is a small scale trial to evaluate the yield response to Ethrel stimulation on panel A of clones RRIC 52 and PB 86 planted in 1961.

Two Ethrel formulations " ACP 70 — 90I " and " ACP 70 — 90 K " are applied at concentrations of 0%, 5% and 10% on trees tapped on two tapping systems S/2, d/2, 100% and S/4, d/2, 50%. Each of the above treatments are combined with two methods of application (a) on 1½ in. strip of scraped bark below the tapping cut and (b) on a 1 in. strip of unscraped bark above the tapping cut. The stimulants were applied at the beginning of 1972 after a period of pre-treatment yield recordings on S/2, d/2, 100% tapping system. A weighed amount of Ethrel was applied on each tree calculated on the basis of 1 U.S. pint " ready mix " to 300 trees.

The average yields recorded for the period November to December 1972 are summarised in Table 6.

TABLE 6

AVERAGE YIELD IN G/TREE/TAPPING FOR CLONES RRIC 52 AND PB 86

(RESULTS FOR TWO MONTHS AFTER STIMULATION)

Treatment	Pre-treatment period		Post-treatment period		% yield compared with S/2, d/2, 100%	
	RRIC 52	PB 86	RRIC 52	PB 86	RRIC 52	PB 86
Above cut monthly application						
S/2, d/2 + 5% Eth. '70 — 90 I'	31·7	39·1	42·5	60·7	134·1	155·2
,, + ,, '70 — 90 K'		31·2		46·1		147·8
,, + 10% Eth. '70 — 90 I'	23·6	22·9	36·1	39·8	153·0	173·8
,, + ,, '70 — 90 K'		28·74		44·6		155·2
S/4, d/2 + 5% Eth. '70 — 90 I'	33·9	23·7	42·0	19·45	124·0	82·1
,, + ,, '70 — 90 K'		28·6		24·8		86·7
,, + 10% Eth. '70 — 90 I'	33·9	30·8	35·4	31·0	104·4	100·6
,, + ,, '70 — 90 K'		26·8		31·6		117·9
Below cut two monthly application						
S/2, d/2 + 5% Eth. '70 — 90 I'	29·6	32·2	40·2	33·2	135·8	103·1
,, + ,, '70 — 90 K'		28·6		24·7		86·4
,, + 10% Eth. '70 — 90 I'	25·6	37·7	38·5	66·4	150·4	176·1
,, + ,, '70 — 90 K'		31·5		48·0		152·4
S/4, d/2 + 5% Eth. '70 — 90 I'	27·5	32·2	37·1	33·2	134·9	103·1
,, + ,, '70 — 90 K'		34·9		35·5		101·7
,, + 10% Eth. '70 — 90 I'	26·6	26·6	28·8	27·5	108·3	103·4
,, + ,, '70 — 90 K		30·9		31·1		100·6

Field experiment No. 73 — 1972 Ethrel stimulation experiment, Eladuwa Estate (R. Satchuthananthavale & I. Amarasinghe).

Two trials were initiated in February and June 1972 on panel C of clone PB 86. Stimulation was carried out after a period of pre-treatment yield recordings on the S/2, d/2, 100% tapping system. 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% ,, ,,

The amount of Ethrel applied to each experimental plot of 25 trees was weighed out on the basis of one U.S. pint (weight equivalent) to 300 trees. The application was confined to 1½ in. strip of scraped bark below the tapping cut. The first application was made in August and the second in December 1972, the delay in the second application being due to intermittent rains in October and November. The results for the four months after the initial applications are summarised in Table 7.

TABLE 7

YIELD IN G/TREE/TAPPING (AUGUST — NOVEMBER)

Treatment	Pre-treatment period	Post-treatment period	% yield compared with pre-treatment as 100%
(1) S/2, d/2 — Unstimulated	29·3	31·2	106·5
(2) - do - + 5% Eth. '70 — 90 I'	26·2	42·1	160·7
(3) - do - + 10% ,,	30·8	49·8	161·7
(4) S/3, d/2 + Unstimulated	18·1	20·2	111·6
(5) - do - + 5% Eth. '70 — 90 I'	18·9	31·6	167·2
(6) - do - + 10% ,,	18·4	32·5	171·2
(7) S/4, d/2 + Unstimulated	15·8	17·1	108·2
(8) - do - + 5% Eth. '70 — 90 I'	16·7	23·4	140·1
(9) - do - + 10% ,,	19·5	30·1	154·3

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 applications and six below cut applications. The application below cut is on a 1½ in. strip of scraped bark while the above cut application is on a 1 in. band on the renewing bark. The details of the various treatments are as follows :—

Applications below the cut

(1) Tapped S/2, d/2, 100% + no stimulants
(2) „ „ + coconut oil
(3) „ „ + 5% Ethrel '70 — 90 I'
(4) „ „ + 10% „ „
(5) „ „ + 5% Ethrel '70 — 90 K'
(6) „ „ + 10% „ „

Applications above the cut

(1) Tapped S/2, d/2, 100% + no stimulants
(2) „ „ + coconut oil
(3) „ „ + 5% Ethrel '70 — 90 I'
(4) „ „ + 10% „ „
(5) „ „ + 5% „ 70 — 90 K'
(6) „ „ + 10% „ „

Ethrel ready mix 'ACP 70 — 90 I' and a new ready mix formulation 'ACP 70 — 90 K' which incorporates a penetrant were used. The amount of stimulant applied to each plot was weighed out on the basis of one U.S. pint (weight equivalent) of Ethrel for 300 trees. The first application of Ethrel was done in August and the Second in December 1972 and the average yields recorded for the four months are summarised in Table 8.

TABLE 8

YIELD IN G/TREE/TAPPING (AUGUST — NOVEMBER)

Treatment	Stimulant application below tapping cut			Stimulant application above tapping cut		
	Pre-treatment period	Post-treatment period	Increase as %	Pre-treatment period	Post-treatment period	% yield compared with Pre-treatment as 100%
(1) Control	37·25	39·24	105·34	38·82	36·83	94·87
(2) Coconut oil	36·40	36·14	99·28	38·45	38·09	99·06
(3) S/2, d/2 + 5% '70 — 90 I'	37·21	69·45	186·64	40·69	62·00	152·37
(4) S/2, d/2 + 10% '70 — 90 I'	42·60	70·19	164·76	38·48	70·21	182·45
(5) S/2, d/2 + 5% '70 — 90 K'	33·26	54·37	163·46	41·14	73·37	178·34
(6) S/2, d/2 + 10% '70 — 90 K'	44·56	69·33	155·58	35·06	49·77	141·95

Tapping Experiments

Field experiment No. 4 —1964 "winter" tapping trial, Dartonfield (*L. B. Chandrasekera & D. R. Colonne*).

In this trial the following treatments are applied to 20 trees of each of the clones PB 86 and Nab 12 replicated three times.

A — Tapped S/2, d/2, 100% system with a "winter" rest
B — Tapped S/2, d/2, 100% system without a "winter" rest

The average girth and yields recorded at the end of nine years are presented in Table 9.

TABLE 9

YIELD IN GRAMMES DRY RUBBER/TREE/TAPPING FROM AREAS TAPPED WITH AND WITHOUT A " WINTER " REST

Clone	Treatment	Yield 1972	Average girth			
			Before treatment		After treatment 1972	
			in.	cm	in.	cm
PB 86	A	34·6	27·9	70·87	33·0	83·82
	B	37·3	27·0	68·58	33·3	84·58
Nab 12	A	38·4	27·4	69·60	33·1	84·07
	B	35·9	27·5	69·85	33·1	84·07

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 the 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 yields were recorded on every tapping day. Although polythene rainguards were used in the first year of the experiment in 1971, their use was discontinued in 1972 owing to unavailability of materials used for fixing these rainguards. However, with the discontinuance of rainguards, an overall improvement in yields for all tapping systems was observed in 1972. The data recorded during the first two years of the experiment are summarised in Tables 10, 11, and 12.

TABLE 10

MEAN YIELD IN G/TREE/TAPPING OF VARIOUS CLONES TAPPED AT DIFFERENT TAPPING INTENSITIES

Tapping System	RRIC 45		RRIC 7		RRIC 52		PB 86	
	1971	1972	1971	1972	1971	1972	1971	1972
S/2, d/2, 100%	15·4	22·9	14·2	21·5	17·2	24·7	21·2	23·7
S/2, d/1, 200%	13·2	21·8	13·4	21·1	14·5	20·8	18·7	22·8
S/1, d/4, 100%	35·0	47·6	29·5	39·5	32·1	44·9	60·1	55·0
S/1, d/3, 133%	34·7	45·1	29·5	33·8	35·7	42·4	39·8	50·6
2S/2, d/4, 100%	35·4	43·6	31·9	32·5	27·9	46·6	55·3	64·9
2S/2, d/3, 133%	35·4	48·8	31·9	37·0	33·3	47·1	45·2	53·2

TABLE 11

MEAN YIELDS PER TAPPING OF VARIOUS CLONES TAPPED AT DIFFERENT INTENSITIES EXPRESSED AS A PERCENTAGE OF THE CONTROL

Tapping System	RRIC 45		RRIC 7		RRIC 52		PB 86	
	1971	1972	1971	1972	1971	1972	1971	1972
S/2, d/2, 100%	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0
S/2, d/1, 200%	114·8	95·2	89·9	98·1	78·4	84·2	90·3	96·8
S/1, d/4, 100%	251·1	207·8	204·7	183·7	207·2	181·8	230·6	232·1
S/1, d/3, 133%	248·9	196·8	200·0	157·2	195·2	171·6	185·6	213·5
2S/2, d/4, 100%	233·0	190·4	212·8	150·0	185·0	188·7	259·3	273·8
2S/2, d/3, 133%	223·3	213·1	225·7	172·1	191·0	190·7	219·0	244·5

TABLE 12

PERCENTAGE BROWN BAST FOR THE VARIOUS TAPPING SYSTEMS IN THE 2ND YEAR OF TAPPING

Tapping System	Clone			
	RRIC 45	RRIC 7	RRIC 52	PB 86
S/2, d/2, 100%	2·5	2·5	—	—
S/2, d/1, 200%	17·0	7·5	2·5	6·6
S/1, d/4, 100%	7·5	10·0	—	—
S/1, d/3, 133%	7·5	15·0	2·5	9·9
2S/2, d/4, 100%	7·5	—	—	—
2S/2, d/3, 133%	—	7·5	—	—

As compared with half spiral alternate daily tapping, the daily tapped plots have shown a higher incidence of Brown Bast. The yield response to full spiral tapping has declined in the 2nd year for all clones except clone PB 86. This clone has also responded favourably to tapping on the double four system during the period of the trial.

Field experiment No. 59 — Tapping experiment — Vogan Group (R. Satchuthananthavale & I. Amarasinghe).

This experiment compares two tapping knives, the Michie-Golledge and the Jebong on each of the tapping systems S/2, d/2, 100% and 2S/2, d/4, 100% in clone RRIC 52. The data recorded during the second year of the experiment in 1972 are given in Table 13.

TABLE 13

RESULTS OF TAPPING WITH MICHIE-GOLLEDGE AND JEBONG TAPPING KNIVES

Tapping knife	Year	g/tree/tapping		Mean thickness of bark shavings in mm
		S/2, 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

Tapping with the Jebong knife has compared well with that of Michie - Golledge knife.

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

This is a preliminary 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 seven months of the experiment in 1972 are presented in Table 14.

TABLE 14

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

	Treatments		
	A	B	C
Pre-experimental yields	36·9	39·5	37·7
Experimental yields	33·9	30·8	40·0

Field experiment No. 54 — Tapping experiment, Dartonfield (L. B. Chandrasekera & D. A. Brahmana).

The two 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 and test tapped on two normal tapping days in each month. The average yields recorded during the second year of the experiment are given in Table 15.

TABLE 15

COMPARATIVE YIELDS FROM TWO TAPPING SYSTEMS ON TWO CLONES

	RRIC 89		PB 28/59	
	S/2, d/2, 100%	S/2, d/3, 67%	S2, d/2, 100%	S/2, d/3, 67%
Grammes dry rubber/ tree/tapping	28·5	36·3	36·8	49·7
*Dry rubber/tree/ year				
(a) lb	8·8	7·5	11·4	10·2
(b) kg	4·0	3·4	5·2	4·6
Theoretical yield (130 trees)				
(a) lb/ac.	1144·0	975·0	1482·0	1326·0
(b) kg/ha.	1282·2	1092·8	1661·0	1486·2

*Theoretical value for 140 tappings.

Both clones RRIC 89 and PB 28/59 have recorded increased yields per tapping on the S/2, d/3, 67% system during the first two years of the experiment. Clone PB 28/59 recorded higher average yields per acre during the first year on S/2, d/3, 67% tapping, but this had not been maintained in the second year as compared with the S/2, d/2, 100% system.

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 two best selections, IRCI 7 and PB 28/59 are compared with RRIM 501 in Table 16.

TABLE 16

COMPARATIVE YIELDS OF RRIC 7 AND PB 28/59 WITH RRIM 501 AS A CONTROL. YIELDS OF DRY RUBBER PER TREE PER YEAR (140 TAPPINGS) (TAPPED, S/2, D/2, 100% FROM MARCH 1960)

Year of tapping	RRIC 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
No. tree tapped in 1972	138—127		103—101		89—86	
Brown Bast cases	—		—		—	
Wind damage cases	11		2		3	
Girth, 1972	32·0 in. (81·2 cm)		33·8 in. (85·8 cm)		29·6 in. (75·2 cm)	

It is of interest to note that the incidence of Brown Bast in clone PB 28/59 on 100 per cent intensity tapping had been negligible on experimental plantings in Sri Lanka.

Field experiment No. 15 — 1953 clone trial, Nivitigalakele (*L. B. Chandrasekera & W. T. Silva*).

The clone RRIC 45 is planted as a monoclonal block in an extent of approximately five acres. Test tapping results for the past 11 years are given in Table 17.

TABLE 17

YIELD OF DRY RUBBER PER TREE PER YEAR (140 TAPPINGS) OF RRIC 45 OVER A TEN YEAR PERIOD (TAPPED S/2, D/2, 100%)

Year of tapping	RRIC 45	
	lb	kg
1962	8·9	4·04
1963	10·2	4·63
1964	10·6	4·81
1965	10·3	4·67
1966	11·0	4·99
1967	12·1	5·49
1968	13·2	5·99
1969	11·9	5·40
1970	9·5	4·31
1971	9·9	4·49
1972	9·4	4·26
No. of trees tapped, 1972	521—495	
Brown Bast cases	20	
Wind damage cases	3	
Girth, 1972	28·1 in. (71·5 cm)	

The lower yields recorded since 1970 are due to tapping on bark of first renewal.

Field experiment No. 19 — 1962 large scale clone trial, Nivitigalakele (*L. B. Chandrasekera & W. T. Silva*).

All clones are planted in unreplicated plots of 150 trees per clone. Test tapping results during the first four years in tapping are summarised in Table 18.

TABLE 18

YIELD IN LB DRY RUBBER PER TREE PER YEAR (140 TAPPINGS) IN LARGE SCALE CLONE TRIAL (TAPPED S/2, D/2, 100%)

Clone	Average girth 1972		Yield							
	in.	cm	1969 lb	1969 kg	1970 lb	1970 kg	1971 lb	1971 kg	1972 lb	1972 kg
RRIM 628	22·0	55·9	16·0	7·26	15·1	6·85	11·3	5·13	13·4	6·08
RRIC 93	23·8	60·5	10·4	4·72	8·7	3·95	12·3	5·58	12·7	5·76
,, 5	27 5	69·9	7·8	3·54	9·7	4·40	12·2	5·53	12·6	5·72
,, 94	22·1	56·1	13·8	6·26	12·0	5·44	10·3	4·67	11·7	5·31
,, 39	26·4	67·0	8·7	3·95	8·7	3·95	10·3	4·67	11·4	5·17
,, 92	25·0	63·4	10·7	4·85	11·2	5·08	10·1	4·58	10·7	4·85
,, 91	28·4	72·1	7·8	3·54	9·1	4·13	9·0	4·08	10·4	4·72
,, 86	24·5	62·2	8·1	3·67	6·3	2·86	8·8	3·99	10·4	4·72
RRIM 623	25·2	64·1	10·3	4·67	8·7	3·95	9·6	4·35	10·3	4·67
RRIC 95	31·7	80·4	10·6	4·81	8·1	3·67	9·2	4·17	9·7	4·40
PB 86	26·2	66·5	9·2	4·17	8·4	3·81	8·2	3·72	8·8	3·99
IAN 45 — 717	26·7	67·8	9·0	4·08	8·6	3·90	7·6	3·45	8·1	3·67

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. The test tapping results during the first two years are given in Table 19.

TABLE 19

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

Clone	No. of trees tapped in 1972	Average girth 1972		Yield					
				1970		1971		1972	
		in.	cm	lb	kg	lb	kg	lb	kg
RRIC 41	190—202	25·2	63·9	8·4	3·81	9·5	4·31	11·8	5·35
,, 45	208—222	24·7	62·7	8·2	3·72	10·2	4·63	11·8	5·35
,, 86	184—195	24·1	61·3	6·5	2·95	8·0	3·63	9·0	4·08
,, 52	248—259	30·4	77·1	5·3	2·40	6·7	3·04	6·7	3·45

Field experiment No. 11 — 1951 small scale clone trial, Hedigalla (L. B. Chandrasekera & S. Wilbert).

All clones are planted in 25 tree plots replicated three times. Test tapping results of the best selection RRIC 99 are compared with PB 86 in Table 20.

TABLE 20

YIELD IN LB DRY RUBBER PER TREE PER YEAR (140 TAPPINGS) OF RRIC 99 AS COMPARED WITH THAT OF PB 86 (TAPPED S/2, D/3, 67% FROM 1958 ; TAPPED S/2, D/2, 100% FROM 1960)

Year of Tapping	RRIC 99		PB 86	
	lb	kg	lb	kg
1961	14·2	6·44	13·3	6·03
1962	19·4	8·80	16·3	7·39
1963	17·7	8·03	15·9	7·21
1964	20·4	9·23	17·0	7·71
1965	17·9	8·12	16·9	7·67
1966	18·2	8·26	17·7	8·03
1967	15·7	7·12	19·4	8·80
1968	15·0	6·80	18·9	8·57
1969	16·3	7·39	16·6	7·53
1970	12·9	5·85	12·9	5·85
1971	9·6	4·35	15·6	7·07
1972	9·4	4·26	13·4	6·08
No. trees tapped, 1972	40 — 50		49 — 46	
Girth, 1972	33·4 in.	84·8 cm	33·9 in.	86·1 cm
Brown Bast cases	10		3	

There had been a decline in yield of clone RRIC 99 since tapping commenced on bark of first renewal in 1971. There had also been a high incidence of Brown Bast in clone RRIC 99.

Field experiment No. 14 — 1955 large scale clone trial, Hedigalla. (L. B. Chandrasekera & S. Wilbert).

Twelve RRIC clones were originally planted in monoclonal blocks of 750 trees per clone. Test tapping results of the two best selections are given in Table 21.

TABLE 21

YIELD IN LB DRY RUBBER PER TREE PER YEAR (140 TAPPINGS) OF CLONES RRIC 13 AND RRIC 50 (TAPPED S/2, D/2, 100%)

Year of Tapping	RRIC 13		RRIC 50	
	lb.	kg	lb	kg
1962	9·4	4·26	5·5	2·49
1963	10·2	4·63	10·2	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
No. trees tapped, 1972	485—483		391—377	
Girth, 1972	30·3 in.	77·0 cm	29·8 in.	75·7 cm
Brown Bast cases	14		20	
Wind damage cases	25		14	
Set apart for Ethrel experiment	10		10	
Resumed after rest	47		30	

The yields for 1972 are recorded on bark of first renewal (panel C). The above two clones are very promising and are now recommended for small scale planting in estates.

Field experiment No. 16 — 1956 clone trial, Hedigalla (L. B. Chandrasekera & S. Wilbert).

In this trial, 18 local and foreign clones were initially planted in monoclonal blocks of 300 trees per clone. The test tapping yields of the best selections are given in Table 22.

TABLE 22

YIELD IN LB DRY RUBBER PER TREE PER YEAR (140 TAPPINGS) OF THE MOST PROMISING FIVE CLONES OF THE EIGHTEEN TESTED (TAPPED S/2, D/2, 100% FROM JULY 1963)

Clone	Trees tapped 1972	Girth in 1972		Yield								
		in.	cm	1964	1965	1966	1967	1968	1969	1970	1971	1972
AVROS 1447	92—104	28·4	72·1	lb 5·3 kg 2·40	7·0 3·18	10·9 4·94	10·9 4·94	9·8 4·45	12·0 5·44	11·5 5·22	11·1 5·03	13·0 5·90
PR 252	208—225	27·1	68·8	lb 7·6 kg 3·45	10·9 4·94	10·2 4·63	10·6 4·81	10·0 4·54	8·6 3·90	14·4 6·53	15·3 6·94	12·0 5·44
IRCI 9	181—187	29·0	73·7	lb 7·3 kg 3·31	9·8 4·45	12·0 5·44	11·3 5·13	12·0 5·44	10·4 4·72	14·2 6·44	13·0 5·90	11·9 5·40
RRIC 48	183—204	25·9	65·8	lb 8·0 kg 3·83	8·8 3·99	12·3 5·58	12·8 5·81	10·8 4·90	11·4 5·17	12·3 5·58	10·7 4·85	8·3 3·76
PB 86	220—230	30·9	78·5	lb 6·4 kg 2·90	7·1 3·22	8·7 3·95	9·1 4·13	8·0 3·63	8·3 3·76	11·2 5·08	12·8 5·81	11·1 5·03

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 23.

TABLE 23

YIELD IN LB DRY RUBBER PER TREE PER YEAR (140 TAPPINGS) OF IRCI 2 COMPARED WITH PB 86 (TAPPED S/2, D/2, 100% FROM MARCH 1964)

Clone	Girth in 1972		Trees tapped 1972	Yield							
	in.	cm		1965	1966	1967	1968	1969	1970	1971	1972
IRCI 2	28·1	71·3	240	lb 8·4 kg 3·81	8·3 3·77	12·4 5·63	12·6 5·72	14·8 6·72	14·7 6·67	17·7 8·04	14·4 6·53
PB 86	26·9	68·3	250	lb 5·3 kg 2·41	5·1 2·32	7·2 3·27	8·0 3·63	8·4 3·81	8·2 3·72	11·0 4·99	10·7 4·85

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 ac. and 20 ac. in plots of 300 trees per clone. Test tapping yields of the best selections are compared with clone PB 86 in tables 24 and 25.

TABLE 24

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

Clone	Girth in 1972		Trees tapped 1972	Yield							
	in.	cm		1965	1966	1967	1968	1969	1970	1971	1972
AVROS 1734	29·7	75·4	178—170	lb 12·5 kg 5·68	12·3 5·58	11·3 5·13	14·4 6·54	16·4 7·45	12·7 5·77	11·8 5·36	9·3 4·22
PB 86	28·1	71·4	189—185	lb 7·3 kg 3·31	9·0 4·09	10·4 4·72	9·9 4·49	8·7 3·95	9·5 4·31	11·7 5·31	11·9 5·40

TABLE 25

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

Clone	Girth in 1972		Trees tapped 1972	Yield							
	in.	cm		1965	1966	1967	1968	1969	1970	1971	1972
RRIM 623	29·8	75·6	212	lb 10·3 kg 4·68	12·1 5·49	9·9 4·49	12·0 5·45	11·9 5·40	12·1 5·49	12·3 5·58	10·6 4·81
*WR 101	28·9	73·5	100	lb 5·9 kg 2·68	8·7 3·95	11·4 5·18	10·0 4·54	10·2 4·63	9·2 4·18	9·4 4·27	11·8 5·35
PB 86	27·6	70·2	235	lb 6·1 kg 2·77	7·2 3·27	7·9 3·95	8·4 3·81	8·5 3·86	8·5 3·86	9·7 4·40	8·9 4·04

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

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 yielders are given in Table 26.

TABLE 26

YIELD IN LB DRY RUBBER PER TREE PER YEAR (140 TAPPINGS) OF BEST YIELDING CLONES IN THE 1958 CLONE TRIAL (TAPPED ON S/2, D/2, 100% FROM APRIL 1965)

Clone	Girth in 1972		Trees tapped 1972	Yield						
	in.	cm		1966	1967	1968	1969	1970	1971	1972
RRIC 36	30·7	78·0	100	lb 8·6	8·5	9·1	9·4	13·7	12·6	13·0
				kg 3·90	3·06	4·13	4·27	6·22	5·72	5·90
IRCI 2	25·1	63·8	238—235	lb 6·7	8·1	8·6	7·4	12·0	13·3	11·8
				kg 3·04	3·68	3·90	3·36	5·45	6·04	3·35
PB 86	27·8	70·7	190	lb 7·1	7·1	7·0	7·1	8·1	9·6	10·8
				kg 3·22	3·22	3·18	3·22	3·68	4·36	4·90
*RRIC 55	26·5	67·4	175—171	lb 10·1	9·8	8·5	7·8	9·5	9·6	8·8
				kg 4·59	4·55	3·86	3·54	4·31	4·36	4·00
RRIC 45	25·3	64·2	238	lb 6·8	8·7	8·7	7·6	6·9	7·2	8·1
				kg 3·09	3·95	3·95	3·45	3·13	3·27	3·67
RRIM 605	25·4	64·6	240—238	lb 6·9	8·6	7·4	7·4	7·3	6·4	8·1
				kg 3·13	3·90	3·36	3·36	3·31	2·91	3·67
RRIC 52	32·0	81·2	250	lb 4·6	4·7	4·9	5·7	6·0	5·6	6·1
				kg 2·09	2·13	2·22	2·58	2·72	2·54	2·77

* The clone RRIC 55 is rather 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. Tapping commenced in 1971 and the comparative yields of the four clones are given in Table 27.

TABLE 27

1964 YIELD TRIAL — YIELD IN LB DRY RUBBER PER TREE PER YEAR (140 TAPPINGS) (TAPPED S/2, D/2, 100% FROM 1971)

Clone	Girth in 1972		Yield			
			1971		1972	
	in.	cm	lb	kg	lb	kg
Nab 15	24·2	61·5	7·2	3·27	10·2	4·60
RRIC 45	22·3	56·6	6·6	3·00	8·9	4·02
RRIC 86	21·8	55·4	5·4	2·45	7·1	3·23
RRIC 88	22·9	58·1	4·9	2·22	5·8	2·63

Clone Nab 15 is a very vigorous grower and had remained the best yielder on this trial. 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 yields in the first year are summarised in Table 28.

TABLE 28

1966 YIELD TRIAL — YIELD IN LB DRY RUBBER PER TREE PER YEAR (140 TAPPINGS) (TAPPED S/2, D/2, 100%)

Clone	Girth in 1972		Yield	
	in.	cm	lb	kg
AVROS 427	16·8	42·7	11·3	5·14
RRIC 45	19·3	49·0	6·9	3·14
RRIC 91	21·4	54·4	6·4	2·92
RRIC 88	20·1	51·1	5·9	2·69

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 test tapping yields during the first two years are given in Table 29.

TABLE 29

SPACING TRIAL — YIELD IN GRAMMES DRY RUBBER PER TREE PER TAPPING (TAPPED S/2, D/2, 100%)

Clone	12′ × 20′				8′ × 30′			
	Trees tapped	Girth in.	Girth cm	Yield g	Trees tapped	Girth in.	Girth cm	Yield g
RRIC 45	219—266	19·4	49·2	29·4	195—250	19·3	48·9	27·8
RRIC 41	303—341	21·9	55·7	27·1	279—315	21·7	55·2	23·7
RRIC 52	294—327	23·5	59·7	14·2	253—278	23·5	59·6	16·9
Mean		21·6	54·9	23·6		21·5	54·6	22·8

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

Immature areas

The following are the growth statistics of immature areas.

TABLE 30

GROWTH STATISTICS OF IMMATURE AREAS

Field experiment	Year planted	Extent ac.	Extent ha.	clone	Points per clone	Average girth 1971 in.	Average girth 1971 cm	Average girth 1972 in.	Average girth 1972 cm
22	1965	10	4·05	RRIC 45	1,800	20·4	51·82	24·2	61·5
23	1965	5	2·02	,, 45	(50 × 3) 150	18·3	46·48	21·3	54·1
				,, 88	,,	20·6	52·32	24·6	62·5
				,, 89	,,	17·6	44·70	20·5	52·1
				,, 90	,,	15·4	39·12	19·2	48·8
				,, 90	,,	20·1	51·05	24·2	61·5
				RRIM 600	,,	17·1	43·43	20·7	52·6
36	1966	10	4·05	RRIC 45	(135 × 3) 405	17·8	45·21	19·6	49·8
				,, 86	,,	18·6	47·24	21·5	54·6
				,, 88	,,	19·1	48·51	22·0	55·9
				RRIM 701	,,	18·6	47·24	20·4	51·8
37	1966	10	4·05	RRIC 5	(150 × 3) 450	16·1	40·89	18·5	47·0
				,, 45	,,	11·9	30·23	14·3	36·3
				Nab 15	,,	14·4	36·58	16·8	42·7
				RRIM 701	,,	10·9	27·69	12·9	32·7
40	1966	10	4·05	RRIC 36	(150 × 3) 450	19·6	49·78	22·1	56·1
				,, 41	,,	17·5	44·45	19·5	49·6
				,, 45	,,	16·0	40·64	18·7	47·5
				RRIM 605	,,	17·7	44·96	20·6	52·4
41	1966	20	8·09	RRIC 36	(265 × 3) 795	15·4	39·12	17·6	44·7
				,, 41	,,	17·3	43·94	19·1	48·4
				,, 86	,,	16·0	40·64	17·8	45·2
				PB 86	,,	15·5	39·37	17·5	44·4
44	1967	10	4·05	RRIC 36	(135 × 3) 405	13·7	34·80	18·3	46·4
				,, 45	,,	14·2	36·07	18·9	47·9
				,, 89	,,	14·2	36·07	19·1	48·4
				RRIM 600	,,	14·5	36·83	19·0	48·3

Contd :—

Field experiment	Year planted	Extent ac.	Extent ha.	clone	Points per clone	Average girth 1971 in.	Average girth 1971 cm	Average girth 1972 in.	Average girth 1972 cm
45	1967	10	4·05	RRIC 36	(175 × 3) 525	8·7	22·10	10·4	26·4
				,, 45	,,	7·7	19·56	8·8	22·2
				,, 89	,,	8·3	21·08	9·5	24·1
				PB 86	,,	9·4	23·88	11·2	28·4
48	1969	10	4·05	RRIC 45	(135 × 3) 405			7·2	18·2
				,, 100	,,			7·2	18·2
				,, 101	,,			7·4	18·9
				AVROS 1734	,,			7·2	18·2
49	1969	27	10·93	RRIC 45	(165 × 3) 495	—	—	—	—
				,, 88	,,	—	—	—	—
				,, 89	,,	—	—	—	—
				,, 90	,,	—	—	—	—
				,, 91	,,	—	—	—	—
				,, 100	,,	—	—	—	—
				,, 101	,,	—	—	—	—
				RRIM 600	,,	—	—	—	—
				PB 86	,,	—	—	—	—
51	1966	10	4·05	RRIC 45	(150 × 3) 450	12·7	32·26	14·4	36·6
				,, 75	,,	13·1	33·27	15·8	40·1
				,, 88	,,	14·3	36·32	17·7	45·0
				,, 89	,,	12·2	30·99	14·4	36·6
64	1971	35	14·16	RRIC 13	(300 × 3) 900	—	—	—	—
				,, 45	,,	—	—	—	—
				,, 48	,,	—	—	—	—
				,, 50	,,	—	—	—	—
				PR 252	,,	—	—	—	—
				IRCI 2	,,	—	—	—	—
				AVROS1734	,,	—	—	—	—
69	1972	10	4·05	RRIC 45	(75 × 6) 450	—	—	—	—
				,, 13	,,	—	—	—	—
				,, 103	,,	—	—	—	—
				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′ × 30′.

(a) Twelve plots with a plot size of approximately 90′ × 120′ 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′ within each row. The creepers are trained on to a single strand of barbed wire fixed to wooden posts approximately 6′ above ground level. Regular application of fertilizer is being made according to recommendations of the Department of Agriculture of Sri Lanka.

(b) Twelve plots with a plot size of approximately 90′ × 120′ 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′ within each row. Fertilizer applications are made according to recommendations of the Department of Agriculture of Sri Lanka.

Stock experiments

Field experiment No. 34 — 1966 small scale stock experiment — Nivitigalakele (A. C. I. Yahampath & 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 experiment was set down in May 1966 as replicated single tree plots. 70% of the trees reached tappable girth and were tapped on S/2, d/2, 100% system from March 1972. The average girth of trees and the yields recorded in 1972 are summarised in Table 31.

TABLE 31

AVERAGE GIRTH AND YIELDS OF PB 86 BUDDINGS

Seedling stock	Scion	Mean girth in cm	Mean yield in g/tree/tapping
RRIC 7	PB 86	52·8	34·5
,, 41	,,	58·2	28·5
,, 52	,,	57·3	30·4
,, 86	,,	59·4	29·1
,, 88	,,	60·3	31·4
,, 89	,,	59·4	30·1
Tjir 1	,,	56·7	25·7
Hevea spruceana	,,	46·2	30·1

The average yields recorded on all clonal rootstocks have exceeded that of selfed Tjir 1 seedlings.

Field experiment No. 47 — 1968 small scale stock experiment, Nivitigalakele (A. C. I. Yahampath, L. S. S. Pathiratne & W. T. Silva).

In this trial, seedlings of clones RRIC 7, 41, 52, 86, Glen 1, Wagga 6278 and Tjir 1 were budded with clone RRIC 45. The experiment was laid down in 1968 as randomised single tree plots. The average girth of scions at 4½ yr of age are given in Table 32.

TABLE 32

AVERAGE GIRTH OF RRIC 45 BUDDINGS

Seedling stock	Scion	Mean girth in cm
RRIC 7	RRIC 45	37·6
,, 41	,,	36·2
,, 52	,,	37·7
,, 86	,,	38·1
Tjir 1	,,	34·7
Glen 1	,,	37·2
Wagga 6278	,,	33·7

Field experiment No. 61 — 1969 stock experiment, Nivitigalakele (A. C. I. Yahampath, L. S. S. Pathiratne & W. T. Silva).

The clone RRIC 45 has been budded on seedling stocks of clones RRIC 5, 41, 52, 89, RRIM 623 and Tjir 1. The experiment was laid down in May 1969 as replicated single tree plots. The average girth of trees at 3½ yr of age are given in Table 33.

TABLE 33

AVERAGE GIRTH OF RRIC 45 BUDDINGS

Seedling stock	Scion	Mean girth in cm
RRIC 5	RRIC 45	27·4
,, 41	,,	27·7
,, 52	,,	26·8
,, 89	,,	26·7
RRIM 623	,,	27·1
Tjir 1	,,	24·9

Field experiment No. 62 — 1971 stock experiment, Nivitigalakele (A. C. I. Yahampath, L. S. S. Pathiratne & W. T. Silva).

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. The buddings were planted in May 1971 as replicated single tree plots. The average girth of buddings at 1½ yr of age are given in Table 34.

TABLE 34

AVERAGE GIRTH OF RRIC 45 BUDDINGS

Seedling stock	Scion	Mean girth in cm
RRIC 5	RRIC 45	10·4
,, 7	,,	10·3
,, 36	,,	10·0
,, 45	,,	9·8
,, 52	,,	10·4
RRIM 623	,,	9·6
AVROS 427	,,	10·1
Glen 1	,,	9·7
Tjir 1	,,	9·9
PB 86	,,	9·6
TR 1406	,,	9·4
WR 101	,,	10·1
Wagga 6278	,,	10·3

The growth of buddings particularly on PB 86 clonal rootstocks compares very favourably with those on Tjir 1 rootstocks.

Other investigations

Budgrafting (*A. C. I. Yahampath & R. B. Gunaratne*) :— Experiments have indicated the possibility of using ploythene strips as a substitute for standard adhesive tape for budgrafting rubber. The results of a budgrafting experiment carried out using three types of tape are given in Table 35.

TABLE 35

BUDGRAFTING SUCCESS USING DIFFERENT TYPES OF TAPE

Type of budding tape	% success
(a) Adhesive budding tape	70
(b) 1″ × 36″ strips of black polythene g. 600	96
(c) ,, ,, ,, transparent ,, g. 300	98
(d) ,, ,, ,, ,, ,, g. 500	98
(e) 1″ × 18″ ,, ,, scrap lace	98
(f) 1″ × 36″ ,, ,, transparent polythene g. 300 with a strip of adhesive tape	96

All materials tested have given better budding success than the standard adhesive tape.

Rainguards (R. Satchuthananthavale & I. Amarasinghe)

Field trials were set down to evaluate the usefulness of a "gutter" type of rubber rainguard developed by the Botany Department. Initial trials have indicated that these rainguards could last for more than a year under field conditions. In a trial carried out at Dartonfield, it had been possible to increase the number of normal tapping days from 227 in the control plots to 278 in plots carrying these rainguards. An analysis of tapping days in this trial are given in Table 36.

TABLE 36

RAINGUARD TRIAL — DARTONFIELD

Month	No. possible tapping days excluding holidays	Without Rainguard			With Rainguard		
		No. normal tapping days	No. late tapping days		No. normal tapping days	No. late tapping days	
			After 8 a.m.	After 10 a.m.		After 8 a.m.	After 10 a.m.
July 1971	31	16	—	6	25	4	—
August ,,	31	17	2	1	24	4	1
Sept. ,,	30	15	—	1	19	4	3
Oct. ,,	30	16	1	1	18	4	2
Nov. ,,	30	19	5	5	25	5	—
Dec. ,,	31	23	2	6	27	4	—
Jan. 1972	30	27	1	2	30	—	—
Feb. ,,	29	27	—	2	29	—	—
March ,,	31	25	1	5	29	2	—
April ,,	28	18	1	9	21	7	—
May ,,	28	12	—	—	12	4	—
June ,,	30	12	4	3	19	1	—
Total for 12 months	359	227	17	41	278	39	6

Bacterial coagulation of latex — (R. Satchuthananthavale in collaboration with (Mrs.) V. Satchuthananthavale).

Two more species of bacteria were isolated from cup lump.

Tissue culture — (R. Satchuthananthavale & G. de Mel)

Callus cultures from anthers continued to maintain good growth on sub-culture. No differentiation or organ formations from callus was observed. Callus cultures from young stem sections were established on modified Nitsch's medium. These cultures have maintained good growth on sub-culture in the same medium.

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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14	1955 Clone trial — Hedigalla
15	1953 Clone trial — Nivitigalakele
16	1956 Clone trial — Hedigalla
19	1962 Clone trial — Nivitigalakele
21	1964 Yield trial — Nivitigalakele
22	1965 ten-acre replanting of RRIC 45 — Nivitigalakele
23	1965 Clone trial — Dartonfield
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34	1966 Stock experiment — Nivitigalakele
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REVIEW OF THE GENETICS & PLANT BREEDING DEPARTMENT

BY

D. M. FERNANDO

SUMMARY

Yields of the large scale trials of some of the RRIC 100 series supported the high level of accuracy of small scale experiments. Some progress was made in combining sources of SALB resistance. Studies on the photosynthetic efficiency of leaves of the different clones were initiated. A clone exchange was effected with India and six clones of the RRIC 100 series were successfully established at Nivitigalakele.

DETAILED REVIEW

General

The large scale yields of some of the RRIC 100 series opened at five years were of primary interest in 1972. These trees were matched against high yielding modern controls such as RRIC 45 and RRIM 623 and the results are very promising (Fig. 1). More seedlings were obtained from the hand pollination programme incorporating double sources of SALB resistance such as F 4542 and FA 1717. Studies on the photosynthetic efficiency of leaves of the different clones were initiated. The first set of selected seedlings were planted at Nivitigalakele during the South West monsoon.

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, Assistant Geneticist, was on duty throughout the year. The Senior Field Assistant, Mr. H. B. H. de Silva, Technical Assistants, Messrs. P. Samaranayake and M. S. C. de Silva, and Field Assistants, Messrs. D. S. Gamage, W. A. C. Wijesinghe, A. K. M. S. Senaratne and B. M. S. G. Peiris were on duty throughout the year. One graduate trainee Mr. W. D. Gunadasa, was absorbed into the Department. Eleven other monthly paid employees assisted in routine laboratory and field work. The annually increasing field work associated with newer areas coming into tapping was competently handled by the field officers in spite of difficulties in transport and estate arrangements.

Visits

The Head of the Department made 30 visits and the rest of the staff made 154 visits in connection with experimental work.

Liaison (D. M. Fernando, C. M. B. Ratnayake) :

The Head of the Department attended the First Symposium on International Co-operation in *Hevea* Breeding held at Kuala Lumpur in April 1972. Arrangements for a Co-operative clone exchange were finalised. In exchange for ten Sri Lanka selections the R.R.I. of India offered ten RRII 100 series and six of these

introductions *viz.*, RRII 105, 106, 109, 113, 114, 116, were established at Nivitigalakele. Budwood from eight of the original *Hevea* introductions at Henerathgoda were sent to the RRI of Malaysia for incorporation in the Polyclone collection.

Lectures

Three Radio Talks under the auspices of the CAAS were delivered during the year. The topics were :—

1. Rubber and Ceylon
2. Our rubber
3. More rubber from better trees.

Publications

The following papers were presented for restricted circulation :—

1. Screening for disease resistance in rubber. D. M. Fernando. *First Symposium on International Co-operation in* Hevea *Breeding, Kuala Lumpur, 1972.*

2. Ideas on clone selection in rubber. D. M. Fernando. *First Symposium on International Co-operation in* Hevea *Breeding, Kuala Lumpur, 1972.*

3. An aspect of the transmissibility of favourable secondary characters in seedling populations of *Hevea.* D. M. Fernando. *I.R.R.D.B. Liaison meeting on* Hevea *breeding and exchange of planting materials, Medan, 1972.*

Buildings and Facilities :

An auxiliary water supply was installed at Nivitigalakele. It was again not possible to implement the additional building programmes at Nivitigalakele or Kuruwita. The supply of mains current to Kuruwita greatly facilitated the work there.

Research Investigations

Clone evaluation (*D. M. Fernando*) :

The second year large scale yields of RRIC 101 averaged over 1000 lb/ac.* (1121 kg/ha.) in the second yr of tapping (Table 12). A large scale plot of RRIC 102 averaged over 500 kg/ha. in the first yr of tapping (Table 14). The efforts of several planters to include the RRIC 100 series in their replanting programmes would therefore appear to be fully justified.

*1121 kg/ha. = 1,000 lb/ac.

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

An eight ac. randomized trial was planted in the South West monsoon season. According to the experimental design only a part of the area was planted and weaker plants were filled into particular planting points in December, 1972.

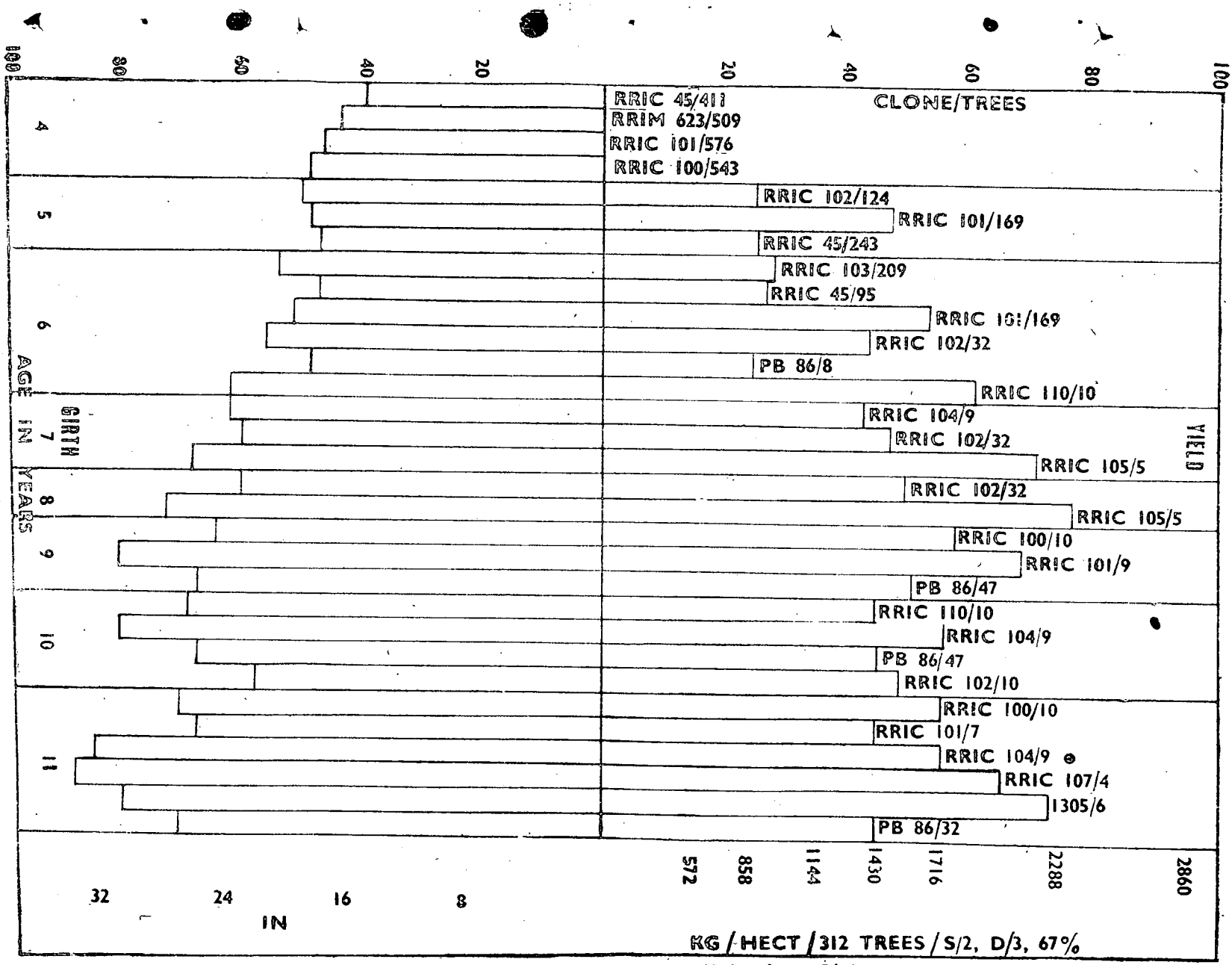
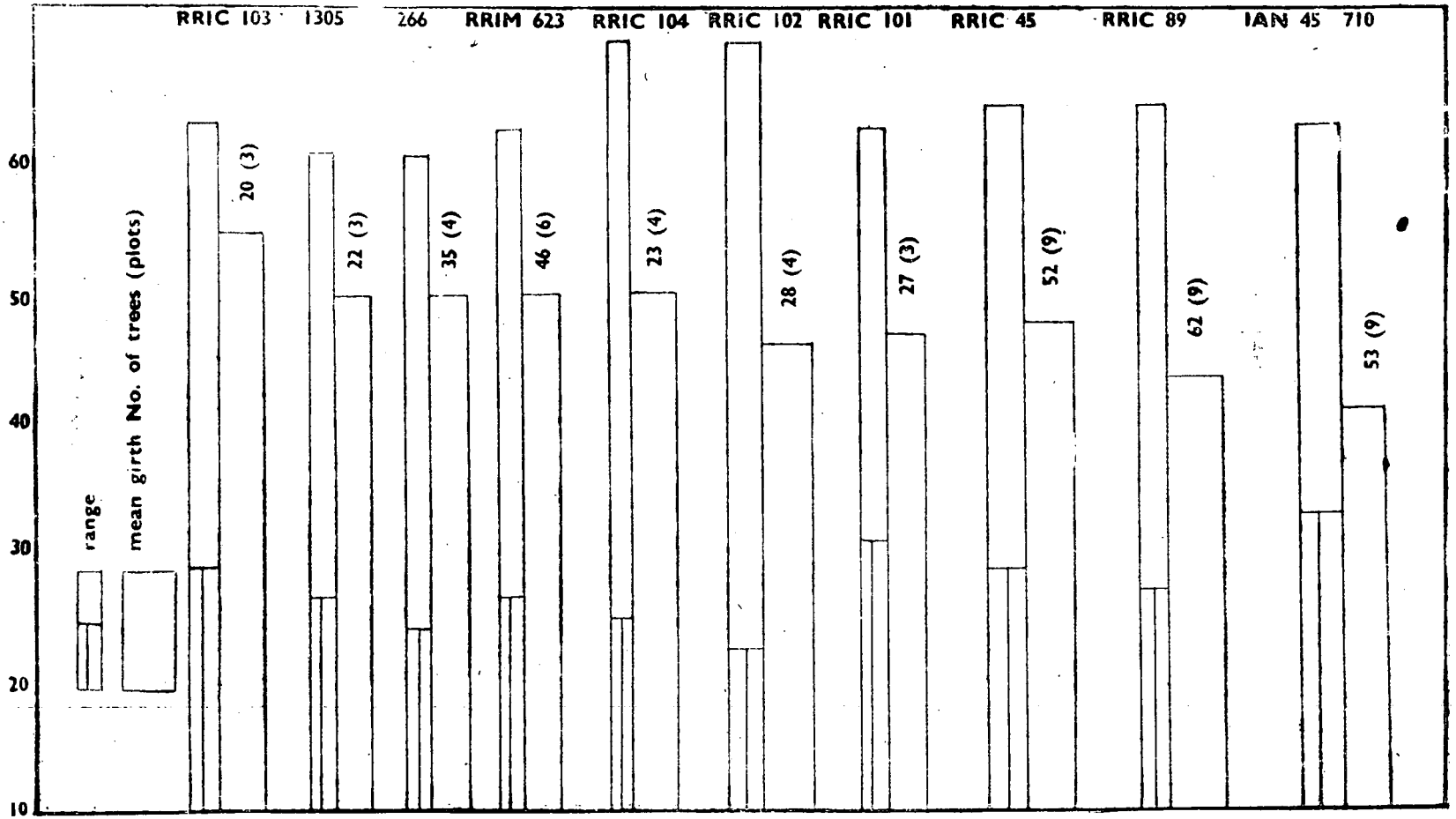


Fig. 1 YELDS AND GIRTHS OF SOME OF THE NEWER CLONES AND CONTROLS

Fig. 2

GROWTH OF SOME OF THE NEWER CLONES AND CONTROLS IN THE 1965 N.E. TRIAL AT MONERAGALA



Seedling variability — Polyclone (M. S. C. de Silva)

Studies were continued on budgrafts of randomized seedlings from seven sources already analysed for growth, latex and oil content.

Photosynthetic efficiency (C. M. B. Ratnayake)

Studies were initiated on a simple method for measuring the photosynthetic efficiency of clones and seedlings.

Selection (K. B. Karunasekera, M. S. C. de Silva & W. D. Gunadasa)

A few more clonal seed sources were tested for selection. The previous year's seedling selections were transplanted into larger polybags. 3000 seedlings of RRIC 103 were screened for sufficient selections for a field experiment.

Total lipid content (D. M. Fernando & P. Samaranayake)

In order to avoid complications due to the presence of chlorophyll, the roots were finally selected for drying, macerating, and estimation of lipids by ether or acetone.

Artificial pollination programme (C. M. B. Ratnayake, D. S. Gamage & B. M. S. G. Peiris)

More seedlings were obtained combining the *benthamiana* source of SALB resistance, F 4542 and the *brasiliensis* source, FA 1717 (Table 1). Post germination losses reduced the total number of seedlings and it is proposed to repeat this programme in 1973.

Disease resistance

Oidium (*C. M. B. Ratnayake and D. S. Gamage*)

The yields of RRIC 102 (Table 2) were again satisfactory. Only two trees of the 300 trees of the control block of PB 86 could be brought into tapping in this area.

TABLE 1

PROGENY OBTAINED BY ARTIFICIAL POLLINATION (1972)

Cross	Parentage		No. of Seedlings
2473 × 5326	(RRIC 45 × IAN 45 - 873)	× (RRIC 51 × F 4542)	27
2473 × RRIC 103	,,	× (RRIC 52 × PB 86)	2
5326 × 2473	(RRIC 51 × F 4542)	× (RRIC 45 × IAN 45 - 873)	51
2417 × 2473	(RRIC 45 × FX 4098)	× (RRIC 45 × IAN 45 - 873)	5
2417 × 5326	(RRIC 45 × FX 4098)	× (RRIC 51 × F 4542)	3
IAN 45 - 717 × 2473	(PB 86 × F 4542)	× (RRIC 45 × IAN 45 - 873)	27
IAN 45 - 717 × RRIC 103	,,	× (RRIC 52 × PB 86)	2
PB 86 × 2473	,,	× (RRIC 45 × IAN 45 - 873)	6
PB 86 × RRIC 101	,,	× (Ch 26 × RRIC 7)	3
PB 86 × RRIC 103	,,	× (RRIC 52 × PB 86)	3
IAN 45 - 710 × RRIC 101	(PB 86 × F 409)	× (Ch 26 × RRIC 7)	28
IAN 45 - 710 × 506	,,	× (RRIC 52 × Tjir 1)	11
IAN 45 - 710 × 8501	,,	× (RRIC 52 × FX 360)	14
506 × IAN 45 - 710	(RRIC 52 × Tjir 1)	× (PB 86 × F 409)	15
		Total	197

Colletotrichum (Gloeosporium *Leaf-fall*) (*H. B. H. de Silva*)

The control PB 86 trees were affected with *Oidium* and *Gloeosporium*. Clone 79 also showed *Oidium* leaf-fall and 3229 had a heavy fruit set and some *Phytophthora* leaf-fall. Clone 3229, 3221 and 79 were multiplied for further proof trials. The yields of sample plots are given in Table 3. Some susceptibility to *Gloeosporium* leaf-fall was shown by RRIC 102 at Nivitigalakele.

TABLE 2

1963 N.E. CLONE TRIAL — MATALE

(Tapped S/2, d/3, 67% from 1970)

Clone	Trees tapped	Mean girth (cm)		Yield (g/tree/tapping)		
		1971	1972	1970	1971	1972
RRIC 101	34	51·9	53·5	15·4	25·7	32·0
1108	23	53·9	55·9	10·6	17·3	20·7
815	22	58·4	60·8	11·3	17·7	24·6

TABLE 3

1964 CLONE TRIAL — NAKIADENIYA GROUP

(Tapped S/2, d/2, 100% from 1970)

Clone	Trees test tapped	Mean girth (cm)		Wind damage trees	Yield (g/tree/tapping)		
		1971	1972		1970	1971	1972
3221	10	63·9	71·0	—	22·5	38·1	38·7
815	10	72·5	77·1	—	21·7	30·0	34·9
79	20	55·3	63·8	—	21·0	31·9	38·8
PB 86	10	42·7	48·0	—	19·7	27·0	27·9
IAN 6505	5	52·0	55·0	—	26·4	28·2	27·5
3229	4	72·0	80·2	1	20·0	37·9	50·8
687	4	59·5	64·1	—	15·6	28·1	39·0
6338	5	55·3	61·1	—	22·1	32·0	33·8

Phytophthora (*D. M. Fernando*)

The RRIC 100 series showed relatively low fruit set and incidence of *Phytophthora* leaf-fall during the year. RRIC 101 produced the least number of fruit even in the large scale plots. The yields of the RRIC 52 selfed clone (Table 10) improved in 1972.

South American Leaf Blight (*D. M. Fernando, C. M. B. Ratnayake, D. S. Gamage, & W. D. Armon*)

As shown in Table 4, IAN 45 — 873 showed better yields than PB 86. Clone IRCI 7 continued to be the highest yielder in this trial. Clone 6306 (RRIC 36 × FX 516) showed yields slightly below RRIC 102 (Table 5) in the 1965 clone trial at Dartonfield.

TABLE 4

1960 CLONE TRIAL — PEENKANDE

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

Clone	Trees tapped	Mean girth (cm)		Yield (g/tree/tapping)			
		1971	1972	1969	1970	1971	1972
IRCI 7	36	71·2	72·9	48·6	39·8	41·8	45·5
C 695	24	62·3	64·9	38·5	32·7	38·5	34·8
IAN 45 - 873	34	74·7	77·2	38·5	33·4	35·5	29·8
PB 86	40	66·8	68·1	26·4	29·8	33·3	24·0
PR 228	28	65·5	69·0	36·3	33·4	32·0	32·1
IAN 45 - 717	36	70·7	72·5	33·0	29·9	30·9	27·0
IAN 45 - 710	37	68·1	69·6	32·1	28·8	29·3	22·8
RRIC 86	12	63·7	65·2	25·4	29·5	29·0	29·4
FX 2261	34	65·4	67·0	37·2	30·5	27·8	25·2
FX 3810	38	79·2	81·9	25·4	22·5	27·6	29·0
TR 1548	32	67·7	69·8	24·4	26·4	24·8	24·0
AV 427	22	58·0	60·3	28·3	30·9	16·4	14·1
IRCI 10	19	57·9	57·2	26·6	21·8	16·4	19·9
Harbel 1	28	59·7	61·5	21·3	22·1	16·1	20·8
ST 71	33	60·2	61·1	19·8	17·9	13·0	11·1

TABLE 5

1965 SMALL SCALE CLONE TRIAL — DARTONFIELD

(Tapped S/2, d/3, 67% from 1970)

Clone	Trees tapped	Mean girth (cm)		Yield (g/tree/tapping)		
		1971	1972	1970	1971	1972
6306	6	53·7	59·2	23·9	34·9	32·0
RRIC 102	4	53·3	59·7	25·8	32·4	35·4
2417	5	53·9	59·0	21·7	31·0	50·1
3164	3	61·5	71·0	22·0	27·3	21·6
1461	10	59·5	65·4	20·0	27·2	27·1
2473	11	53·5	60·5	14·8	23·2	27·9
RRIC 45	79	51·6	56·8	18·7	22·7	23·1
691	4	57·5	64·8	13·1	20·9	21·1
2885	10	63·4	71·6	14·6	20·9	22·7
2416	13	61·4	70·8	16·7	20·8	18·6
5326	10	54·9	60·2	16·2	20·5	18·5
5352	13	61·2	68·9	13·6	18·8	18·8
6182	11	57·1	64·0	14·7	18·7	24·7
IAN 45 - 710	4	51·1	58·2	13·7	16·9	16·8
RRIM 623	9	53·7	60·3	16·2	16·1	17·4
RRIC 106	12	58·9	64·4	16·0	14·4	15·9

Clone Trials

1961 — Kuruwita (B. M. S. G. Peiris)

RRIC 107 and 1305 showed improved yields. A slight yield increase was recorded for RRIC 100. Most of the trees showed depressed yields on approaching the union (Table 6).

Intensive tapping

Some of the lower yielding vigorous trees were tapped on 2S/2, d/3, 133% intensity and the incidence of wind damage and Brown Bast on clones averaging over 100 g/tree/tapping (Table 7) are of interest.

TABLE 6

1961 SMALL SCALE CLONE TRIAL — KURUWITA

(Tapped 67% in 1966,1967 ; 100% in 1968,1969 ; 67% from 1970)

Clone	Trees tapped	Mean girth (cm)		Yield (g/tree/tapping)			
		1971	1972	1969	1970	1971	1972
RRIC 100	10	68·5	71·1	63·7	58·6	51·3	56·7
RRIC 100	4	66·8	69·1	67·3	78·5	59·8	60·4
RRIC 101	7	67·9	70·3	56·5	46·1	35·0	45·6
RRIC 104	9	84·3	89·9	52·6	68·4	56·4	55·1
RRIC 107	4	91·2	96·3	62·2	44·1	47·8	59·6
RRIC 107	4	87·3	90·9	58·1	62·6	60·8	65·2
1152	7	74·1	76·9	49·6	66·6	61·7	73·6
1152	4	74·4	79·9	48·7	55·9	51·3	64·5
1305	6	80·0	83·1	73·8	51·4	58·2	76·0
1305	3	88·0	92·4	66·1	104·9	96·2	86·4
82	9	78·1	82·9	40·6	52·2	35·6	49·5
PB 86	32	70·6	72·3	37·8	40·2	45·7	44·8

TABLE 7

1961 SMALL SCALE CLONE TRIAL — KURUWITA

(Tapped 2S/2, d/3, 133% from 1970)

Clone	Parentage	Trees tapped	Mean girth (cm)		W.D. trees	B.B. trees	Yield (g/tree/tapping)	
			1971	1972			1971	1972
715	PB 86×RRIC 36	4	80·4	85·2	—	1	124·8	104·6
1057	T 170×Tjir 1	6	83·9	90·4	1	—	116·6	114·3
1461	RRIC 52×T 792	4	82·5	84·4	—	—	109·3	105·2
1793	RRIC 45×PR 107	5	90·1	91·6	—	—	115·5	102·0
1799	RRIC 45×PR 107	5	79·4	81·2	1	—	139·6	128·9
1851	RRIC 45×LCB 1320	4	92·4	94·8	—	—	122·6	122·4

W. D. Wind damage; B. B. Brown Bast

1962 South West clone trial — Kuruwita (B. M. S. G. Peiris)

RRIM 701 and RRIM 628 showed high yields. The die-back associated with RRIM 701 was not observed in this clearing so far. WR 101, RRIC 37, RRIC 41 and RRIC 36 indicated yields between 1000 and 1,500 lb/ac. (1,121 and 1,682kg/ha). (Table 8).

1962 small scale clone trials — Kuruwita (B. M. S. G. Peiris)

The eight tree plot of RRIC 102 showed the best yields.

1962 small scale clone trials — Nivitigalakele (D. S. Gamage)

Clone 82 showed the best yields followed by RRIC 102 and PB 28/59 (Table 9).

TABLE 8

1962 S. W. CLONE TRIAL — KURUWITA

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

Clone	Trees tapped	Mean girth (cm)		Yield (g/tree/tapping)			
		1971	1972	1969	1970	1971	1972
RRIM 701	201	64·2	65·0	32·1	51·7	51·7	70·9
TR 3702	188	60·2	62·7	38·0	38·5	45·8	43·5
RRIC 36	177	60·1	61·2	35·3	37·3	43·0	43·0
PR 228	102	58·3	58·9	37·8	46·9	39·8	36·0
RRIM 628	116	51·3	52·6	52·2	38·0	39·6	52·4
WR 101	84	60·9	61·1	49·9	45·6	38·2	47·4
RRIM 623	211	63·7	67·2	46·5	49·7	36·9	41·9
PB 86	179	59·1	63·8	30·0	31·9	36·1	45·8
IRCI 7	103	58·0	61·0	39·5	36·9	35·6	28·3
RRIM 707	219	62·2	63·2	—	47·6	34·3	48·5
RRIC 37	87	59·6	62·2	27·5	38·7	32·3	51·6
PR 259	105	52·4	55·0	35·0	36·3	32·0	42·3
IAN 45 - 717	207	59·1	61·9	21·0	25·1	31·5	41·6
RRIM 607	177	60·5	63·1	24·9	31·4	30·1	40·1
AVROS 529	97	62·4	62·9	35·2	21·8	29·8	30·9
PR 251	104	56·7	57·9	39·3	26·3	29·5	30·8
RRIC 14	198	66·0	69·2	31·4	29·3	24·8	30·8
TR 1548	209	60·1	62·8	25·0	22·4	26·2	39·9
RRIC 7	111	56·5	59·2	43·7	37·0	26·1	34·2
IAN 6497	93	58·5	59·9	21·4	16·3	23·9	29·8
AV 2037	211	64·4	65·5	24·1	20·7	23·6	37·6
Harbel 1	204	55·5	58·9	30·8	20·6	22·1	31·9
RRIC 52	240	68·9	69·9	10·2	14·8	19·9	30·7
RRIC 51	193	60·3	64·9	17·3	12·8	14·3	25·8

TABLE 9

1962 S.W. SMALL SCALE TRIALS

(Tapped (Nivitigalakele) 67% in 1969, 100% in 1970, 1971, 1972) (Kuruwita) 67%

Clone	Trees tapped	Mean girth (cm)		Yield in (g/tree/tapping)			
		1971	1972	1969	1970	1971	1972
RRIC 102 (Kuruwita)	8	62·2	64·1	48·5	55·3	57·2	44·4
RRIC 102 (Nivitigalakele)	10	58·5	59·8	41·4	32·7	49·2	50·8
82 (,,)	6	80·0	82·5	42·2	33·2	44·8	57·3
RRIC 45 (,,)	6	60·0	61·7	32·5	29·0	45·6	36·4
RRIC 52 (,,)	7	71·0	74·0	24·1	19·6	28·1	28·2

1963 N. E. clone trial — Kuruwita (W. A. C. Wijesinghe)

RRIC 105 showed high yields and a wind resistant type of branching. The selfed RRIC 52 clone 4011, possibly suitable for districts with marked *Phytophthora* leaf-fall, showed commercially feasible yields this year (Table 10).

1964 N. E. clone trial — Kuruwita (W. A. C. Wijesinghe)

RRIC 110 showed outstanding yields but the latex, though white, was subject to slight enzymatic discolouration on standing. This is obviously inherited from RRIM 7. RRIC 102 displayed a potential of over 1000 lb/ac. (1121 kg/ha.) at seven years of age when opened on d/3 at five years.

TABLE 10

1963 SMALL SCALE CLONE TRIAL — KURUWITA

(Tapped S/2, d/2, 67%)

Clone	Trees tapped	Mean girth (cm)		Brown Bast trees	Yield (g/tree/tapping)		
		1971	1972		1970	1971	1972
3279	6	70·3	74·1	—	58·7	82·4	50·3
RRIC 105	5	72·7	75·9	—	70·8	78·8	95·1
RRIC 109	6	67·4	73·1	—	49·9	73·7	57·3
3606	2	74·9	84·2	—	50·4	71·0	65·6
3060	7	70·0	75·6	—	18·7	65·1	71·1
1620	5	64·3	69·2	—	57·2	57·8	49·5
RRIC 108	7	59·6	63·6	—	62·2	55·8	48·7
4011	7	62·8	66·7	—	47·5	54·4	53·0
2994	8	65·0	70·3	1	42·0	53·9	55·7
T 132	7	63·6	67·2	1	41·1	52·8	60·0
3076	6	57·1	60·5	—	56·7	43·4	50·1
1501	10	58·2	60·5	—	28·0	41·8	49·4
4008	10	68·6	72·7	—	32·8	40·7	41·0
PB 86	56	58·5	62·4	—	28·5	33·3	36·4
2228	10	65·1	67·7	2	44·7	28·3	44·1

TABLE 11

1964 CLONE TRIAL — KURUWITA

(Tapped S/2, d/3, 67%)

Clone	Trees tapped	Mean girth (cm)		Brown Bast trees	Yield (g/tree/tapping)		
		1971	1972		1970	1971	1972
RRIC 102	32	60·4	63·9	1	45·3	49·4	49·8
	34	60·8		—	43·4	44·3	—
RRIC 110	11	65·5	68·4	—	61·9	64·2	66·3
266	19	67·6	71·1	—	41·6	46·8	47·8
1152	18	61·9	65·9	—	32·5	33·4	34·1

1965 N. E. clone trial — Moneragala (D. S. Gamage)

The outstanding growth of RRIC 103 in the wet districts was also shown in this trial. As shown in Fig. 2, RRIC 103, 102 and 104, 1305 and 266, appear suitable for this district. RRIM 623 shows favourable growth but also a certain amount of die-back in this district.

1966 clone trial — Kuruwita (W. A. C. Wijesinghe)

The large scale yields of RRIC 101 and 103 opened at five years of age, showed appreciable increase and a potential of from 900 to 1,200 lb/ac. (1,009 to 1,345 kg/ha.), on S/2, d/3, 67% tapping system (Table 12).

1966 clone trial — Nivitigalakele (H. B. H. de Silva).

The large scale yields of RRIC 103 were slightly less than that of Kuruwita. As in Kuruwita a mean girth of over 21 in. (54 cm) was recorded for this clone (Table 13).

1966 clone trial — Gikiyanakande (S. Senaratne & B. M. S. G. Peiris)

The first RRIC 100 series planted on a large scale in an outside estate were opened in mid 1972.

TABLE 12

1966 S.W. CLONE TRIALS — KURUWITA
(Tapped S/2, d/3, 67% from March 1971)

Clone	Trees tapped	Mean girth all trees (cm) 1972	% trees in tapping	Yield g/tree/tapping 1971	1972
RRIC 101	169	51·0	84·5	48·2	54·5
RRIC 103	162	56·5	84·4	31·7	38·1
1004	106	51·1	51·2	18·1	30·2
RRIC 45	243	55·1	87·4	28·3	29·2

TABLE 13

1966 S.W. CLONE TRIAL — NIVITIGALAKELE
(Tapped S/2, d/3, 67% from March 1971)

Clone	Trees tapped	Mean girth (cm) 1972	Yield (g/tree/tapping) 1971	1972
RRIC 103	209	54·6	28·7	29·8
1004	131	50·6	25·7	23·6
RRIC 45	95	46·0	30·8	27·7

TABLE 14

1967 S.W. CLONE TRIAL — GIKIYANAKANDE

(Tapped S/2, d/3, 67% from mid 1972)

Clone	Trees tapped	% trees opened	Mean girth (cm) 1971	Mean girth (cm) 1972	Yield g/tree/tapping 1972
RRIC 102	124	45·1	44·2	49·6	27·2
RRIC 103	330	68·4	46·7	54·2	16·2
1004	164	47·1	43·1	49·3	14·9
RRIM 623	176	53·6	42·8	50·0	27·0

RRIC 102 showed substantial yields, matching the control clone RRIM 623. RRIC 103 showed relatively lower yields in the first year accompanied by more vigorous growth. The yields of RRIC 103 are expected to improve in the 2nd and 3rd years of tapping (Table 14).

1967 N. E. clone trials — Peenkande (W. D. Armon) and Bibile (de Silva H. B. H.)

Tapping is expected to commence on the clone trial at Peenkande in 1973. A comparison of girths of the same clone in the two different locations indicates that our selection for yield has also resulted in selection for the drier areas (Fig. 3).

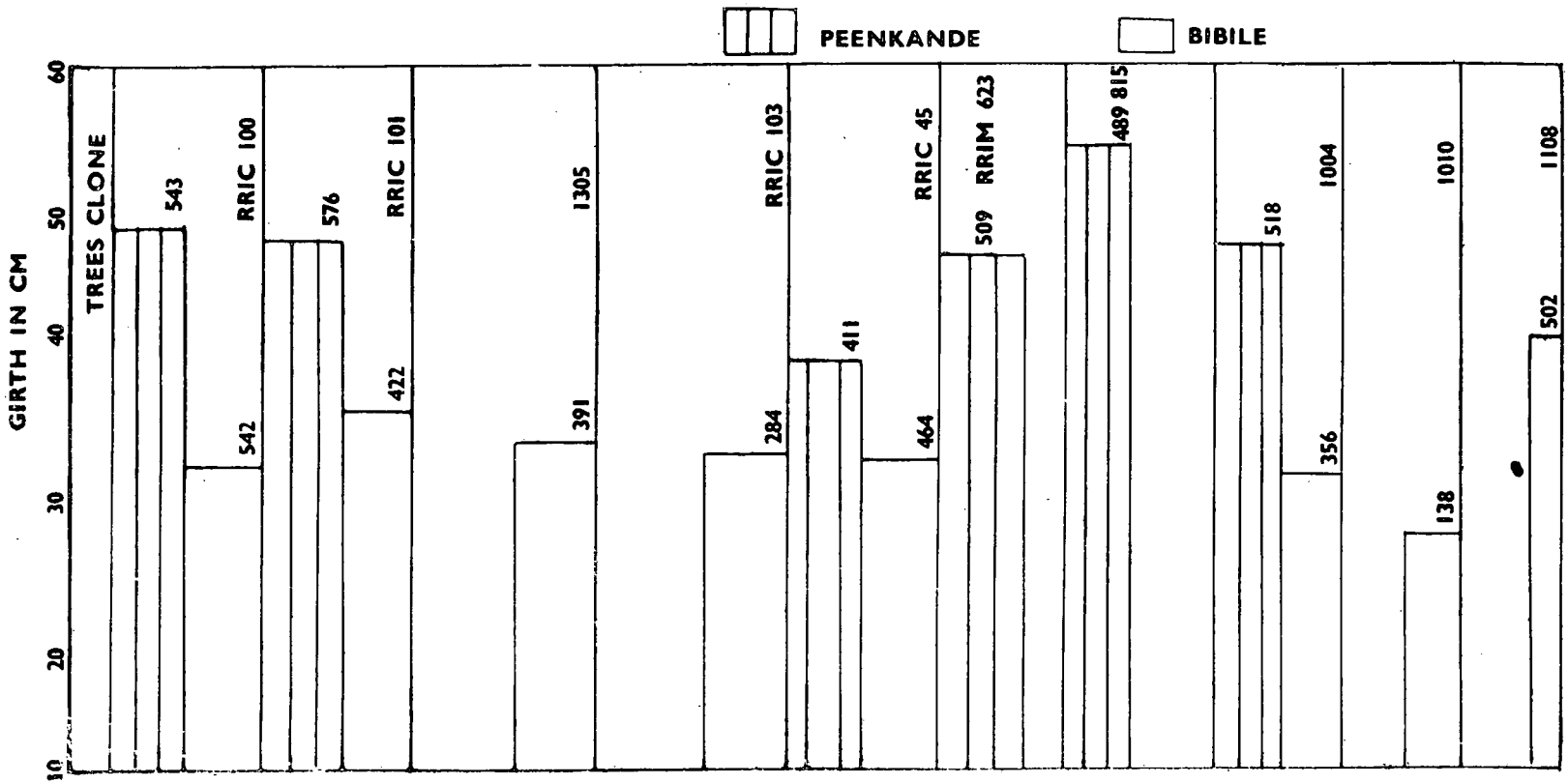
New Trials

Two hundred and thirty six selected seedlings from known clonal sources were planted at Nivitigalakele.

Index to Field Experiments

Field Experiment No.	*Description*	*Site*
1	1961 small scale clone trial	Kuruwita
1A	1960 clone trial	Peenkande
2	1961 medium and small scale clone trial	Kuruwita
3	1962 large scale clone trial	Kuruwita
4	1962 small scale clone trial	Kuruwita
5	1962 ,, ,, ,, ,,	Nivitigalakele
6	1963 ,, ,, ,, ,,	Kuruwita
6A	1963 ,, ,, ,, ,,	Matale
7	1964 clone trial (S. W. and N. E.)	Kuruwita
8	1965 small scale clone trial	Dartonfield
9	1965 ,, ,, ,, ,,	Moneragala
10	1965 clone trial	Matale
11	1966 ,, ,,	Kuruwita
12	1966 ,, ,,	Nivitigalakele
13	1966 ,, ,,	Moneragala
14	1967 ,, ,,	Nivitigalakele
15	1967 small scale clone trial	Kuruwita

Fig 3.
1967 N.E. PLANTINGS
COMPARISON OF GROWTH AT KARAWITA (PEENKANDE) AND BIBILE



Field Experiment No.	*Description*	*Site*
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
26	1969 ,, ,,	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
35	1972 seedling trial	Nivitigalakele

REVIEW OF THE PLANT PATHOLOGY DEPARTMENT

By

O. S. Peries

SUMMARY

The incidence of all the leaf disease of *Hevea*, normally prevalent in Sri Lanka, was mild during the period under review. The weather conditions in 1972 militated against the rapid spread of these diseases confirming that routine dusting or spraying for leaf disease control is not required in this country, but that control measures could be safely geared to weather patterns.

Studies on phytoalexins have indicated that there is a correlation between the concentration of these substances produced by various *Hevea* clones and the resistance of the latter to diseases.

Detailed studies have been undertaken on the rate of decay of rubber wood, the succession of fungi on felled rubber timber and the interaction between various saprophytic fungi and *Fomes lignosus*, in attempts to devise means of biological control of White Root disease. Certain fungi which may act as antagonists to *F. lignosus* have been identified and further studies are being undertaken to evaluate their effectiveness in this regard.

The microbiology of rubber soils is being studied to provide the infra-structure to the analysis of the above problem.

DETAILED REVIEW

Staff

The Director, continuing to act as Head of the Department, the Plant Pathologist, Dr. (Mrs.). V. Satchuthananthavale and the Assistant Plant Pathologist, Mr. G. W. Liyanage, were on duty throughout the year. The Senior Technical Assistant, Mr. T. M. Fernando and the Technical Assistants, Messrs. Z. E. Irugalbandara, D. M. Dantanarayana, L. Halangoda, S. A. R. D. Sebastian and S. S. Jayasooriya were on duty throughout the year. Mr. W. C. Dayaratne, was promoted to the post of Senior Technical Assistant in the Rubber Chemistry Department and assumed duties in that Department on 1st March, 1972.

Mr. A. de S. Liyanage, Assistant Plant Pathologist, continued his post graduate studies at Wye College, University of London. He is expected back in Sri Lanka at the end of 1973.

The Director attended the Symposium on *Hevea* diseases, organised by the International Rubber Research and Development Board (IRRDB), and held in Medan, Indonesia, in October, 1972. This Institute contributed the following papers to that symposium :

1. The Incidence of Root Diseases and Recent Developments in Controlling them in Ceylon.
2. Leaf and Panel Diseases of *Hevea*.

These papers were prepared jointly by Dr. (Mrs.) V. Satchuthananthavale and Dr. O. S. Peries.

Visits

The following visits were paid for advisory, experimental and other work by the departmental staff, during the period under review :—

Advisory	40
Experimental	275
Miscellaneous	21
Total	336

Advisory

Sun scorch on four to five year old trees :—

A severe drought was experienced in the early part of 1972. At Kelani Estate, Yatiyantota, the bases of young trees, which were exposed to the direct rays of the sun, were scorched and the secondary rot caused by micro-organisms had extended up the trunk (V. Satchuthananthavale & D. M. Dantanarayana).

Dry trees :

There were a large number of either partially or completely dry trees in a PB 86 clearing at Arapolakande Estate, Tebuwana. An investigation was carried out to determine whether *Fomes* root disease was primarily responsible for this condition.

It was found that *Fomes* root disease was only secondary and had aggravated the condition of the trees. (V. Satchuthananthavale & L. Halangoda).

Meetings

The Director attended the following Planters' Association (PA) meetings during the year, and addressed them on problems in plant pathology, amongst other subjects :

PA General Committee meetings	5
Kalutara PA	1
Kegalla PA	1
Kelani Valley PA	2
Sabaragamuwa PA	2

The Director and the Assistant Plant Pathologist, attended the first Smallholders' Conference held at Horana in October 1972, and addressed the meeting.

Publications

The following papers were prepared for publication during the year :

Peries, O. S. Studies on the relationship between weather and incidence of leaf diseases of *Hevea*. A Symposium on Plant Diseases in South East Asia. Published by The University of Malaya (in Press).

Peries, O. S. Incidence, symptoms and control of *Oidium* leaf disease of *Hevea*. Contributions to "Guide to Tropical Diseases" edited by the Tropical Institute, University of Geissen.

Peries, O. S. *Phytophthora* leaf disease of *Hevea*, its incidence symptoms and control. Contribution to "Guide to Tropical Diseases" edited by The Tropical Institute, University of Geissen.

Laboratory investigations

Diseased specimens : Only a few specimens were received at the Institute for disease identification, indicating that the incidence of *Hevea* diseases was low during the year under review, and that the Superintendents of most estates recognised the disease symptoms and took the necessary remedial measures at the appropriate stage to minimise the losses caused by them. The diseases identified on the samples received are listed below :—

(a) *Fungi*

Gloeosporium alborubrum	1
Oidium heveae	1
Phytophthora spp.	1

(b) *Pests and Other causes*

Cockchafer grubs	1
Dieback	1
Unidentified	1

Physiology of Disease Resistance

Phytoalexins : Studies on phytoalexins were continued when *Hevea* pods were available. It is now established that phytoalexins are produced as a result of the interaction between the host and the parasite. There appears to be a correlation between the concentration of these substances and the resistance of clones to disease.

A paper entitled "Phytoalexins in *Hevea*" is being prepared for publication. (R. Satchuthananthavale & V. Satchuthananthavale).

Routine tests of fungicides : Difolatan gave promising results in laboratory trials, indicating that it may be a suitable fungicide for Bark Rot control. This material is now being tested to evaluate its phytotoxic levels. There is no urgency in these trials, as the incidence of Bark Rot has been remarkably low in recent years, and there are proven fungicides for use in case epidemics occur. The Institute is now in a position to assess the economics of the use of fungicides and there appears to be no purpose in testing fungicides which may be more costly to apply than those currently recommended (O. S. Peries & S. A. R. D. Sebastian).

Phytophthora spp.

Oospore Production : Two types of *Phytophthora* isolates occuring on rubber were studied. The type isolate 62 produces oospores when grown alone on Lima Bean Agar (LBA) at 20°C. Single zoospore isolates of type isolate 62 were screened for oospore production under the same conditions as for the parent. Only 11 of the 50 isolates tested produced oospores. It appears that all the filial isolates are

not capable of forming oospores under the same conditions. (V. Satchuthananthavale & D. M. Dantanarayana).

Nutrition and reproduction : Selected isolates of *Phytophthora* spp. were studied. The maximum growth of type isolate 62 was recorded on sucrose asparagine — calcium nitrate modified liquid medium.

Growth of the type isolate 60 was not consistent. The rest of the isolates grew fairly well on this medium.

Only one isolate produced sporangia on the above medium solidified with Agar and on Corn Meal Agar (CMA). Sporangia were formed by six isolates on LBA over a wide range of temperatures, the optimum range being 25° — 30°C. There was a variation in the number of sporangia formed between these six isolates. Two isolates failed to produce sporangia on LBA at the temperatures tested.

All the eight isolates formed sporangia, within six days at room temperature, on a medium prepared from the extract of a number of vegetables. The sporangia were measured and their shapes were compared by camera lucida drawings. (V. Satchuthananthavale & S. S. Jayasooriya).

Penetration : Attempts were made to isolate *Phytophthora* from 'die back' twigs and from the epicarp of old *Hevea* pods, using the cacoa pod baiting method. Secondary fungi grew out rapidly from the test material.

Studies are being continued to ascertain the possibility of the pathogen surviving in the presence of the other fungi in this material. (V. Satchuthananthavale & D. M. Dantanarayana.)

Survival of Phytophthora *spp. in soil :* Soil sampling was done up to September for the above purpose. The cocoa pod baiting method was used as usual. However, no *Phytophthora* spp. were obtained from the above samples, possibly due to the fact that *Phytophthora* leaf fall on these areas was very mild during the year under review (O. S. Peries & S. A. R. D. Sebastian).

Shape and size of Phytophthora *sporangia : Phytophthora* isolate No. 62 was grown on different culture media and variations on shapes and sizes of sporangia were noted. The lengths and breadths of 100 sporangia were measured from each medium. These results will be statistically analysed and prepared for publication later. (O. S. Peries & S. A. R. D. Sebastian).

Stock cultures : Cultures were selected from the large stock that was available in the Department and all the contaminated cultures were purified, subcultured and preserved under mineral oil. (V. Satchuthananthavale & D. M. Dantanarayana).

Studies on Bark Rot

Callusing of wounds : Observations are being made at Frosester Estate Bulatsinghala, on the development of the old Bark Rot lesions, the lesions formed in the current year, and the manner in which these wounds callus over.

Spread of infection : Five clones were artificially inoculated with *Phytophthora* spp. Observations were made on the spread of the disease and the reaction to infection if any.

Clones RRIC 45 and RRIM 513 were found to be more susceptible to black stripe than clone PB 86, under the conditions of this experiment. The spread of the infection was either limited or absent in clones NAB 12 and RRIC 52.

Observations are being made on the callusing of the treated wounds and the time of application of fungicides to wounds. Clone RRIC 45 was badly affected, by the disease spreading rapidly along the trunk, on the average well over a foot above and a foot below the point of inoculation, at the end of four weeks. The infection pattern resembled that observed on clone RRIC 36.

Bark Rot has been reported on clone RRIC 45 from Doloswella Group, Ratnapura, where the incidence was high and the spread of the infection similar to that seen in the above inoculation trials, and from Farnham Estate, Puwakpitiya, during the 1972 *Phytophthora* season.

The results of the inoculation trials indicate that RRIC 45 can be susceptible to Bark Rot in certain situations and for the present it would be advisable not to plant this clone in very wet districts or in areas where there is a history of heavy incidence of Bark Rot. (V. Satchuthananthavale & D. M. Dantanarayana).

Anatomical Studies : Artificially inoculated bark was embedded and sectioned. The fungus could not be traced in these sections. (V. Satchuthananthavale & Z. E. Irugalbandara).

Gloeosporium *leaf disease*

Frequent surveys were carried out in the Dartonfield budwood nursery in order to assess the degree of incidence of *Gloeosporium* leaf disease on various clones. This will serve as a preliminary study for further detailed investigations to be undertaken in the near future.

Both old and young rubber leaves bearing lesions (probably old *Oidium* spots) were brought to the laboratory and circular pieces were cut from areas bearing lesions and incubated in a humid atmosphere. Observations before incubation showed that *Gloeosporium* spores were absent. Pieces from young leaves produced spores within about 24 h whereas those from old leaves took more time. Thus it was established that the fungus *Gloeosporium* lives in the necrotic areas produced by secondary *Oidium*, in an inactive form, and when given suitable environmental conditions become active. A comprehensive programme of work will be carried out on the above subjects in the year 1973. (O. S. Peries & S. A. R. D. Sebastian).

Fomes lignosus

Sulphur and decay of rubber wood : Wood chips were buried in normal soil and sulphur treated soil. Fungi colonising these chips were recorded at regular intervals. At the end of 18 months the chips buried in normal soil were dark brown to black in colour and broke off easily while those buried in soil treated with sulphur were hard and light brown in colour. (V. Satchuthananthavale & L. Halangoda).

Rate of decay of rubber wood by F. lignosus : The experiment designed to measure the rate of decay of rubber wood with low nitrogen content by *F. lignosus* on different media having various C : N ratios was concluded. The results will be subjected to statistical analysis and published later. (O. S. Peries & S. A. R. D. Sebastian).

Rhizosphere microflora : The rhizosphere microflora associated with *Hevea* roots affected by *Fomes* was studied. Czapex Dox Agar (CDA) adjusted to a pH of 4·3 and containing 33 ppm Rose Bengal and 40 ppm streptomycin was used as the isolating medium.

The soil adhering to *Fomes* affected roots was washed off and used at a dilution of 1 : 10,000. Colony counts were made on the 2nd, 5th and 7th days. The fungi were isolated from the 5th day onwards. It was found that *Mucor* spp. often grew over the plates. This was perhaps because the glucose content in the medium (30 g) was too high ; in later work this was reduced to 20 g per litre. The following genera of fungi in descending order of abundance was observed :

Trichoderma spp.
Penicillium spp.
Fusarium spp.
Mucor spp.
Cladosporium spp.
Cuninghamella spp.
Unidentified spp.

Only a few unidentified species were observed. *Trichoderma* species were very common on highly decayed roots.

There was no difference in total colony numbers from tree to tree, the average being about 80 — 100 clonies per plate. The frequency of occurrence of *Trichoderma* spp. was lower on the roots of healthy trees. This indicates that *Trichoderma* spp. are associated with *Fomes* infected roots. These studies were repeated throughout the year, even during a severe drought, and the association between *Fomes* and *Trichoderma* spp. was maintained throughout. Therefore, it appears that *Trichoderma* spp. can survive in soils with a low moisture content.

The association between *Fomes* affected roots and *Trichoderma* spp. was confirmed in tests employing other techniques. Some *Trichoderma* spp. colonies were obtained from healthy roots, but very often those plates were covered with *Mucor* spp. This suggests that *Trichoderma* spp. may be the first to colonise *Fomes* infected roots, and that they may be able to compete successfully with other fungal species, for this particular substrate. (G. W. Liyanage & O. S. Peries).

Wood rotting fungi : The rate of decay of wood effected by different wood-rotting fungi was studied, using the British Standard method, to determine the individual rate of decay. Decay fungi showing the fastest rate of growth on malt agar were selected for this study.

The medium used was : malt extract 20g, glucose 20g, agar 20g vit.B trace, tap water 1 litre. The medium was adjusted to pH 7 using KOH.

Wood blocks 15 × 15 × 50 mm dried to constant weight at 105°C were used, and the period of exposure of the wood blocks was three months. The mean percentage loss in dry weight caused by each fungus is given below :

Fungus	Mean % loss in dry wt.
WR1	30·17
WR2	21·34
WR3	32·87
WR4	21·30
WR8	0·58
WR9	29·04
WR10 (*Daldenia concentrica*)	12·01
WR11	24·42
WR12	30·32
WR17	1·66
WR18	1·89
WR19	1·97
WR20	31·47
WR21	25·84
WR22	

A weight loss in excess of 30% was recorded for four fungi. In general, most of the fungi caused above 20% loss in weight.

One of the fungi that has been identified, *Daldenia concentrica*, which colonises the bark of rubber logs, caused a loss in weight of only 12 per cent. It appears that this fungus preferentially colonises *Hevea* bark of recently felled trees.

The unidentified fungi WR 12 and WR 20 caused rapid and vigorous decay of *Hevea* timber. It was surmised that if these fungi colonised rubber wood initially, then *Fomes* may not be able to displace them from their substrate. This was tested by growing these two fungi separately on 15 mm × 15 mm × 50 mm pieces of rubber wood for one month and then placing the infected blocks on *Fomes* growing on malt agar. After a period of one month the fungi WR 12 and WR 20 were reisolated from the wood blocks, but not *Fomes*. It would be interesting to repeat these experiments under field conditions, by developing a suitable technique.

The fungus WR 19, *Schizophyllum commune*, was the first basidiomycete to colonise rubber timber under the conditions of these tests. However, this fungus has very poor characteristics as a decay fungus, as it causes only 1·97% loss in weight, and it grows very slowly on malt agar. The moisture content of the wood may act as a limiting factor for this fungus, as the wood was dried to constant weight at 105°C, or this fungus may prefer freshly felled timber.

Tests for antagonism : Decay causing fungi selected on : (a) growth rate on malt agar (b) ability to colonise rubber wood rapidly, were grown in paired cultures with *Fomes*, to check whether any of them were antagonistic to *Fomes*. The following fungi were selected for these trials on the basis of the above criteria :—

WR 1, 2, 3, 4, 9, 10, 11, 12, 18, 19, 20 & 21.

It was noted that three clear reactions could occur in paired cultures ; these and the fungi exhibiting the reactions are given below :—

A. both colonies meet and *Fomes* grows over the other fungus : WR 4 & 11
B. both colonies meet and both stop growing : WR 1, 3, 9 & 19.
C. both colonies meet and the other fungus grows over *Fomes* : WR 10, 12, 18 & 20.

D. concentrica grows over *Fomes*, but the growth of the former is slow and it has limited ability as a decay causing organism, producing only 12% loss in weight. The fungus WR 18, identified as a basidiomycete by its clear clamp connections, produced very thick hyphae on malt agar and grows over *Fomes* colonies completely and very rapidly. Therefore, it appears to be able to compete with *Fomes* very effectively for a food base ; but it has very poor decay qualities, causing only 1·97% mean loss in weight. This fungus does not colonise wood blocks very effectively too.

The most interesting morphological features were shown by WR 20. This fungus is characterised by very fine hyphae on malt agar, but in paired cultures with *Fomes*, it produces very thick hyphae when growing over the *Fomes* colony and it completely over-runs the latter, Further detailed microscopic studies will be made of this fungus and its reaction with *Fomes*. (G. W. Liyanage & O. S. Peries).

Paired cultures with Trichoderma : Five isolates of *Trichoderma* spp. were tested against *Fomes* on malt agar plates. Here too *type C* reaction was observed, where *Trichoderma* spp. overran *Fomes* colonies. Inhibited colonies were compact and dense. There was abundant sporulation of *Trichoderma* on compact *Fomes* colonies. (G. W. Liyanage & O. S. Peries).

Fungal succession on Hevea *timber :* Observations were made on fungal successions on rubber timber. Frutifications of basidiomycetes first appeared after three months. The first frutifications were those of *S. commune*, especially on the cut ends of logs. The peak colonisation by this fungus occurred between the fourth and fifth months and after five months it started to decline. This fungus appears to prefer sugar and starch. *D. concentrica* appeared at about the same time as *S. commune*, but at a lower frequency and it colonised the bark, mainly. New unidentified fungi began appearing after seven months. The succession of fungi appears to be the same on logs with and without the bark, except for *D. concentrica*, which is less frequent on debarked timber.

Borers and white ants were common on timber, especially that without the bark. Thus the bark appears to offer a mechanical barrier to invasion and at the early stages, before the death of the bark, the latex in it too may act as a barrier to invasion. (G. W. Liyanage & O. S. Peries).

Rate of decay of Hevea *timber :* An experiment was carried out to assess the rate of decay of timber under field conditions, under three conditions : (a) under a cover of *Pureria phaseoloides* (b) under naturals (c) in clean weeded areas.

A randomised block design with six replicates of three plots each was used, with an effective plot size of 10 ft × 10 ft. Blocks of rubber wood 1 in. × 1 in. × 6 in. were made from freshly felled timber. The initial weight was taken as the constant weight when dried at 105°C, and the loss in weight was determined at monthly intervals after exposure to the conditions noted above. An unweighed set of wood blocks was taken for the isolation of fungi.

An analysis of variance was carried out on weight reductions. As the initial weight may have a bearing on the absolute reduction in weight, an analysis of covariance too was carried out. By this means it was intended to adjust the reduction in weight for differences in the initial weight. The wood blocks were invaded by white ants, the extent of damage was visually graded and taken into consideration in the analyses. The final adjusted means were taken for comparison between treatments.

After two months, decay was significantly lower under the cover treatment ; this was unexpected and difficult to explain. There was no significant difference between naturals and clean weeded areas. This experiment will be continued and other experiments started to confirm the results reported here. (G. W. Liyanage & O. S. Peries.)

Soil Type, depth & microflora : Soil samples were collected from seven soil series (a) Agalawatta (b) Boralu (c) Deniya (d) Homagama (e) Matale (f) Parambe (g) Ratnapura. Samples were taken monthly from the first three inches (76·2 mm) of soil.

Soil temperature, pH, field moisture content, water holding capacity and organic matter content of the samples were determined.

Soil dilution plates were prepared at a dilution of 1 in 10,000. Five plates for each series per sample were prepared for colony counts. Czapeks Dox Agar was used as the medium at pH 4·5, with Rose Bengal (33 ppm) and streptomycin (40 ppm.) The latter was added after sterilization. Counts were taken on the 7th day after plating. Fungi that grew were isolated to be identified later.

In May samples were removed at three depths. (a) First 3 in. (76·2 mm) 3—6 in. (76·2 — 152·4 mm) (c) 6—9 in. (152·4 — 228·6 mm).

The results have been tabulated and are being analysed for publication. (O. S. Peries & T. M. Fernando).

Histological studies

Stock scion : Wax embedded sections of the stock, scion and stock-scion union were cut for studies on the anatomy of the stock-scion union (R. Satchuthananthavale & Z. E. Irugalbandara).

Brown Bast : Tissue affected by Brown Bast was embedded, sectioned and stained to study the effect of this disorder on *Hevea* bark. (R. Satchuthananthavale & Z. E. Irugalbandara).

Pollenia in culture : The studies on this project were continued, where the chromosome patterns in *Hevea* are being recorded. (R. Satchuthananthavale & Z. E. Irugalbandara).

Bacterial coagulation

Two more species of bacteria were isolated for coagulation of latex. (R. Satchuthananthavale & V. Satchuthananthavale).

Leaf diseases

Oidium *leaf disease*

The incidence of *Oidium* leaf disease was extremely mild during the 1972 refoliating season. There was a severe drought at the beginning of the year, with the result that most *Hevea* clones wintered early and refoliated rapidly under very dry, sunny weather conditions, which are not conducive to the propagation of the causal fungus, *Oidium heveae.* The rubber in many areas had completely refoliated by the time weather conditions became favourable for the rapid propagation of the fungus. However, rubber flowers, which appear later in the year, were heavily infected by *Oidium* resulting in a poor pod-set all over the rubber growing districts.

Phytophthora *leaf disease*

The incidence of *Phytophthora* leaf disease was very low during the 1972, South West monsoon season. July 1972 was abnormally dry, and there were bright sunny periods right through the monsoon season. This together with the poor pod-set generally resulted in a very low incidence of the disease.

Gloeosporium *leaf disease :*

The incidence of *Gloeosporium* leaf disease was low throughout 1972, and very few requests were received for advice on the control of this disease.

Field Experiments

Leaf diseases

Economics of Oidium *and* Phytophthora *leaf disease control :* The experiment laid down on Malaboda Estate in 1971, to assess the economic importance of *Oidium* and *Phytophthora* leaf diseases of *Hevea* was continued. This is a 4 ft. × 5 ft. randomised block experiment where the following treatments are being compared :

(a) Control — No dusting.
(b) *Oidium* control — only with sulphur dusting.
(c) *Phytophthora* control — only with copper dusting.
(d) *Oidium* and *Phytophthora* control — by sulphur and copper respectively.

Four dusting rounds were carried out in treatments (b) and (d) during the *Oidium* season. Rate of dusting 8 lb (3·6 kg) /ac./round. Dusting commenced at bud burst, which was very even in the whole experimental area, and stopped when leaves had passed the susceptible stage. Two leaf counts were taken when leaf fall was observed.

The totals of the two leaf counts are given below :

	1st Repl.		2nd Repl.		3rd Repl.		4th Repl.		5th Repl.	
Treat-ment	*Oidium*	Other causes	*Oidium*	Other causes	*Oidium*	Other causes	*Oidium*	Other causes	*Oidium*	Other causes
A	182	232	327	177	156	138	223	79	157	182
B	142	167	342	181	115	155	110	164	76	154
C	337	142	123	147	119	106	146	203	152	179
D	336	109	157	115	139	162	93	156	98	160

Yield estimations were taken in mid February at the time of refoliation, in mid June, July and August. Results are given below :

YIELD RECORDS

Total of 20 trees per plot in grammes

Treatment	1st Repl.	2nd Repl.	3rd Repl.	4th Repl.	5th Repl.
February					
A	878	518	578	899	399
B	460	674	821	779	569
C	471	562	400	515	711
D	694	729	641	1375	533
June					
A	686	915	831	955	927
B	617	671	801	512	842
C	833	697	747	700	903
D	745	753	682	998	819
July					
A	847	689	930	915	581
B	737	702	878	907	747
C	1360	732	830	590	805
D	831	1031	639	1121	859
August					
A	945	823	856	971	555
B	815	506	999	759	734
C	611	795	551	641	919
D	869	930	664	1223	783

No yield records were taken after August 1972. No dusting was carried out against *Phytophthora* leaf disease, as there were no symptoms of the disease. (O. S. Peries, T. M. Fernando & Z. E. Irugalbandara).

Economics of Oidium *Control :* The 1965 replanted area, clone RRIC 45, Malaboda Estate was blocked out according to tapping blocks, each approx. 2 ac. in extent. Six blocks were thus marked, four were dusted with sulphur 8 lb (3·6 kg) ac./round and two blocks were left undusted as controls. *Oidium* attack was mild and only two rounds of dusting were carried out. Leaf fall in this area was very mild.

This experiment is to observe whether there is a reduction in yield in the undusted tapping blocks, when compared with the dusted ones. (O. S. Peries & T. M. Fernando).

One acre field at Dartonfield : This area was replanted for carrying out small scale leaf disease trials. Six clones namely RRIC 52, RRIC 100, RRIC 36, RRIC 45, PB 86 and Glen. 1 were planted in this field at a spacing of a 4 ft (1·2192 m) in the row at the beginning of August 1972. Eight trees were planted from each clone per replicate, there being six replicates.

A census of the plants taken in November, showed that there were eight plants affected with White Root disease caused by the fungus *F. lignosus*, 21 unsprouted, and 31 dead stumps making a total of 60 plants. These will be replaced with new plants in May 1973. The *Fomes* affected trees were uprooted, infected material was dug out and areas cleaned for filling vacancies (O. S. Peries & T. M. Fernando).

Refoliation : A new project was started at the beginning of the year. This consisted of taking down observations regarding the time of wintering (defoliation) refoliation, bud break, various stages in leaf maturity, production of flowers and different stages in fruit formation up to drying and bursting of pods. Observations were made on trees selected from three clones PB 86, RRIC 52 and RRIC 45. Almost daily observations were made and recorded, when necessary. Leaf samples from the copper brown stage, apple green stage, and semi-mature and fully mature stage were collected and fixed in F.A.A. fixative (Z. E. Irugalbandara).

Incidence of Oidium *leaf disease in Smallholdings :* A survey was carried out in collaboration with the Smallholdings Department to assess the incidence of *Oidium* on smallholdings. The results of this survey will be published separately (O. S. Peries & G. W. Liyanage).

Root disease

Effect of sulphur and Collar Protectants : Two experiments were laid out in 1970 at Milleniya and Malaboda Estates to assess the effect of sulphur and collar protectants in minimising disease incidence. A census of *Fomes* infected trees was taken twice during 1972 in both experimental areas.

In general the incidence of *Fomes* has been low at Malaboda Estate, but there were more infected plants in the control plots than in the sulphur treated plots.

At Milleniya Estate only three trees succumbed to *Fomes* infection in the entire area for the whole year.

Minimum dosage of sulphur : An experiment was laid out in June 1972 at Milleniya Estate to determine the minimum dosage of sulphur required to reduce disease incidence.

A census was taken of the *Fomes* infected plants in October 1972, but no conclusions can be drawn at this early stage of the experiment.

Spread of Fomes : At Malaboda Estate observations are being made on a four ac. area on the spread of *Fomes* root disease. A census of infected old stumps was taken at the time of clearing the field for planting. This area was planted in June by the estate. A census of the infected plants was taken in October 1972.

Dartonfield 1973 Replanting — 10 ac. area : A preliminary census of *Fomes* infected old trees were taken prior to felling them. (V. Satchuthananthavale & L. Halangoda).

Nursery for Fomes *experiment* : An experiment was laid out to plant five clones in a seedling nursery. Seedling of PB 86, RRIC 45, RRIC 52, RRIM 628 were planted in September. RRIC 36 seedlings were damaged hence it was not possible to plant them. Only two sub-sets of RRIC 45 were planted due to non availability of seedlings. The others were planted in four sub-sets. Each sub-set consists of four replicates. Each plot in a replicate consists of 24 seedlings of a single clone

planted 1 ft. (30·48 cm) apart in a square, with room in the centre to supply the focus of infection. Each sub-set is to be uprooted in six monthly intervals after infected material is introduced to these plots to cause infection. A space of 3 ft. (0·9144 m) was left out barren between plots. Some of these plants were attacked by chamelions. (O. S. Peries & T. M. Fernando).

Bark disease

Rainguard/Bark Rot experiments : This experiment was laid out at Milleniya Estate, Paragastota, and at Frocester Estate, Bulathsinhala, in six tapping blocks of clone PB 86. Fields selected for the above experiment have been severely affected by Bark Rot at one time or another.

A census of the Bark Rot affected trees was taken in both estates.

These experiments though valuable have to be discontinued. Close personal supervision by the Institute staff is necessary and this is not possible with the staff available.

The Institute recommends that wet trees should not be tapped in order to minimise the incidence of Bark Rot. It was found that unless rainfall is very heavy, the panels of trees protected by rainguards were either dry or dried much earlier than those trees without rainguards. The use of rainguards will definitely reduce the risk of tapping wet trees. It should also be noted that, as the water running down the trunk is drained away along the rainguard attached to the trunk above the panel, the chances of infection by the zoospores and sporangia, washed down the trunk are minimised, in trees protected by rainguards. (R. Satchuthananthavale, V. Satchuthananthavale, D. M. Dantanarayana & S. S. Jayasooriya).

Observations on Phytophthora *diseases :* Observations were made at Frocester Estate, Bulathsinhala and Dartonfield Estate, on the incidence of leaf fall. Meteorological data were also collected from these estates.

In Dartonfield Estate (122 ac.) fungicides were not applied during the wet season too, except for the Botany Department experimental area (31½ ac.). There was no difference in the incidence of Bark Rot. (V. Satchuthananthavale & D. M. Dantanarayana).

REVIEW OF THE SOILS CHEMISTRY DEPARTMENT

By

C. G. Silva

SUMMARY

The results of *Hevea* leaf nutrient content variation studies have shown that the pattern of the change in leaf nutrient content is very similar to that observed in Malaysia.

The analysis of leaf samples from the trees receiving urea or sulphate of ammonia has shown that the effect of these two sources of nitrogen is comparable.

A statistical analysis of the degree of analytical variation of nutrients in leaves, indicate that except in the case of manganese, the methods of analysis are satisfactory. Based on these values a tentative set of standard leaf nutrient levels has been prepared and a discriminatory system of fertilizer applications has been recommended for a few experimental areas.

A fertilizer experiment on a 1949 replanted area of clone PB 86 has given a statistically significant yield increase of 17% over the control as a result of the addition of 2 lb of the standard fertilizer mixture. The application of anything more than 2 lb of fertilizer per tree does not increase yields.

Two experiments on a Boralu series soil have continued to give significant responses to nitrogen, phosphorus and potassium.

Two experiments on cover crop policies in immature areas have shown that the addition of phosphorus to the cover has a beneficial effect on the growth of rubber.

An intercropping trial with pineapple has shown that intercropping in immature rubber areas could be very profitable.

DETAILED REVIEW

Staff

Mr. C. G. Silva, Soils Chemist, was on duty throughout the year. Dr. R. S. John, Soils Chemist, was on duty up to 7th January. Mr. N. Yogaratnam, left for post-graduate studies in June.

Mr. E. Bellis, the Colombo-Plan Consultant to the Soils Chemistry Department, who arrived in Ceylon in October 1971, continued to work up to February 1972.

Mr. M. H. Sulaiman, Experimental Officer, Mr. T. Kanthasamy, Senior Technical Assistant, Messrs. H. A. Seemon, F. P. W. Silva, A. M. A. Perera, B. P. M. Arsecularatne and L. J. Wickramasinghe, 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. G. N. de Silva, Technical Assistant, resigned from the service of the Institute on 15th September 1972. Messrs. V. Gunasekera and G. Jayawardene joined the Department as Technical Assistants during the year.

Visits

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

Advisory	14
Experimental	121
Miscellaneous	62
Total	197

Meetings and conferences

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

Working Group on Fertilizers (11)
Standing Committee on Agro-Chemicals (3)
Annual Sessions of the Ceylon Association for the Advancement of Science
Miscellaneous Meetings at Ministries *etc.* (5)
Planters' Conference, Malaysia 12-07-1972 to 25-07-1972.

Publications

The following papers were prepared for publication.

1. Fertilizer responses in *Hevea brasiliensis* seedlings grown in the field nursery.
   N. Yogaratnam and A. D. M. Karunaratne.

2. Loss of ammonia by volatilization from surface dressings of urea containing rubber fertilizer mixtures.
   C. G. Silva, A. M. A. Perera and D. R. Peiris.

3. New Advisory Circular on Manuring.
   E. Bellis and C. G. Silva.

Advisory work

Advice on the methods which should be adopted in correcting situations of backward growth or poor yields, was given whenever such requests were made. These were either by visiting the estate concerned where necessary or through correspondence, where this was considered adequate.

Perth Estate, Horana, was visited and recommendations were made to correct a situation of suspected nutrient imbalance in oil palm. Many visits were made to Nakiadeniya Group to advise on the cultivation of oil palm. A new fertilizer schedule was recommended for the oil palm areas at Nakiadeniya Group.

Two divisions of Neboda Group and Silverdale Estate, were visited with officials from the Agricultural Diversification Project, in order to find suitable areas for planting oil palm in the Kalutara District.

Research investigations

Mr. E. Bellis, the Consultant to the Soils Chemistry Department visited the rubber growing areas and the field experiments of the Department and after studying the work that has been done in the past, recommended that, in 1972, the effort of the Department should be concentrated on the following lines :—

1. Commercial rubber productivity survey
2. *Hevea* leaf nutrient content variation investigations
3. Soil survey of selected estates
4. Urea comparison trials
5. Analysis of soil and plant materials
6. Fertilizer requirements for Ethrel stimulated areas
7. Field experiments.

Commercial rubber productivity survey

It was recommended that 30 fields be selected for this study. These 30 fields were to be selected from 69 fields depending on their five year yield averages. 45 of these fields were visited and about 21 fields were considered suitable for further investigation, mainly because of the easy accessibility, moderate acreage, yield average and uniform tapping system. The next phase of this exercise *viz.* stand counts, selection and confirmatory test-tappings of yield recording trees, were started in nine fields and completed in four fields. Soil survey, mapping, boundary delineation, soil description and sampling was also completed in four fields. Leaf samples were also collected from ten of these fields.

Hevea *leaf nutrient content variation study*

A study of the relationship between leaf NPK and Mn and some of the growth characteristics of the shoots in clone RRIC 45, shows that the overall influence of shoot class on leaf P and K was not evident in individual comparisons between shoot classes. This lack of discernible differences between shoot classes could well mean the interchangeability of shoots for analysis.

For the clone RRIC 45 there is a fall in the concentration of leaf nitrogen, phosphorus and potassium at the beginning of the season but after about a month these values increase and thereafter decreased very gradually with age. In the case of leaf Ca there is a steady increase with age. A significant increase in leaf nitrogen in the clone RRIC 45 is brought on by rain. In the clone PB 86 it is observed that rain influences the interpretation of leaf nutrient data even up to the extent that interpretations, based on the sampling and analysis of recently wetted leaves, should be done with caution.

Leaf nutrient levels

The nutrient levels of leaves sampled in July — August are given in Table 1 and show that while the N and K are low, P levels are adequate and the Mg status is high even to the extent of interferring with K uptake.

TABLE 1

LEAF NUTRIENT AVERAGES

Clone	N%	P%	K%	Ca%	Mg%	Mn (ppm)
PB 86	3·09	0·241	1·44	0·65	0·296	30
RRIC 45	3·25	0·231	1·14	0·51	0·355	22

In accordance with these leaf data, a discriminatory fertilizer schedule has been recommended for this area in 1973 which would consist of 2 lb per tree of a fertilizer mixture containing sulphate of ammonia and (60% K_2O) muriate of potash in the proportion of 40 parts of the former to 7 parts of the latter.

Soil survey of selected areas (*C. G. Silva & F. P. W. Silva*)

Soil survey and sampling of experimental areas at Paiyagalla Estate, Lowmont Estate, Sorana Group, and Hedigalla Division were completed. This consisted of a total acreage of 84 ac. (34 ha.). A total of 697 soil samples were also collected.

A detailed soil survey of Silverdale Estate, Dodangoda, which is about 500 ac. (202·5 ha.), in extent, was completed at the request of the Director of the Minor Export Crops Division of the Ministry of Plantation Industries.

Urea comparisons

No responses have been observed to any of the fertilizers added in 1972. The leaf nutrient levels are adequate in the case of nitrogen, more so in the case of phosphorus and on the border line of being excessive in the case of magnesium. The potassium levels vary considerably. These experimental areas will also to be under a discriminatory fertilizer schedule in 1973 differing mainly in their N, K ratios.

The removal of the midrib during sample preparation had no effect in changing the leaf analytical data. The comparison of nutrient levels with and without midribs has therefore been discontinued.

Ethrel trial

The leaf analysis data prior to stimulant application and its analyses are given in Table 2.

TABLE 2

LEAF ANALYSIS DATA BEFORE STIMULATION

Blocks A 1 — 3						
	N%	P%	K%	Ca%	Mg%	Mn% (ppm)
Mean	2·70	0·274	1·30	0·70	0·291	41
Standard error	0·12	0·031	0·16	0·10	0·054	13
C. V. %	4·4	11·2	12·7	13·6	18·7	31·0
F. Blocks	—	—	—	—	—	—
F. Treatments	—	1·71	—	45·1	—	3·11*
Blocks B 4 — 6						
	N%	P%	K%	Ca%	Mg%	Mn% (ppm)
Mean	3·03	0·272	1·48	0·74	0·268	59
Standard error	0·16	0·023	0·18	0·18	0·030	24
C. V. %	5·2	8·4	12·3	24·9	11·3	40·2
F. Blocks	2·16	2·31	—	—	2·79	—
F. Treatments	—	2·92*	—	—	—	—

These leaf nutrient data, when compared to the published standards elsewhere, indicate that the plants are deficient in N and suboptimal in K with respect to blocks A 1 — 3. In blocks B 4 — 6, they are suboptimal in N. In view of the fact that Sivanadian *et al.*, (1972) have reported a special demand for N and K in stimulated areas, the 1973 fertilizer schedule for these areas would be a mixture of 20 parts of sulphate of ammonia and 7 parts of 60% muriate of potash 2½ lb per tree now and a further 1½ lb per tree to block A 1 — 3 with the North — East rains.

Analysis of soil and plant materials

Soils : (A. M. A. Perera, L. J. Wickremasinghe, G. N. de Silva, V. Gunasekera & G. Jayawardene).

The number of samples received in the laboratory were 697 and the amount of determinations were as follows :—

Nitrogen	324
Organic carbon	372
Moisture	144
Cation exchange capacity	576
Exchangeable potassium	300
Exchangeable calcium	270
Exchangeable magnesium	270
Exchangeable hydrogen	540
Total potassium	99
Total phosphorus	325
pH	78

Latex : (T. Kanthasamy)

The number of samples collected was 146 and the number of determinations were as follows :—

d.r.c.	237
Total solids	276
Nitrogen	62
Dry ash	21

Leaf : (H. A. Seemon & B. P. M. Arsecularatne)

The number of leaf samples received in the laboratory was 765 and the number of determinations were as follows :—

Nitrogen	1516
Phosphorus	749
Potassium	1027
Calcium	782
Magnesium	794
Manganese	377
Boron	11
Dry ash	8

A statistical analysis of the analytical variation of the leaf values as given in Table 3, indicate that the reproducibility is satisfactory. It is also to be observed that greater precision is needed in the estimation of manganese.

TABLE 13

LEAF ANALYTICAL VARIATIONS

Source	N%	P%	K%	Ca%	Mg%	Mn%
Urea investigation	5·9	6·4	11·8	—	11·0	47·5
Midrib study	5·9	7·2	6·2	—	—	21·2
Ethrel trials block A 1 — 3	4·4	11·2	12·7	13·6	18·7	31·0
,, ,, A 4 — 6	5·2	8·4	12·3	24·9	11·3	40·2
Mean over single plot samplings	5·2	8·8	11·3	19·3	13·7	35·2
RRIC Group 1	4·9	5·9	10·3	—	—	21·6
PB 86 Group 1	3·6	6·9	10·5	—	—	21·5
RRIC Group 2 — 4	3·2	4·5	11·1	6·5	6·9	28·7
PB 86 Group 4	2·4	11·8	17·0	7·7	7·8	15·2
Mean over single tree samplings	3·5	7·3	12·2	7·1	7·4	21·8
Nualsiri *et al.*,	5·2	7·2	8·9	16·9	8·8	16·2
Shorrocks	1·4	2·3	2·9	4·8	2·2	5·2

Field Experiments (Messrs. M. H. Sulaiman, M. Abeysinghe, M. A. Mendis, K. S. A. C. Peiris, J. Wijenayake & A. D. M. Karunaratne).

Six experiments on fertilizers and one experiment on weed control were terminated from 1972.

Experiment No. 1 — Effect of N and K in the presence of P, Hedigalla Division — 1952 clearing (M. A. Mendis)

The object of this trial is to test the effect of N and K in the presence of P. Since it is accepted that the necessity for phosphate is sufficiently proved, the need for a full NPK trial was not considered necessary. The five treatments are O, P, NP, PK and NPK. The fertilizer applied during the mature phase did not have any significant effect on either the yield or growth of any of the three clones PB 86, AVROS 255 and PB 86 crown budded with LCB 870.

Experiment Nos. 6 to 9 :

In these diagnostic physiologique experiments, the assessment of the response to the application of fertilizer on the basis of physiological diagnosis was terminated in the case of experiment Nos. 6, 7 and 8, and the experiment was continued merely to test the effect of different levels of the standard fertilizer mixtures on *Hevea*. The results of each of these experiments are given below :—

Experiment No. 6 : Nakiadeniya Group, Galle District, 1956 replanting, clone PB 86 (M. A. Mendis).

The yield and girth data for 1972 do not show any significant difference due to the different fertilizer treatments.

Experiment No. 7 : Gallewatte Estate, Kalutara District, 1960 replanting, clone PB 86 (W. M. Abeysinghe).

The yield and girth data do not show any significant effect of the fertilizer on growth or yield.

Experiment No. 8 : Parambe Group, Kegalle District, 1951 replanting Gl. 1 (W. M. Abeysinghe).

The girth measurements of 1972 do not indicate any significant effects due to the fertilizer treatments. The mean yields for 1972 as shown in Table 4, show that there is a significant response to the addition of fertilizer. This yield increase could be as high as 45% with the highest level of fertilizer used. The data obtained in 1971 also showed a yield increase of 23% over the control at the highest level of fertilizer added. This indicates the beneficial effects which could be obtained by the addition of fertilizer even in areas which are as old as 21 years.

TABLE 4

THE MEAN YIELD OF *HEVEA* IN RESPONSE TO DIFFERENT DOSES OF THE SAME FERTILIZER MIXTURE

Treatments	Mean yield of dry rubber per tree per tapping in g	L.S.D.	% increase over control
No fertilizer	34·71		—
R. 4 : 6 : 3 + Mg (2 lb)	40·02		15
R. 4 : 6 : 3 + Mg (4 lb)	49·04	7·89	44
R. 4 : 6 : 3 + Mg (6 lb)	50·62		45

Experiment No. 9 : Eladuwa Estate, Kalutara District, 1949 replanting, clone PB 86 (W. M. Abeysinghe).

The mean yields of this experiment as shown in Table 5, show a significant increase in yield of about 17% over the control. The girth data however do not show any significant effects of the treatments. A statistical analysis of the yield data shows that no added benefits could be obtained by increasing the fertilizer dosage over 2 lb per tree.

TABLE 5

MEAN YIELD OF DRY RUBBER IN GRAMMES

Treatment	Yield	L.S.D.
Control	39·12	
R. 4 : 6 : 3 + Mg (2 lb)	45·88	6·61
R. 4 : 6 : 3 + Mg (4 lb)	48·29	
R. 4 : 6 : 3 + Mg (6 lb)	50·99	
D. P. Complete	42·43	

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

This experiment which was started with a split plot design where two forms of magnesium were the main treatments and different levels of N, P and K, were the sub-treatments, was changed from 1972 and now consists only of the different levels of N, P and K. The girth and yield data as given in Table 6, show that there is a positive response to potassium, and a yield increase of about 16% has been obtained at the highest level of potassium. The fact that this response is observed for the third consecutive year confirms that, not only the soils of the Homagama series but also the soils of the Boralu series would benefit from the applications of the higher levels of potassium.

TABLE 6

MEAN GIRTHS AND YIELDS OF TREES FOR THE DIFFERENT TREATMENTS

Treatment	Mean yield (g/tree)	L.S.D.	Mean girth (cm)	L.S.D.
N_0	34·9		60·9	
N_1	36·1		61·7	
P_0	34·9	3·06	60·6	2·3
P_1	36·0		62·0	
K_0	32·9		58·4	
K_1	38·1		64·1	

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 data do not show any significant difference between the treatments. The coefficient of variation of the yield data from the experiment is very high and might be an indication of the caution that must be exercised in using these data for any interpretation.

The analysis of girth data given in Table 7, shows a quadratic response to nitrogen and a linear and quadratic response to phosphorus. This means that girth increases with increasing levels of nitrogen up to the second level of nitrogen and then decreases ; this result is statistically significant. With respect to phosphorus, there is a trend similar to that for nitrogen and in addition an increase in girth with increase in levels is also observed, which trend is statistically significant.

The interaction totals given in Table 8 show that the effects of different levels of N and P on girth are dependant on their levels and that the best growth is obtained with the treatment N_1P_1.

TABLE 7

MEAN GIRTH OF TREES FOR DIFFERENT TREATMENTS

Treatment	Mean girth (cm)	L.S.D.
N_0	58·4	
N_1	61·6	
N_2	60·1	1·90
P_0	58·4	
P_1	61·4	
P_2	60·3	

TABLE 8

INTERACTION TOTALS

Treatment	P_0	S_1	P_2	L.S.D.
N_0	170·0	177·1	178·9	
N_1	177·7	192·1	184·8	9·9
N_2	178·2	183·3	179·4	

Experiment No. 22 : Response of mature rubber to fertilizers, Malaboda Estate, Matugama, clone PB 86, (M. A. Mendis).

In this experiment where the relative importance of the three nutrients nitrogen, phosphorus and potassium on trees being tapped on renewed bark is being tested, neither the yield nor the girth data show any significant difference between the treatments.

Experiment Nos. 24, 25 & 26 : The effects of manuring rubber in relation to ground covers, are studied in these experiments. They are aimed at determining whether the application of extra nitrogen in areas with non legume ground covers, could contribute to good growth during immaturity and yield during early maturity. The ultimate aim in these experiments is to formulating the most economical cover crop policy for rubber.

Experiment No. 24 : Pussella Group, Parakaduwa, 1970 replanting, clone RRIM 623, (K. S. A. C. Peiris).

This experiment which at the end of one year showed that a legume cover leads to the better growth of the rubber has at the end of the second year shown a response to phosphorus. As indicated in Table 9, it has shown that the best growth is obtained by the addition of phosphorus to both the rubber and the cover and that the addition of phosphorus even to the cover alone gives significant beneficial effects in growth.

TABLE 9

MEAN GIRTH OF PLANTS (CM)

Treatment	Mean girth (cm)	L.S.D.
P_0	19·61	
P_r	20·92	1·38
P_c	21·30	
P_{rc}	21·78	

P_0 — no phosphorus (P_1) ; P — P_r to rubber only ;
P_c — P to covers only ; P_{rc} — P to rubber and covers.

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

The girth measurements show that a significant beneficial effect is recorded when phosphorus is applied to the legume cover areas as shown in Table 10. This result shows that in legume cover areas the addition of phosphorus to the cover would help in the better growth of the cover, which would in turn have a beneficial effect on the growth of the rubber.

TABLE 10

PHOSPHORUS, COVER INTERACTION MEANS

	P_0	P_r	P_c	P_{rc}	L.S.D.
Naturals	20·82	20·31	19·33	20·04	
Legume	18·63	19·75	20·98	20·14	1·90

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

The girth measurements 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 on yield and bark regeneration. Lowmont Estate, Kalutara, 1964 replanting, clone RRIM 623, (J. Wijenayake).

The yield and girth data do not show any difference due to the treatments.

Experiment No. 28 : Effect of three levels of the standard fertilizer mixture R. 4 : 6 : 3 + Mg on a tea area replanted with rubber. 1971 replanting, clone PB 217, (J. Wijenayake).

The girth data do not indicate any significant difference in growth which could be attributed to the different amounts of fertilizer added.

Experiment No. 30 : Studies on the management of ground covers in immature rubber areas for an economic evaluation of the cover crop policies suitable for the rubber lands. Katuhena Division, Sorana Group, Horana, 1972 replanting, (A. D. M. Karunaratne).

The five treatments in this experiment are as follows :—

1. Sown, mixed legume cover.
2. Selective removal of non legumes from the natural cover which would consist of legumes and non legumes.
3. Non selective control of natural cover, without supplementary nitrogen to the tree rows.
4. Non selective control of natural cover, with supplementary nitrogen applied to the tree rows.
5. Non selective control of natural cover with manuring of the rubber controlled by leaf analysis, to the levels with sown mixed cover legumes.

The girth data recorded after six months do not show any significant difference in growth due to the treatments.

Intercropping trial, Paiyagala Estate, Dodangoda

In this trial where 4,000 pineapple suckers of the Kew variety were interplanted in 1970 in half an acre, of the 1970 rubber clearing, the expenditure and income for the 1st crop is as follows :—

		Rs.
Cost of 4,000 pineapple suckers @ = /12 cts.		480·00
Transport of pineapple suckers from Kalagedihena		135·00
Sundries — coir rope *etc.*		20·20
Labour :		
31 days for cutting drains		94·95
30 days for planting		89·94
12 days for cutting drains and planting		37·35
Pests and Diseases :		
Cost of chemicals, spraying *etc.*		57·27
Manure :		
Cost of manure and application		374·75
Weeding :		
Weeding, maintenance *etc.*		166·13
Total Expenditure	Rs.	1,455·59
Details of Income :		
By sale of fruits (10,287 lb)	Rs.	1,278·31
Expenditure over income	Rs.	177·28

The difference of expenditure over income was however increased to Rs. 1,649·10 because, on our specific instructions no effort was spared to see that the full crop was realised. As such a very high amount of Rs. 1,471·82 was spent on watchers wages, torch batteries *etc.* thereby increasing the loss to Rs. 1,649·10. The second harvest is due in a few months time. The income from the second harvest is expected to increase by at least 50% over that of last year and with the necessary reduction in expenditure, an overall profit is expected out of the second harvest. The profit is expected to increase still further for the next two crops. The growth of the rubber is satisfactory and compares very favourably with that in the area without pineapples.

REVIEW OF THE RUBBER CHEMISTRY DEPARTMENT

BY

M. NADARAJAH

SUMMARY

The Rubber Chemistry Department continued to give advice to large estates on problems connected with the manufacture of raw rubber.

A significant development has been work done on the use of formaldehyde as the stabilizer for field latex and the manufacture of centrifuged latex from formaldehyde stabilized field latex. This method of stabilization has led to the use of such field and concentrated latices in adhesives for plywood, in chlorinated rubber manufacture and for mixing with Portland cement. All the latex of clones RRIC 100 to 110 appear suitable for pale crepe manufacture with the exceptions of clones RRIC 101 and 110.

Papain is a suitable coagulant for raw rubber manufacture and its immediate potential use in Sri Lanka is in skim rubber manufacture where, by its use, it should be possible to bring skim rubber into the acceptable grades of technically specified natural rubber.

Pale crepe manufactured by using papain as the coagulant has been found suitable for the manufacture of cyclised rubber, the cyclising agent being para toluene sulphonic acid.

The dry rubber after hydroxylamine treatment processed from the latex of the three collecting centres at Mawanella has a Mooney viscosity of 68 $\pm$ 5, whilst CV rubber should have a Mooney viscosity of 60 $\pm$ 5.

Samples were tested regularly from the two factories currently engaged in block rubber production. Much effort has been put into the Central Specification Laboratory, under construction at Ratmalana, and which is expected to be ready by the middle of 1973.

DETAILED REVIEW

Staff

The Head of the Rubber Chemistry Department, Mr. M. Nadarajah and the Rubber Chemist, Mr. S. W. Karunaratne were on duty throughout the year. Mr. R. Tharmalingam and Dr. P. A. J. Yapa returned after their postgraduate studies in October 1972. Mr. D. S. Muthukuda, Assistant Development Officer, was on duty throughout the year. Mr. W. S. E. Fernando joined the staff as Assistant Rubber Chemist on 1-10-72, Mr. C. G. Balasingham as Experimental Officer on 3-1-72 and Mr. W. C. Dayaratne as Senior Technical Assistant on 15-3-72.

Mr. S. W. Karunaratne attended the ISO — TC45 meeting held in Cologne in November 1972. Mr. M. Nadarajah attended the IRMRA 6th Technical Seminar

at Madras, India, in December 1972. Mr. L. M. K. Tillakaratne, Assistant Specifications Officer, left in October for the U.K. on a Colombo Plan Scholarship, for a post-graduate course in analytical chemistry at the University of Aston in Birmingham. Messrs. A. M. A. Amarapathy, A. Coomarasamy, M. R. N. Fernando and G. Varathungarajan, Assistant Rubber Chemists, continued their port-graduate studies in the U.K.

Technical Assistants, Messrs. A. S. Dekumpitiya, K. P. N. de Silva, W. D. Dharmasena, L. S. Goonewardene, S. Kasinathan, J. K. Kirubakaran, D. D. Medagama, H. Narangoda, K. A. Piyadasa and P. P. Jayasinghe were on duty throughout the year. Graduate trainees, Miss K. N. Peiris and Mr. K. S. Peiris were absorbed to the Department with effect from 1-7-72. Specification Assistants, Messrs. T. M. Ahamadeen, M. D. C. Seneviratne and A. S. Wijesekera were on duty throughout the year. Mr. D. R. Peiris was appointed as a Specification Assistant on 1-3-72.

Conferences

(1) A paper on " The Natural rubber industry in Ceylon " was presented by Mr. M. Nadarajah at the Institute of Chemistry, Inaugural Sessions on 15-7-72.

(2) A paper on " The use of natural rubber latex-resin blends as an adhesive for plywood " by W. G. Weeraratne, M. Nadarajah, D. A. R. Eliatamby, U. P. P. Amarasinghe and N. Liyanage was presented by Mr. M. Nadarajah at the CAAS, 28th Annual Sessions on 15-12-72.

(3) A paper on " Development of natural rubber-Portland cement mixes for practical applications " by M. Nadarajah, H. Pieris and K. P. N. de Silva was presented by Mr. M. Nadarajah at the CAAS, 28th Annual Sessions on 15-12-72.

(4) A paper on " Easy processing natural rubber " by M. Nadarajah and H. Narangoda was presented by Mr. M. Nadarajah at the Sixth Technical Seminar of the Indian Rubber Manufacturers' Research Association (IRMRA) on 18-12-72.

Papers :

(1) Speciality Rubbers and Plastic derivatives based on natural rubber. M. Nadarajah, *Polymer Journal*, 3, 37 — 40, 1971 — 1972.

(2) Proposals to increase quality production of RSS in Sri Lanka. M. Nadarajah, P. A. Bartholomeusz and D. S. Muthukuda. *RRIC Bulletin* 7, 50—63.

(3) Development of natural rubber-Portland cement mixes for practical applications. M. Nadarajah, H. Pieris and K. P. N. de Silva. *RRIC Bulletin* 7, 71 — 75.

(4) The effect of protease digestion *(in situ)* on the slime substance of mature sieve tubes. P. A. J. Yapa and D. C. Spanner. *Planta*, **107**, 1972, 89 — 96.

(5) Isoelectric focussing of sieve tube proteins. P. A. J. Yapa and D. C. Spanner. *Planta*, **106**, 1972, 369 — 373.

Serving on panels :

Mr. M. Nadarajah functioned as committee member for I.R.I. (Ceylon Section). Mr. S. W. Karunaratne attended meetings at the Bureau of Ceylon Standards Sri Lanka on specifications. Mr. M. Nadarajah and Mr. S. W. Karunaratne gave 61 and 40 lectures respectively, on rubber chemistry and technology to students reading in the course to the L.I.R.I. at the University of Sri Lanka, Katubedde campus.

Mr. S. W. Karunaratne represented the R.R.I.C. in the following drafting committees of the Bureau of Ceylon Standards :—

(1) Drafting committee for NR latex
(2) Revision committee for NR
(3) Drafting committee for braided fabrics
(4) Drafting committee for vulcanised rubber products.

Mr. R. Tharmalingam represented the R.R.I.C. in the drafting committee of the Bureau of Ceylon Standards on plastic containers.

Complete Sri Lanka patents applied for ;

The following seven complete Sri Lanka patents were applied for :—

(1) "Improvements in or relating to the manufacture of chlorinated rubber." Mrs. M. Rajasingham, M. Nadarajah, J. K. Kirubakaran and P. P. Jayasinghe. Sri Lanka patent No. 6909.

(2) "Improvements in or relating to the method of manufacturing cyclised rubber." M. Nadarajah, H. Narangoda and C. G. Balasingham. Sri Lanka patent No. 6910.

(3) "The use of natural rubber-resin blends as an adhesive for plywood." Miss D. A. R. Eliathamby, M. Nadarajah, U. P. P. Amerasinghe and N. Liyanage. Sri Lanka patent No. 6911.

(4) "Stabilizing of natural rubber latex for mixing with Portland cement." M. Nadarajah, K. P. N. de Silva and G. W. Goonasena. Sri Lanka patent No. 6938.

(5) "The use of papain as a latex coagulant in natural raw rubber manufacture." M. Nadarajah, C. G. Balasingham and S. Kasinathan. Sri Lanka patent No. 6939.

(6) "Modification of natural rubber latex to be used as a general purpose adhesive." M. Nadarajah, J. K. Kirubakaran and P. P. Jayasinghe. Sri Lanka patent No. 6972.

(7) "The use of natural rubber grafted latex in leather finishes." W. K. Wickremasinghe, M. Nadarajah, Z. Kotasek and L. Blazek. Sri Lanka patent No. 6986.

Rubber Technology

Use of easy processing rubber in tyre manufacture (M. Nadarajah & H. Narangoda).

The competitive pressures that are applied by the synthetic rubber (SR) industry compel the natural rubber (NR) producing industry to plan so that NR is competitive in consumer product fabrication. Hot room treatment and premastication which are necessary steps in the processing of NR and not SR, can be eliminated by adding a mineral oil, which is a physical plasticiser, to field latex at approximately 11% on the rubber and a peptiser, which is a chemical plasticiser *e.g.* RPA 3, at approximately 0·2% to 0·3% on the rubber. This could be conveniently done in conventional Ribbed Smoked Sheet (RSS) producing factories. In our compounding experiments we have equated 105 kg of easy processing rubber to 100 kg of masticated rubber and 5 kg of mineral oil. In mixing of easy processing NR in a No. 3 Banbury it was found that the mixing time for a tyre tread mix, is approximately 10% more than for masticated NR. The use of easy processing rubber cuts down mastication time considerably on open mills too.

The use of easy processing NR is an important step in the manufacture of oil extended NR compounds on open mills, as the extra oil necessary can be easily added on the open mills during the compounding stage.

Advisory Service to Producers

Routine Advisory Work : The following advisory visits were done by Mr. D. S. Muthukuda, Assistant Development Officer.

	RSS Manufacture	Pale crepe Manufacture	Sole crepe Manufacture	Latex weighing	Other visits	Total
1st Qtr.	25	6	3	7	6	47
2nd Qtr.	20	4	6	6	12	48
3rd Qtr.	18	7	1	13	14	53
4th Qtr.	12	9	5	10	13	49
Total	75	26	15	36	45	197

Pale crepe manufacture (*S. W. Karunaratne & K. A. Piyadasa*)

One of the standard practices in pale crepe manufacture is to use a bleaching agent, xylylmercaptan, commonly referred to as RPA 3, to reduce or completely remove the yellow colouring matter present in most latices. The bleaching agent being oil based has to be emulsified before it can be mixed with latex and the age-old estate practice is to shake a mixture of RPA 3 and water with an added emulsifying agent in a bottle prior to use. The emulsion thus formed breaks off within a matter of minutes and examination of this emulsion under the microscope reveals large globules many times larger than the normal size of latex particles (Fig. 1). Shaking the bottle does not bring about further reduction in particle size, but a very efficient method of breaking the globules further is to use a Silverson emulsifier. This reduces the size of globules to the size of latex particles (Fig. 2), and a stable emulsion is formed which could be kept even for a week without separating. This improves the efficiency of mixing of the bleaching agent with the latex. The bleaching agent is expected to react within a short period of time prior to the onset of coagulation and efficient mixing will play a large part in bringing about a uniform bleaching effect. It is also possible to cut down the amount of bleaching agents by this method.

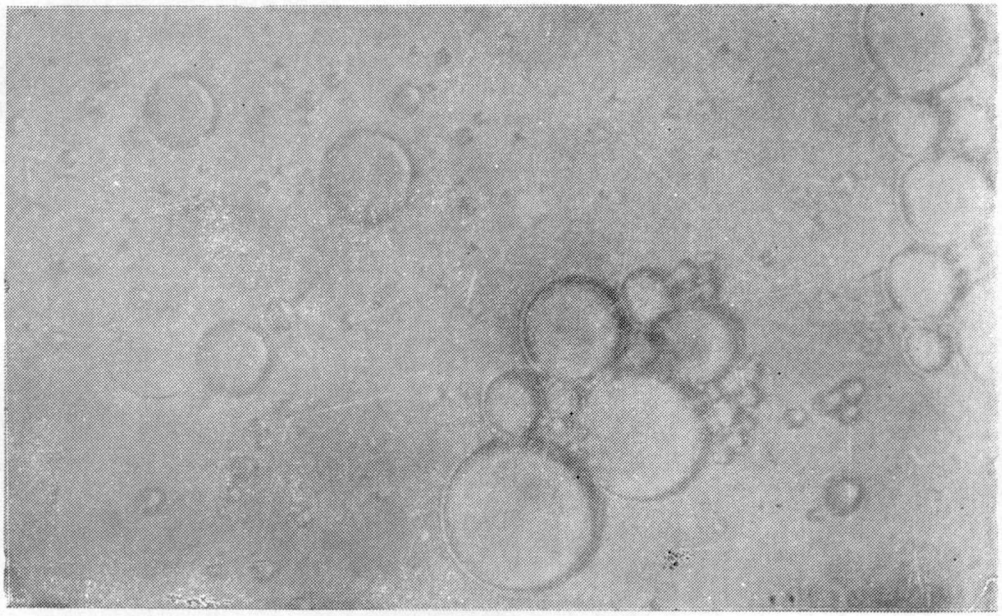


Fig. 1.
RPA 3 emulsion prepared by mechanical shaking in a bottle.
Magnification — X 20,000

Fig. 2.
RPA 3 emulsion prepared using Silverson Emulsifier.
Magnification — X 20,000

Suitability of " 100 " series clones in pale crepe manufacture (*C. G. Balasingham*)

The colour of pale crepe produced from the latex of RRIC clone numbers 100 to 110, using different manufacturing methods, is given below :—

(a) When oxalic acid at 12 oz per 100 lb d.r.c., $NaHSO_3$ at 1 oz per 100 lb d.r.c. and 40 fl. oz of a 5% emulsion of RPA 3 per 100 lb d.r.c. were added to latex diluted with an equal volume of water :

Clone	*Colour*
RRIC 100, 101*, 103, 107	White
RRIC 102, 104, 105, 108, 110*, 109	Pale yellow

* Enzymatic discolouration

(b) When oxalic acid at 8 oz, formic acid at 4 fl. oz, $NaHSO_3$ at 8 oz and 40 fl. oz of a 5% emulsion of RPA 3 per 100 lb d.r.c. were added to the latex diluted with an equal volume of water :

Clone	*Colour*
RRIC 100, 101*, 103, 108	White
RRIC 109, 110* and 102	Pale yellow

* Enzymatic discolouration

The clones 101 and 110 may not be suitable for pale crepe manufacture as they tend to discolour.

Collection and processing of rubber seed (*M. Nadarajah, W. C. Dayaratne & R. Tharmalingam*)

Over 1,000 tons of rubber seed were collected in 1972. The popular method of extraction of the oil was to take whole seed, pulverise it, steam it and expel the oil in a copra expeller. The price of crude oil was approximately Rs. 2,100/- per ton and its main use is in paint manufacture and in particular the manufacture of alkyd resins. Alkyd resins are at present being produced on a commercial scale in Sri Lanka using rubber seed oil, and Sri Lanka can well claim to be the first country in the world to have pioneered the commercial use of rubber seed oil in alkyd resin manufacture.

This use in alkyd resin manufacture is a considerable avenue for the use of rubber seed oil and opens the way to utilizing the thousands of tons of rubber seeds which are now allowed to go waste on rubber estates. It is intended to actively promote the collection and utilization of rubber seed on a planned basis in Sri Lanka in 1973.

Advisory services in rubber and latex technology.

(a) *Use of natural rubber latex - resin blends as an adhesive for plywood* (*M. Nadarajah*).

This work was done in collaboration with the Ceylon Plywoods Corporation. Approximately 1,300 tons of urea formaldehyde (UF) and 100 tons of phenol formaldehyde (PF) resins involving a foreign exchange expenditure of 2·5 million rupees are expected to be imported annually into Sri Lanka for bonding plywood.

This project is an endeavour to find a method of substituting part if not all of this with a locally available adhesive. The basis of this work is the use of natural rubber (NR) latex-UF resin blends or of NR latex-PF resin blends as the adhesvie for plywood. China clay is used as the extender and it was found that a minimum adhesive total solids content of 55% is necessary to obtain minimum plywood bond strength specifications. Formaldehyde is used as the stabilizer for NR latex as its use enables the blending of UF resin with NR latex without any coagulation of the latex and gives an acidic pH which is necessary to cause polymerisation of the UF resin.

Using NR latex-UF resin blends, it should be possible to substitute satisfactorily $\frac{3}{4}$ of the imported UF resins by NR. This would result in an annual saving to the Ceylon Plywoods Corporation of eight lakhs of rupees and of a foreign exchange involvement of approximately 1·5 million rupees. It also finds a new use for NR in Sri Lanka.

By using NR latex-PF resin blends it should be possible to replace half of the imported PF resin for use in commercial plywood. This would result in an annual saving of approximately one lakh of rupees to the Ceylon Plywoods Corporation and of a foreign exchange involvement of approximately one lakh of rupees.

Advisory service to latex based manufacturers (*W. D. Dharmasena*)

Advice was given to General Industries Ltd., to improve their latex products manufacture.

Room temperature and quick curing formulations (*K. P. N. de Silva & P. P. Jayasinghe*)

A room temperature, quick curing compound was formulated out of natural rubber. It was a system of accelerators formed out of ZDC, MBT and DPG. The samples were cured in a room at ambient temperature. The best accelerator combination was found to be ZDC/MBT/DPG at 1 : 1. 4 :1. 4 on 100 of rubber which imparted a curing time between 8 — 12 h at room temperature. Along with this, the effect of various colouring pigments on the cure time of room temperature curing samples was studied. The best was the black stock but all the coloured stocks (red, blue, yellow and orange) cured within the specified time.

Use of leather waste (*W. S. E. Fernando & C. G. Balasingham*)

It is known that leather waste could be used to make leather board using NR latex as a binder. Our preliminary experiments show that this waste could also be used as a reinforcing filler and that it could be successfully used to make floor tiles, shoe soles and leather cloth.

General purpose adhesive from natural rubber latex (*M. Nadarajah, J. K. Kirubakaran & P. P. Jayasinghe*)

A general purpose adhesive has been prepared by adding urea formaldehyde resin at 1 to 5% on field latex stabilized with 0·3% formaldehyde, the best results being obtained with 2% resin. The field latex stabilized with 0·3% formaldehyde can also be centrifuged, the formaldehyde content brought up to 0·3% and the urea formaldehyde resin added at 1 to 3% on the centrifuged latex.

(a) *Pale and scrap crepe (D. S. Muthukuda)*

Work was done in collaboration with Head, Estates Advisory Department, on the proposal to construct central pale crepe factories at Badureliya and Kuruwita and a scrap crepe factory at Matugama. Engineering firms were consulted regarding construction of these factories and the supply of the relevant machinery and estimates were prepared.

(b) *Field and centrifuged latex (M. Nadarajah)*

A draft proposal for a central factory to produce stabilized field and centrifuged latex was written in collaboration with Mr. K. Balasingham of the C.I.S.I.R. It is recommended that in the case of centrifuged latex, the factory should be large enough, to maintain good quality control. Hence facilities should be available to centrifuge a minimum of approximately 5 tons of rubber per day as centrifuged latex. This factory should be able to produce Sri Lanka's requirements of field and centrifuged latex. The excess production of centrifuged latex should be exported.

Effluent disposal and usage (W. C. Dayaratne & M. Nadarajah)

Qualitative experiments on treating vegetable plots with serum water have shown that :—

(1) It is useful as a pretreatment of soil and possibly kills nematodes and treatment should be stopped at least 10 days before seeds are planted. Soil pH may drop to about 5·25 from 6·95 due to serum treatment. A substantial increase in the essential nutrients NPK in soil is observed, the potassium value being about double that of the control and the phosphorus value more than double that of the control.

(2) Watering with serum water can be done as a regular practice after the plants are well established. Sufficient serum water should be applied but care must be taken not to make the soil too wet and to avoid sprinkling the serum on the foliage.

(3) Marked response in growth due to serum water treatment is shown by cabbage, spinach and other leafy vegetables. Brinjals, chillies, papaya, banana and mulberry also show a positive response in growth to serum water treatment.

(4) Seed germination was carried out in serum water at different concentrations. Neat serum does not promote germination but fungal contaminations were more or less absent in serum treated seeds. Investigations are being carried out to find whether serum water could be used as a seed dressing against pathogens.

Biochemistry

Use of papain as a latex coagulant (M. Nadarajah, P. A. J. Yapa, C. G. Balasingham & S. Kasinathan)

Over a million lb of formic acid are imported into Sri Lanka each year as a latex coagulant and the cost to the consumer is Rs. 1·76 per lb Papain can be used as the coagulant for rubber latex, because it breaks down the stabilizing proteins, and the rubber obtained has a lower nitrogen content than acid coagulated rubber. Rubber low in nitrogen content has aroused enthusiastic interest in many engineering applications.

Papain at 500 ppm on the latex causes rapid coagulation and at 250 ppm causes overnight coagulation. Papain can be used as a coagulant for RSS manufacture too replacing 50% of the formic acid *i.e.* a mixture of 1½ oz papain and 3 fl. oz of formic acid for 100 lb d.r.c., added one after the other can be used as the coagulant in RSS manufacture. In pale crepe manufacture the use of 6 oz of oxalic acid and 1½ oz papain for 100 lb d.r.c. gave a good quality product.

The reduction in nitrogen content of the final rubber is supported by the fact that there is an increase in amino acid content in the serum after papain coagulation ; the increase in amino acid content is due to the release of amino acids by hydrolysis of proteins by papain, it is also possible that free amino acids in papaw milk may have contributed to this increase. A considerable increase in the concentration of the four amino acids, namely trypophan, valine, phenyl alanine and leucine were observed after papain coagulation. Amino acid analysis was performed by paper chromatography after papain coagulation.

The coagulation of skim latex with papain was also investigated. Skim latex autocoagulates after seeding with bacteria in about three to four days. The rubber has a high nitrogen content and smells badly. A rubber with acceptable PRI and nitrogen content and with less odour can be obtained by coagulating the skim latex which has been seeded with bacteria and allowed to stand for about two days, with papain (1½ g per gal. of skim) and oxalic acid (¼ g per gal. of skim). Fresh skim latex can also be coagulated with papain to give rubber with acceptable nitrogen contents, but sulphuric acid and oxalic acid have to be added as coagulants before the addition of papain. The specification for nitrogen has been introduced in the SCR scheme because of the possibility of adulteration with skim rubber. If skim rubber can be prepared in all centrifuging factories in Sri Lanka by our method, then there will be no necessity to test for specifications for nitrogen, as the nitrogen content will be within the specifications. The MOD values are comparable to those of biologically coagulated rubber and cup lump (6·5 to 7·49).

Papain fetches a very high price in Sri Lanka and a way of obtaining it readily on rubber estates is by intercropping *papaya* between immature rubber trees. The tree *papaya* appears to be suitable for intercropping with rubber, because the normal period during which papain can be commercially extracted from the *papaya* plant is only about five years from planting and therefore *papaya* may be grown as an intercrop in immature rubber for about four to five years.

Polymer Chemistry

Cyclised rubber (*M. Nadarajah, H. Narangoda & C. G. Balasingham*)

When partially deproteinised crepe obtained by papain coagulation is used in the manufacture of cyclised rubber, it was found that if 8 parts of para toluene sulphonic acid were used for 100 parts of rubber, the reaction occurred at 120°C in approximatley ½ h. If the rubber is well masticated before incorporation of the para toluene sulphonic acid, it was found that the dosage of para toluene sulphonic acid could be reduced to 7 pphr and that the product was suitable for use in paints and in printing inks. Cyclised rubber prepared by our method was successfully used by us at Bata Shoe Company of Ceylon Ltd., in a resin rubber shoe sole formulation.

Chlorinated rubber (*M. Nadarajah, P. P. Jayasinghe & J. K. Kirubakaran*)

Clone RRIC 7 was found to give an insoluble chlorinated rubber even when hydroxylamine was used, but a soluble chlorinated rubber was obtained when RPA No. 3 was used. The dilution of the field latex with an equal volume of water after addition of Vulcastab LW and HCl and before addition of the sodium chlorate, was of great value in keeping the temperature below 40°C during the chlorination reaction.

The most efficient stabilizing system for field latex for use in chlorinated rubber manufacture was found to be Vulcastab LW and formaldehyde at 0·5% and at 0·3% on the latex, respectively. A soluble chlorinated rubber can be made from field latex by the addition of an oxidation catalyst. The dosages at which these chemicals are used are given in Table 1.

TABLE 1

Name of chemical	%
Cumene hydroperoxide	0·05
p-xylyl mercaptan (RPA No. 3)	0·2
Mercapto benzothiozole	0·4
Boric acid	0·4

The approximate formulation used in preparing chlorinated rubber is field latex 2250 g, sodium chlorate 915 g and hydrochloric acid 1800 g.

Rubber hydrochloride :

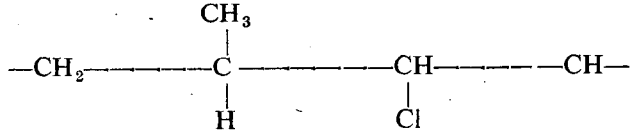
Preparation of rubber hydrochloride (*S. Kasinathan & M. Nadarajah*)

HCl from the HCl tower at Paranthan Chemicals Corporation was cooled to room temperature and allowed to pass under suction for 35—45 h through 3 gal. creamed latex, stabilized with Vulcastab LW and Conc. HCl. The addition of RPA No. 3 at 0·1% latex and an antioxidant (Nonox WSL) at 1% on the latex was necessary. The latex changed colour to rose-pink and then to a light violet colour and the rubber hydrochloride was precipitated by pouring the latex into a saturated sodium chloride solution heated to 80°C. The precipitate was washed well with water, filtered and dried at room temperature for two to three days. 30 lb rubber hydrochloride was prepared by this method.

Structure of rubber hydrochloride (*S. Kasinathan & A. Coomarasamy*)

The structural analysis of rubber hydrochloride using infrared and spectrophotometric techniques reveal that the structure :

is more probable than



Very little cyclisation products are also present, being five membered and six membered rings.

Uses of rubber hydrochloride (*S. Kasinathan, M. Nadarajah & R. Tharmalingam*)

Sodium fusion of the sample and titration with silver nitrate showed that the chlorine content in the sample is approximately 30%. Hundred parts of rubber hydrochloride is stabilized with two parts by weight of dibutyl tin di-laurate, dried for 4 h at 100°C, and then mixed with 5 parts of dibutyl phthalate (plasticiser). This material was satisfactorily used in injection moulding. Better results were obtained when the rubber hydrochloride was blended with an equal weight of polythene.

Development work

Rubber in roads (*M. Nadarajah & G. W. Goonasena*)

Formaldehyde stabilized centrifuged latex with Vulcastab LW at 0·5% in it is suitable for use for blending with cationic bituminous emulsions.

Sodium hydroxide preserved field latex d.r.c. 33% has been supplied to Mr. C. Yoganandan of the Department of Highways and they have used it as 2% rubberised bitumen on the following road sections :—

(a) 1320 ft. on Panadura — Nambapana Road from 7th mile post onwards ;
(b) 160 ft. on Nugegoda—Kotte Road in front of Territorial Civil Engineering Organisation ;
(c) On the 19th mile on the Colombo—Horana Road ;
(d) Repair work on a short stretch of road in front of the Dehiwela — Mt. Lavinia courts.

Visual inspection has shown that pot holes are noticeable due to heavy rains in control sections, whilst the rubberised section is performing well.

Field latex stabilized with 0·3% formaldehyde has been supplied to Mr. C. Yoganandan of the Department of Highways for laboratory and road trials.

Natural rubber latex-Portland cement mixes (*M. Nadarajah, K. P. N. de Silva & G. W. Goonasena*)

A stabilizer for latex to enable it to be mixed with Portland cement is formaldehyde at the rate of 0·3% on the latex. The formaldehyde is added as a concentrated solution to the field latex, immediately after collection. The addition to the latex of either potassium hydroxide or sodium hydroxide at 0·5 to 1% on the latex as a 25% solution, enables the latex to be sufficiently stable for mixing with Portland cement. The stabilized latex is allowed to stand at least 3 days before use.

This mix would be of great value in repairs of old cement structures and in industrial flooring. It was also found that 10 parts of rubber as field latex could be mixed with 10 parts of cement and 100 parts of clay to give products with improved water seepage resistance.

Rubber Rainguards (*M. Nadarajah & G. W. Goonasena*)

Trial plots in different estates were fitted with rubber rainguards supplied by the C.I.S.I.R. Some estates have recorded yield increases of 5 to 10%. It appears that this increase is not adequate for estates to carry out further trials at their expense. The use of rubber rainguards may be of great value to minimise any loss in crop, due to washouts caused by rain and when trees are treated with a stimulant such as Ethrel.

Use of natural rubber latex for finishing leather (M. Nadarajah)

Work done in collaboration with the Ceylon Leather Products Corporation has shown that methyl methacrylate graft polymerised NR latex could be used as a substitute for synthetic binders in leather finishing. Further the rubfastness property of synthetic binders could be improved by blending with methyl methacrylate graft polymerised NR latex.

Use of NR latex to stabilize soils (M. Nadarajah, W. D. Dharmasena & W. G. Goonasena)

Synthetic rubber latices mixed with mineral oil have been used as soil stabilizers. In Sri Lanka there is a need for a good soil stabilizer.

(a) to prevent erosion in tea lands, just after pruning. Pruning takes place about once in five years.

(b) to prevent wind erosion in sandy areas, and to make sandy areas suitable for cultivation.

Preliminary experiments using NR latex mixed with mineral oil were carried out in collaboration with Dr. W. S. Alles and Mr. K. P. Alwis of the Central Agricultural Research Institute, Gannoruwa. Details of soil splash observed due to rain are given in Table 2. In each case the amount of water was adjusted so that a constant volume of spray materials was sprayed in each plot *i.e.* one gal. per plot of 25 sq. ft. area. It will be seen from the Table that there is a marked decrease in soil splash in the treated plots and that prevulcanised latex gave the best results.

TABLE 2

NR LATEX - MINERAL OIL MIXES IN SOIL STABILIZATION

Type of latex in ml	50% Dutrex R in ml (mineral oil)	25% Carbon slurry in ml	Water in ml	Soil Splash in g per sampler
Prevulcanised 1000	200	60	3286	2·96
Compounded 1000	200	60	3286	5·90
Prevulcanised 1000	300	60	3186	4·66
0	0	0	4546	14·16

Since waste engine oil is available from the Ceylon Transport Board (CTB), free of charge and in our opinion the amount of oil could be increased considerably for soil stabilization, thus rendering the mix cheaper, further experiments are being carried out using waste CTB engine oil, with an oil to dry rubber ratio greater than two, *e.g.* 9 : 1. Since compounded latex is easier to prepare, this is being used instead of prevulcanised latex. The formula for the compounded latex and for oil emulsion is given in Table 3.

TABLE 3

FORMULA FOR COMPOUNDED LATEX

	Wet	Dry
Natural rubber (as field latex)	300	100
S (50% dispersion)	2	1
ZDC (50% dispersion)	2	1
ZnO (50% dispersion)	2	1
Nonox W.S.L. (25% emulsion) (antioxidant)	4	1

50% oil emulsion

Oil	100	A
Coconut oil fatty acid	0·7	A
Water	95·6	B
KOH	0·7	B
Ammonia 10%	3·0	B

A and B are mixed together to give a 50% emulsion.

Studies in the preparation of CV Rubber :

CV characteristics of rubber derived from latex collected in the Mawanella area (S. W. Karunaratne & L. S. Goonawardena)

This study was undertaken to evaluate CV characteristics of rubber prepared from smallholders latex in the Mawanella area. Representative samples of latex were collected from three collecting centres, Dehimaduwa, Randiwela and Talgamuwa established to feed the Mawanella Block Rubber Factory. These were treated with hydroxyl amine sulphate (0·15% on dry rubber), coagulated with formic acid, sheeted and dried. The Mooney viscosity was determined on the air dried sheet of rubbers. Ammonia content of the latex was kept below 0·05% prior to coagulation.

Wallace plasticity number (WP) and Mooney viscosity (MV) of rubber derived from latex collected from Mawanella on five occasions during a period of four months from September to December 1972, are given in Table 4.

TABLE 4

WALLACE PLASTICITY NO. AND MOONEY VISCOSITY OF RUBBER DERIVED FROM LATEX IN THE MAWANELLA AREA

Latex Collecting Centre	Wallace plasticity number (WP)										Mooney viscosity (MV) ML_{1+4} at 100°C.									
	Normal sample					Viscosity stabilized sample					Normal sample					Viscosity stabilized sample				
Sample No.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
DEHIMADUWA	55	48	53	51	55	48	43	43	43	45	76	75	77	79	72	70	68	69	69	70
RANDIWELA	48	—	40	56	53	43	—	52	44	43	69	—	71	79	83	67	—	67	67	67
TALGAMUWA	60	45	—	53	48	47	42	—	44	41	71	66	—	76	73	68	69	—	71	64

The results show that all three collecting centres could provide latex which could be processed into dry rubber (in sheet form) of a Mooney viscosity of 68 ± 5. Comminuted rubber however will be expected to have a lower Mooney viscosity than sheet or crepe rubber.

Analysis

Specifications and standards for concentrated latex (*S. W. Karunaratne & K. A. Piyadasa*)

Tests for the evaluation of Plasticity Retention Index (PRI) as a criterion of assessing concentrated latex have been carried out. The following types of concentrated latex were tested.

Centrifuged latex — High ammonia (H.A.)
Low ammonia (L.A.) with added preservatives
(a) Sodium pentachlorophenate (L.A./S.P.P.)
(b) Zinc diethyl dithiocarbonate (L.A./Z.D.C.)
(c) Boric acid (L.A./B.A.)

Creamed latex — High ammonia (H.A.).

These were collected from several factories and tested at regular intervals.

The following are the main conclusions :—

(1) PRI of total solids film is related to the level of copper, but in the case of low ammonia/Z.D.C system copper complexes with the Z.D.C. to give an overall antioxidant effect.

(2) PRI of rubber derived from coagulation of concentrated latex is very low, and in some cases the PRI is controlled by the extent of dilution prior to coagulation. Generally PRI of rubber derived by coagulating of concentrated latex is less than 30 and in most instances it is less than 10.

(3) Storage of concentrated latex has only a marginal effect on the PRI of total solid films.

The general conclusion is that for concentrated latex, PRI of total solids film should be considered as a criterion of assessment of the latex in preference to copper and manganese determinations. It is meaningless to estimate the copper and manganese levels in low ammonia/Z.D.C. systems for purposes of specification or evaluation.

Estimation of formaldehyde content of formalin stabilized latex (*W. S. E. Fernando & M. Nadarajah*)

This work was done with Miss S. Vaithilingam of the University of Ceylon, Peradeniya, when she was on vacation employment at this Institute. The formaldehyde was oxidised with H_2O_2 to formic acid and the liberated acid was reacted with a known amount of excess NaOH. The amount of formic acid formed and hence the concentration of formaldehyde in the latex was obtained by back-titrating the unreacted NaOH with standard HCl.

$$NaOH + HCHO + (O) \longrightarrow H.COONa + H_2O$$

It was found that the amount of formaldehyde necessary to form the formaldehyde-protein complex is used up within two days. After that the bound formaldehyde remains more or less constant. The amount of formaldehyde to form this stable, formaldehyde-protein complex is dependent on the initial concentration of the formaldehyde present in the latex. If the initial concentration of formaldehyde is 0·5% and 0·3%, then the amount of bound formaldehyde is 0·14% and 0·05% respectively.

Modification to the SCR Scheme (S. W. Karunaratne)

A number of revisions to the SCR Scheme were introduced during 1972, following representation by the Institute, that the SCR Scheme should fall in line with the natural rubber standard proposed by the IRRDB. The revised scheme, which has been circulated by the Bureau of Ceylon Standards, Sri Lanka for public comment towards the end of 1972, is in close agreement with the standard stipulated in the SMR Scheme.

PRI is introduced as a mandatory parameter. It is an improvement over copper and manganese determinations in that a direct, as opposed to an indirect assessment of oxidation behaviour is obtained.

The grading of block rubber produced by the Heveacrumb process at Peenkande, from fraction coagulum was changed from SCR 5 to SCR 10 as this type of rubber does not quality to be graded as SCR 5 according to a new stipulation under the SCR Scheme, that only rubber prepared by deliberate coagulation of field latex, be graded as SCR 5. RSS cuttings reprocessed into block form, however, is acceptable as SCR 5 under the new scheme.

SCR Production
(Tons)

		1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
	5L	—	—	—	—
	5	30	28	32	—
Heveacrumb	10	—	—	—	40
	20	—	—	—	—
	50	—	—	—	—
	5L	—	—	—	—
Comminuted	5	9	65	122	—
	10	—	—	—	—
	20	76	110	95	100
	50	26	6	21	—

These have been shipped to U.K., West Germany, Italy, France, China and Guinea Democratic Republic.

Testing of Standard Ceylon Rubber (SCR) (S. W. Karunaratne, L. M. K. Tillakeratne & A. S. Dekumpitiya)

The testing facilities at the RRI Headquarters at Dartonfield were under heavy strain, due to the shortage of personnel and lack of space. Five Specification Assistants were responsible for carrying out the routine analysis under the charge of a Technical Assistant and the Assistant Specification Officer. Samples were tested regularly, from two factories currently engaged in block rubber production. A breakdown of the routine analysis undertaken is given in Table 5.

TABLE 5

DISTRIBUTION OF ROUTINE ANALYSIS

Sample Type	Total number of samples analysed	Total number of determinations performed
Heveacrumb	936	5,148
Comminuted	1,865	9,947
Research	1,687	4,634

Test data on the production of comminuted rubber from RSS cuttings are given in Table 6.

Initial Wallce Plasticity (P°) is appreciably high (average, about 45), compared to the other grades of rubber prepared by the new process of comminution. MOD values indicate that this type of rubber falls into either the fast or medium curing category.

The Central Specification Laboratory under construction at Ratmalana is expected to be ready by the middle of 1973 and should be in operation towards the end of the year. Much effort was put into the planning of this new station and Mr. H. C. Baker, one time Chief Specification Officer, of the RRIM, has been requested to assist in the project. He has already spent a month in Sri Lanka discussing the details of the plan of the Specification Laboratory and the equipment list. Overseas Development Administration (ODA) in U.K. is supplying the equipment for the Laboratory.

Round Robin Tests :

As a result of two rounds of Round Robin Tests conducted by the RRIM during the year under review, RRIC has been confirmed as an approved laboratory for testing arbitration samples under Technically Specified Rubber (T.S.R.) contract drawn up by the International Rubber Association (I.R.A.).

TABLE 6

TEST DATA ON PRODUCTION OF COMMINUTED RUBBER FROM RSS CUTTINGS — CENAT FACTORY, PAIYAGALA

Lot Size Metric Tons	Dirt on 325 mesh, % wt.			Volatile Matter % wt.			Po			PRI			Nitrogen % wt.			Ash % wt.			MOD Value		
	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean
20	0·032	0·014	0·027	0·265	0·127	0·230	47	37	43	83	67	75	0·457	0·299	0·335	0·393	0·163	0·222	—	—	—
15	0·031	0·022	0·027	0·287	0·192	0·255	51	42	46	84	68	79	0·467	0·288	0·409	0·313	0·212	0·264	—	—	—
10	0·026	0·017	0·022	0·425	0·298	0·367	47	43	44	85	77	82	0·458	0·377	0·417	0·349	0·260	0·317	7·16	6·54	6·82
5	0·034	0·017	0·028	0·345	0·282	0·303	46	44	45	86	80	83	0·432	0·349	0·391	0·268	0·177	0·217	6·90	6·07	6·44
10	0·036	0·010	0·021	0·313	0·277	0·290	47	44	45	90	85	88	0·407	0·370	0·387	0·218	0·177	0·197	6·51	6·23	6·35
10	0·019	0·014	0·017	0·328	0·287	0·300	45	39	44	90	86	87	0·417	0·345	0·377	0·269	0·162	0·202	6·45	5·97	6·18
10	0·018	0·010	0·014	0·306	0·282	0·291	45	41	43	88	83	86	0·449	0·345	0·386	0·259	0·223	0·237	6·65	5·80	6·17
5	0·018	0·012	0·015	0·304	0·255	0·283	46	42	44	86	82	84	0·434	0·372	0·396	0·260	0·222	0·236	6·55	6·26	6·43
10	0·014	0·011	0·012	0·466	0·275	0·317	46	44	45	88	82	85	0·397	0·338	0·360	0·240	0·172	0·200	6·71	6·23	6·48
10	0·020	0·015	0·019	0·341	0·290	0·317	46	38	41	83	62	76	0·446	0·388	0·412	0·283	0·218	0·243	6·61	6·01	6·40
20	0·037	0·017	0·028	0·300	0·229	0·267	52	43	47	89	71	78	0·430	0·296	0·389	0·333	0·207	0·268	—	—	—
5	0·019	0·017	0·019	0·299	0·281	0·233	45	43	44	85	78	82	0·436	0·408	0·422	0·255	0·241	0·243	6·25	5·98	6·98
20	0·024	0·016	0·019	0·299	0·274	0·288	45	42	44	90	80	84	0·458	0·388	0·423	0·268	0·200	0 234	6·68	5·82	6·25
10	0·019	0·016	0·018	0·453	0·284	0·309	48	43	45	90	69	82	0·476	0·375	0·429	0·264	0·221	0·237	6·65	6·01	6·29
20	0·036	0·015	0·023	0·320	0·277	0·301	46	43	45	87	77	82	0·483	0·355	0·398	0·288	0·217	0·261	7·16	6·04	6·53
20	0·030	0·016	0·026	0·307	0·276	0·292	45	36	43	90	83	86	0·474	0·361	0·426	0·284	0·214	0·256	6·60	5·12	6·21
10	0·031	0·023	0·027	0·392	0·280	0·321	47	42	44	89	79	84	0·450	0·372	0·409	0·280	0·200	0·258	6·48	5·87	6·30
1	0·025	0·025	0·025	0·348	0·348	0·348	46	46	46	85	85	85	0·431	0·431	0·431	0·263	0·263	0·263	6·34	6·34	6·34
Extremes	0·037	0·010	—	0·466	0·127	—	52	36	—	90	62	—	0·483	0·288	—	0·393	0·162	—	7·16	5·12	—
Average			0·022			0·295			44			83			0·400			0·242			6·41

REVIEW OF THE STATISTICAL SECTION

By

G. A. J. P. R. Gunasekera

The first few months were spent in analysing experimental results of the research departments and in the preparation of the Annual Review of the Section. Considerable time was then spent in connection with the smallholdings survey organized by Dr. C. Barlow. As the data were required by Dr. Barlow in Australia and Mr. G. R. Chandrasiri in England, it was undertaken to obtain computer prints of same. This venture in a new field would not have materialized if not for the assistance of Mr. L. Ranaweera of the Ceylon Insurance Corporation Computer Division.

The problem of the variation in rubber yields was amongst many others referred to Dr. C. H. Proctor of North Carolina University, during his period of service as visiting lecturer at the University of Ceylon. We are indebted to him for the lengthy hours spent and the guidance generously given. It was revealed that of the variables chosen, temperatures had significant effects on dry rubber content and latex volume. (Steps are being taken to collect more refined data to complete this study). Extensive use of the computer at the State Engineering Corporation was obtained in these studies.

The Assistant Statistician was granted permission to follow a course in computer science and was successful at the examinations 'Computer Systems Fundamentals' and 'Fundamentals of Computer Programming'. This course was held by the IBM World Trade Corporation, Ceylon, in May.

During November, the Assistant Statistician underwent training at the Department of Meteorology in the use of meteorological instruments. A new site for the Dartonfield meteorological station was selected with the assistance of the Meteorological Department. All instruments except the ground thermometers were shifted. Charts were supplied and repairs were made for the meteorological instruments at Nakiadeniya, Elpitiya, Doloswela, Eladuwa, Kuruwita and Nivitigalakele Estates and Sub-Stations.

Throughout the year, the Section was engaged in attending to statistical services required by other departments. Girth measurements in the study of growth curves were taken. Tapping charts and yields from some estates were collected for a comparative study. The assistance of the Smallholdings Department was received in the collection of smallholder yields to study their seasonal variability. These studies are being continued.

SUMMARY OF METEOROLOGICAL OBSERVATIONS

JANUARY — DECEMBER 1972

Longitude — 80° 0′ E

Latitude — 6° 32′ N

Height above mean sea level 215 ft. (546 cm)

	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
*Mean max. temperature	32·1	32·6	33·2	33·2	29·3	31·2	30·8	30·7	30·6	30·9	31·9	32·4	31·6
*Mean min. temperature	21·0	20·0	20·3	22·0	19·1	15·9	15·6	18·2	22·6	22·6	21·1	25·9	20·4
*Average of max. & min. temp. means	26·6	26·3	26·8	27·6	24·2	23·6	23·2	24·5	26·6	26·8	26·5	29·2	26·0
*Highest max. temperature	33·3	34·4	34·4	34·4	32·8	32·0	31·5	32·5	32·0	32·5	33·0	33·5	34·4
*Lowest min. temperature	20·0	17·8	18·9	20·3	14·6	15·0	14·8	15·0	20·2	21·5	16·0	19·0	14·6
*Mean earth temp. at 4″ (10·2 cm) depth	26·9	26·7	27·4	27·6	26·6	27·6	27·8	27·5	27·3	27·2	26·7	27·2	27·2
*Mean earth temp. at 8″ (20·3 cm) depth	—	—	—	—	27·2	28·1	28·2	28·1	27·7	27·8	27·5	27·7	27·8
*Mean earth temp. at 4′ (121·9 cm) depth	28·7	28·7	28·9	28·6	28·3	28·6	—	29·1	28·9	28·9	28·8	28·8	28·8
Monthly rainfall in cm	12·57	7·29	26·97	28·88	73·15	81·43	15·49	20·40	51·92	39·60	46·58	15·11	34·95
Cumulative rainfall in cm		19·86	46·83	75·71	148·86	230·29	245·78	266·18	318·10	357·70	404·28	419·39	419·39
Most rainfall in one day	2·20	4·36	6·71	7·52	19·53	26·90	2·87	7·37	9·83	5·73	11·73	5·94	26·90
No. of rainy days (rain > 0·1 mm)	13	4	12	20	25	25	23	20	25	23	21	15	226
Mean atmos. pressure in Hg. mm	757·77	757·77	758·34	758·20	757·98	756·28	757·02	757·43	757·55	758·16	757·87	758·22	757·72
*Mean temp. in attached thermometer	27·0	27·4	28·3	28·4	27·8	28·4	28·2	28·0	27·9	27·5	27·7	27·9	27·9

*All temperature measurements are in degrees Centigrade.

REVIEW OF THE ESTATES ADVISORY DEPARTMENT AND ECONOMIC RESEARCH UNIT

BY

A. B. DISSANAYAKE

General

As usual the Department continued to be of service to plantation owners in the acreage group of 25 — 500 ac. by carrying out advisory visits. Each visit was followed by a report to the owner and the Superintendent or the Conductor giving the relevant recommendations.

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

Staff

The Head of the Estates Advisory Department and two Assistant Estates Advisory Officers, continued to be on duty throughout the year. Mr. H. T. Wickremasekera, Assistant Estates Advisory Officer, left the services of the Institute with effect from 30-11-72. Mr. G. R. Chandrasiri, Assistant Agricultural Economist, who was doing post-graduate studies at the Wye College, University of London, was successful at the M.Sc. Examination in Agricultural Economics. He will continue his studies for the Ph.D. Examination. The other Assistant Agricultural Economist, Mr. S. K. W. Jayasooriya, left in January 1972 to study for the M.Sc. in Agricultural Development Economics at the Australian National University at Canberra.

The two Graduate Trainees, Mr. S. K. de Silva and Mrs. N. M. K. Welikanne, attached to this Department were absorbed during the year. Mrs. N. M. K. Welikanne was however transferred to the Smallholdings Department towards the end of the year.

Correspondence

A great deal of correspondence was attended to by the Department in the form of advisory reports, advisory letters on simple problems, surveys and feasibility studies. A total of 415 reports and letters have been sent by this Department during the year.

Visits

ESTATES ADVISORY DEPARTMENT

Routine visits : A total of 338 visits were made during the year under review. A break up of the visits would be as follows :—

TABLE 1

ROUTINE VISITS TO ESTATES

Category of Estate	No. of visits
Small Estates	263
Medium Estates	75
Total	338

Visits on request : A total of 39 visits on request have been made.

TABLE 2

VISITS TO ESTATES ON REQUEST

Category of Estate	No. of visits
Small Estates	27
Medium Estates	6
Large Estates	6
Total	39

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

Other Visits

The officers of this Department also attended discussions, seminars, meetings and other institutions in connection with the work of this Department and the Institute. A total of 107 such visits have been made. A break up of which would be as follows :—

TABLE 3

OTHER VISITS

Purpose	No.
C.O.P. survey	4
Discussions at Head Office	10
Seminars	8
Discussions with Scientific Staff	13
Committee meetings (Scientific, Prov. Fund etc.)	8
Visits for Rubber Controller	7
Board of survey	8
Other Institutions	36
Visiting Scientists	3
Others	10
Total	107

Conferences — Seminars

Mr. A. Dahanayake, A. E. A. O., attended the Malayan Planters' Conference held in Kuala Lumpur in July 1972 followed by a study tour of the Extension Department of the RRIM for a week.

Mr. R. A. Wijewansa, A. E. A. O., attended the five day FAO symposium on Farm Management held at Kandy.

Sinhala Bulletin

Articles of general interest to smallholders and small estates were published. Reprints of articles of technical value will be distributed to small and medium estates when the necessity arises.

ECONOMIC RESEARCH

As the two Assistant Agricultural Economists are both on overseas study leave very little work was done during the year.

Cost of Production studies

The data on cost of production (c.o.p.) were grouped according to average yield levels. For this purpose the following groups were formed. Average yield under 800 lb/ac./yr, 800 — 999 lb/ac./yr, 1000 — 1199 lb/ac./yr, 1200 — 1399 lb/ac./yr, 1400 — 1499 lb/ac./yr. Table 4 gives the c.o.p. of these different categories.

TABLE 4

C.O.P. OF RSS AT DIFFERENT AVERAGE YIELD LEVELS

Item	Average yield (lb/ac./yr)			
	800	800-999	1000-1199	1200-1399
Overhead charges	23·91	21·79	17·91	14·66
Cost of maintenance	6·53	7·59	6·78	6·93
Cost of extraction and transport	33·22	28·77	27·30	23·89
Cost of manufacture	8·74	8·38	8·33	8·71
Other charges	5·32	1·26	2·06	0·85
Total	77·72	67·79	62·38	55·04

Here a definite trend of lowering costs is observable with increasing average yields. If this is quantified it can be seen that, within the yield levels obtained, the c.o.p. per lb decreases by about 22·68 cts. when the average yield increases by 600 lb per ac.

TABLE 5

PROGRESS OF THE RUBBER REPLANTING SUBSIDY SCHEME

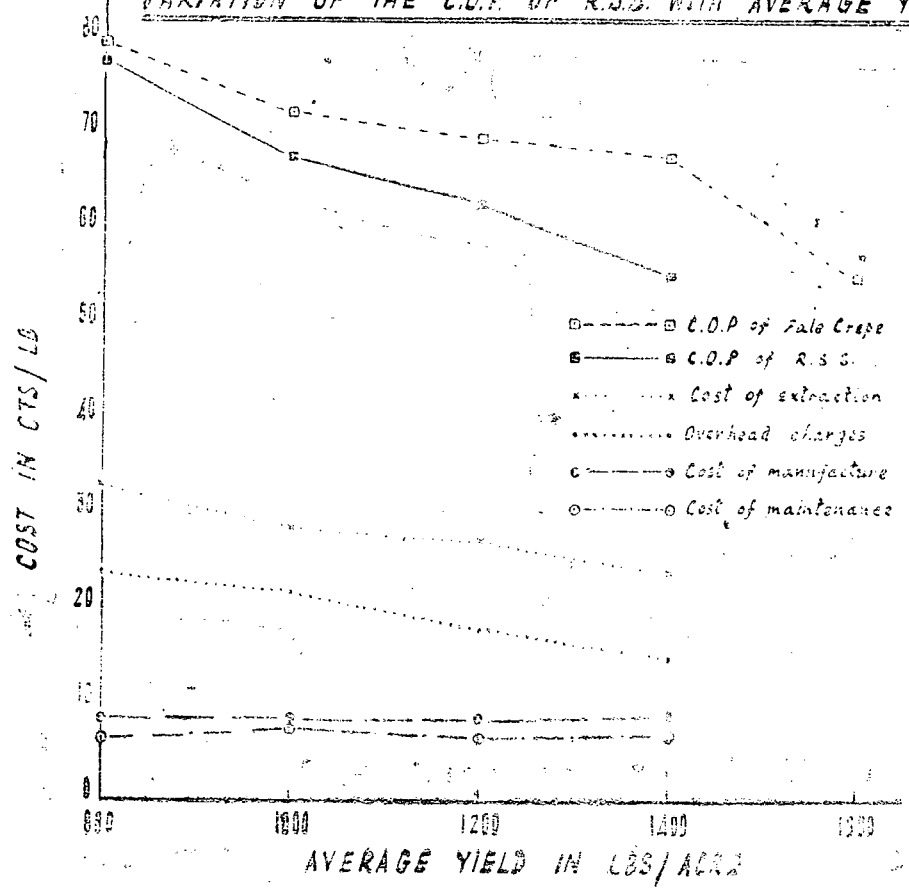
Year	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962
Acreage Replanted	5799	18453	20919	24576	24229	20640	18532	17895	18687	17956
Price of RSS 1	1·35	1·10	1·30	1·45	1·17	0·97	1·25	1·23	1·00	0·98

Year	1963	1964	1965	1966	1967	1968	1969	1970	1971
Acreage Replanted	15912	13553	12502	11583	10086	12734	12084	10239	8476
Price of RSS 1	0·93	0·90	0·91	0·89	0·79	0·88 (0·70)	1·04 (0·83)	0·91 (0·73)	0·79 (0·63)

Simplifying this it is seen that the c.o.p. decreases at the rate of 3·78 cts/lb when the average yield increases by 100 lb per ac. This reduction in the c.o.p. with increase in average yield effected mainly by the reduction in the costs of overhead increase in average yield is effected mainly by the reduction in the costs of overhead charges and cost of extraction and transport of latex. The cost of maintenance of plantation and cost of manufacture appear to remain almost static. Fig. 1. has been drawn to illustrate this.

Figure 1

VARIATION OF THE C.O.P. OF R.S.S. WITH AVERAGE YIELD

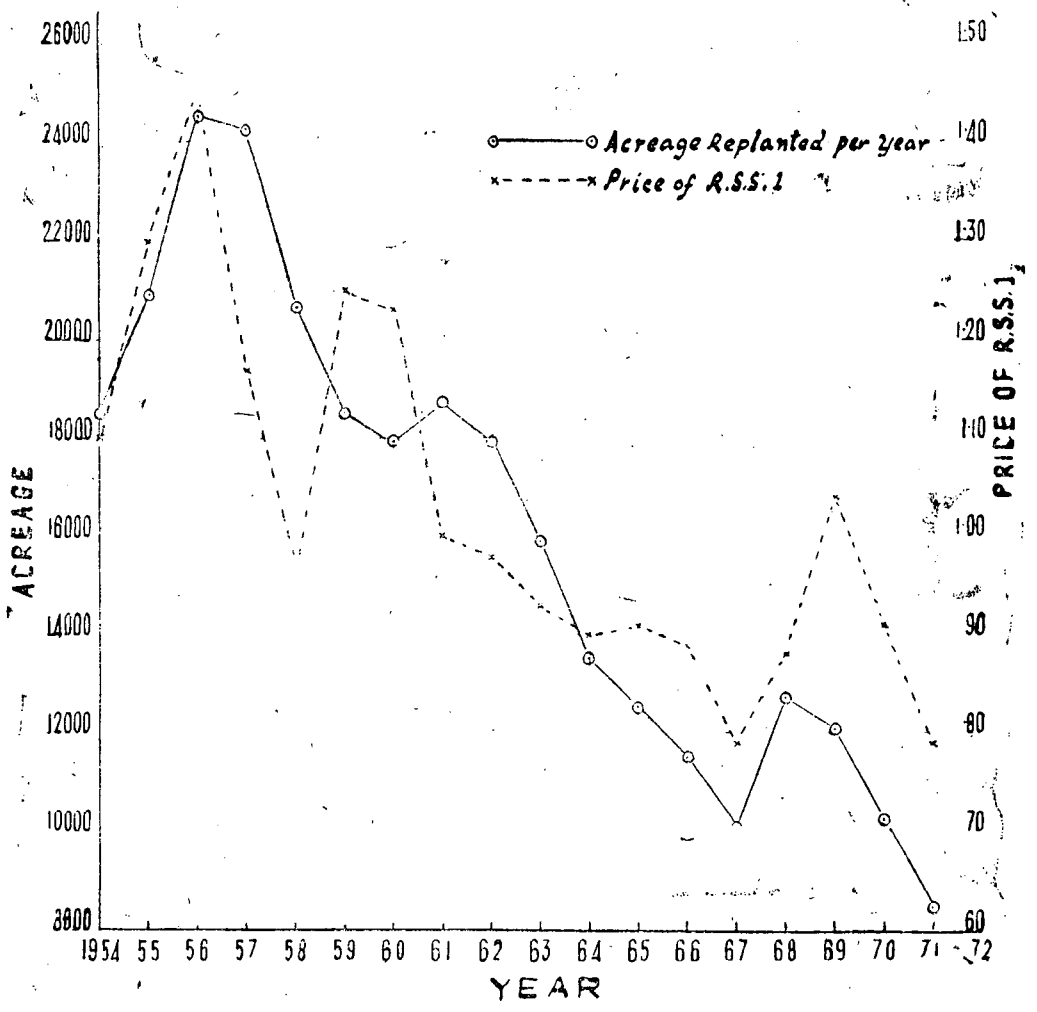


Replanting of Rubber : A study of the Replanting of rubber was made to identify the causes responsible for the reduction in the acreage replanted under the Rubber Replanting Subsidy Scheme (RRSS).

The progress of the RRSS over the years is given in Table 5 along with the price of No. 1 RSS. The relationship between the price of rubber and the rate of replanting was studied and is shown in Fig 2. The two graphs take very much the same shape indicating a very close correlation. Using rounded figures for ease of calculation a statistical calculation indicated that over 90% of the variation in the acreage replanted could be attributed to the change in the price of rubber.

Fig. 2.

RELATIONSHIP BETWEEN PRICE OF R.S.S 1 AND THE RATE OF REPLANTING



The figure further shows that increasing the replanting subsidy in January 1962 and in August 1966, has had almost no effect on the rate of replanting. The only increase in the rate of replanting had taken place in 1968 and 1969 the two years immediately following devaluation and this is most likely the result of the increase in the price of rubber in terms of devalued money.

A limited survey carried out to find out the reasons why small estate owners are reluctant to replant showed that :—

(1) Small estates owners were doubtful about the future of the rubber industry.

(2) They felt that the subsidy of Rs. 1,500/- per ac. was insufficient and should be raised to Rs. 1,800/- — Rs. 2,000/-.

(3) The sense of insecurity of the future was increased as the rubber tree has a long period of immaturity of six years.

Suggestions were made as to how these could be overcome.

Feasibility Studies : A number of feasibility studies of central factory projects, suggested by various organisations, were carried out.

Surveys

The survey of the economics of smallholdings started by Dr. Barlow is being continued by the Graduate Trainee.

ANRPC/ECAFE — Expert group : The Head of the Department attended the first meeting of the ANRPC/ECAFE — Expert group on rubber at Kuala Lumpur, Malaysia. A working paper entitled " Scope of studies to be undertaken by the Expert Group " was read at this Conference. At this meeting each Expert undertook to :

(1) Provide data in relation to the position of rubber in their own countries.

(2) Study one topic in relation to the world position.

The writer also attended the second meeting of the Expert group held in Kuala Lumpur in August and the third meeting held in Hat Yai, Thailand, in December.

The following studies were made in respect of the above :—

Studies for the ANRPC/ECAFE — Expert group :

(1) The importance of NR in the economy of Sri Lanka.
(2) The demand for elastomers — Sri Lanka.
(3) Price trends of NR in relation to Sri Lanka.
(4) Marketing of rubber in Sri Lanka.
(5) International Trade in Rubber in relation to Sri Lanka.
(6) The importance of the NR industry — Indonesia.
(7) Marketing of rubber — Indonesia.
(8) An analysis of the supply of all elastomers.

Pale Crepe Factory Project

The Head of the Department was authorised to start operations on the above project in April 1972.

Surveys : Surveys were first carried out to select suitable areas for the establishment of central factories for the production of pale crepe from smallholder and small estate latex. A total of 29 areas were surveyed. An analysis of the position is shown in Table 6.

TABLE 6

SURVEYS FOR CENTRAL FACTORIES

Category	No of sites.
Sites selected	8
Area suitable but site not yet selected	4
Areas suitable but will cover larger areas	10
Areas unsuitable	7
Total	29

Sites approved for construction of factories :

The following sites were approved by the Ministry for the construction of central factories:—

(1) Badureliya
(2) Kuruwita sub-station
(3) Waharaka.

In addition it was decided that two existing private factories, which were operating below capacity be acquired for conversion into central factories. They are :—

(4) Yataderiya Estate factory
(5) Silverdale Estate factory

Acquisition papers have been submitted through the Agricultural Ministry for the acquisition of the above sites except Kuruwita, where the factory will be constructed on the sub-station of the RRIC.

Details of factory : In the meantime discussions were held with officers of the Rubber Chemistry Department to finalise details concerning the central factories. The following decisions were reached :—

(1) The initial capacity of the factory should be 1 ton per shift.

(2) The machinery should consist of one chilled macerator (for wet milling as well as for dry blanketing) and two smooth mills.

(3) The laces should be drip dried for one day prior to putting into the drying tower.

(4) The capacity of the drying loft should be 4,500 lb.

(5) The drying tower capacity should be 12,000 lb.

(6) The water supply should be pumped into overhead tanks for gravity-flow.

(7) The cutting of the site should be carried out as a " Shramadana " campaign to save finances and to create a greater interest among smallholders in the area.

(8) A standardised method of manufacture to be adopted in all factories except where experimentation is going on.

Quotations : Quotations were called from the three firms which normally cater for the rubber industry. The quotations received ranged from Rs. 478,000/- to Rs. 598,000/-. These quotations did not include the cost of site cutting and the cost of tractors for collection and transport of latex.

It is expected that tenders will be called for, very soon so that the contract could be given over as soon as the sites are acquired.

Surveys for a site for a block rubber factory :

In addition, on a request by the Director, a survey was carried out to select a suitable site for the Government Scrap and Block rubber factory (O.D.A.). The following five sites have been suggested for inspection and final selection.

(1) Kendawa
(2) Ellakande Estate
(3) Ingiriya
(4) Narthupana
(5) Vogan Estate.

Acknowledgement

Lastly our thanks are due to all Owners, Superintendents and Conductors of estates for the willing co-operation extended to us.

REVIEW OF THE SMALLHOLDINGS DEPARTMENT

By

H. H. Peiris

SUMMARY

The year under review was favourable to the smallholder. Prices offered to RSS Grade 1 and 2 improved as a floor price was fixed. The field officers devoted a good part of their time to organise Group Processing Centres (GPCs) and in improving the quality of smallholders sheet rubber to grade 1 RSS.

All 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 new film on rubber produced by the Rubber Research Institute was screened along with other films of agricultural interest.

The large scale sulphur dusting was curtailed and dusting was confined to holdings that were situated at elevations over 300 ft. (91 m) over mean sea level.

DETAILED REVIEW

General

The year under review was a favourable year to the smallholders as the weather was favourable for tapping. The Ministry of Plantation Industries fixed a favourable floor price for grade 1 & 2 RSS. In November the price was further increased by -/04 cts.

The field officers devoted a great deal of their time to organise co-operative Group Processing Centres and improving the quality of smallholders sheet rubber to grade 1 RSS.

Nineteen new ranges were carved out from the existing 52 ranges. The present eight Advisory Divisions were increased to ten. The two new Divisions will be centred around Elpitiya and Ruwanwella. It was also decided to rename Pasyala Division as Gampaha Division. Along with the recarving of the ranges all field staff who had served over four years in their present stations were transferred to new ranges as from January 1973.

The Chief Advisory Officer Smallholdings, was on duty throughout the year. Mr. R. P. M de Zoysa, Deputy Chief Advisory Officer Smallholdings, who was away on a scholarship to Malaysia returned to the Island and resumed duties on 1-2-72.

Eighteen new Rubber Instructors were appointed during the year. These Instructors were assigned under Range Instructors for preliminary training. They were provided with a further short refresher course before being posted as Rubber Instructors into new ranges.

Mr. S. Weerakoon, (internal applicant), newly appointed Rubber Instructor reverted back to the former position at Dartonfield.

Mr. J. A. T. P. Gunawardena, newly appointed Rubber Instructor, resigned his post on 24-1-72.

Mrs. N. K. Ekanayake, typist/clerk, resigned her post on 24-1-72.

Twenty four Rubber Instructors sat for a written test for promotion to vacant posts of Divisional Advisory Officers Smallholdings and after an interview the following were selected.

(a) Mr. W. S. Dassanayake, Acting Divisional Advisory Officer, Kegalle.
(b) Mr. D. R. Wijesuriya, Acting Divisional Advisory Officer, Homagama.
(c) Mr. A. J. L. de Silva, Rubber Instructor, Ratnapura.
(d) Mr. K. I. Ariyaratne, Rubber Instructor, Bandaragama.

Messrs. W. S. Dassanayake and D. R. Wijesuriya were confirmed in their positions from 1-6-72.

Two Rubber Instructors were promoted to the higher grade of salary scales.

Mr. U. J. Hirimutugoda and Miss G. N. P. Perera, Graduate trainees were appointed as Rubber Instructors with effect from 1-7-72.

Messrs. W. A. A. Perera and I. L. Sirisena, Clerk/Translators were promoted to higher grade of salary scales after a test in translations and typewriting.

Mr. U. S. Wijepala, Rubber Instructor, Publicity Unit 1, was transferred to Homagama Range as Rubber Instructor, Homagama.

Graduate trainees, Misses W. Yasawathie, J. N. Kumarasena and D. S. Elvitigala were confirmed in their appointments on 1-7-72, and were provided with work in the office of this department.

Mr. W. Leelaratne, Graduate trainee attached to the Pasyala Division was transferred to Dartonfield on 3-7-72.

Mrs. J. C. Perera from Head Office reported for duty at this office on 3-10-72, and was attached to Accounts section to assist Accounts Clerk.

Miss D. S. Elvitigala, Graduate trainee was transferred to Head Office, and Mrs. N. M. K. Welikanna was transferred to this office from Estates Advisory Department.

Mr. K. A. Wijesena, Office Labourer was transferred to Dartonfield, and Mr. D. J. Gunadasa, Office Labourer was sent here in his place on 1-3-72.

Mr. J. M. E. Dissanayake, Rubber Instructor, Pelmadulla, resigned his post on 24-1-73.

It is with deep regret that I have to record the death of Mr. K. J. L. Perera, Accounts Clerk on 9-3-72. His 16 years of sincere service in this department is greatly appreciated.

Loans : The following loans were granted during the year :—

(1) The Rubber Instructor, Polgahawela, Rs. 4,750.00 for the purchase of motor cycle.
(2) Five officers were granted motor cycle repair loans amounting to Rs. 8,489.50.
(3) Two officers were granted motor car repair loans amounting to Rs. 5,000.00.
(4) Two officers were granted loans to purchase two push cycles amounting to Rs. 1,100.00.
(5) Three officers were granted loans to repair motor cycles amounting to Rs. 4,832.00.
(6) Messrs. L. Subasinghe and M. W. Gunadasa were granted loans to purchase push cycles amounting to Rs. 1,100.00.

Correspondence

General :

Inward	—	6,468
Outward	—	8,260

With Rubber Controller :

Inward — 1178 (applications from new planting, unregistered rubber lands and new planting permits)

Outward — 1660 (preliminary reports, final inspection reports and special reports *etc.*,)

From Rubber Instructors to permit holders — 1660

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 as to the suitability of such lands for new planting before a permit is issued to him. These applications that were in turn referred to the respective Rubber Instructors for a preliminary report after a visit to such lands and 153 preliminary reports have been submitted to the Rubber Controller during the period. Further 232 final inspection reports and 1223 special reports on new rubber planted lands too have been furnished to the Rubber Controller at his request. A total of 129 new planting permits covering an extent of 187 ac. (74·8 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 nine new planting areas for 1972 covering an extent of 11 ac. (4·4 ha.) for soil conservation measures and twelve permit areas, covering an extent of 13 ac. (5·2 ha.) for planting holes. They have also lined a further total of nine permit

areas of the previous year's permits covering an extent of 14 ac. (6·4 ha.) for soil conservation measures and seven permit areas covering an extent of 12 ac. (4·8 ha.) for planting holes.

Fifty five first visits and 315 subsequent visits too were made by Instructors to new planting and new planted areas of 1971 and 1972. Further, a total of 4925 subsequent visits too were made by them to permit areas for which permits have been issued prior to 1971.

Rubber Instructors have marked a total of 1234 tappable trees in 27 new rubber planted smallholdings as demonstrations and marking for tapping.

Soil conservation : A sum of Rs. 1,139.18 has been paid to 22 peasant-class permit holders for conserving soil in their lands.

Fourteen peasant-class permit areas, covering an extent of 21 ac. (8·5 ha.) have been checked in the field by Divisional Advisory Officers during the period for payment.

Replanting : A considerable amount of the time of the field staff was also devoted to subsidy replanting work. A total of 2031 Rubber Replanting Subsidy Scheme permits covering an extent of 2888 ac. (1169·6 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 these permit areas has been visited by an Instructor. In all 5578 visits to subsidy replanting permit areas of this year and 33,858 visits to subsidy replanted permit areas of the previous years have been made by Rubber Instructors during the period. Rubber Instructors have lined a total of 923 subsidy replanted permit areas of this year covering an extent of 1093 ac. (442·7 ha.) for soil conservation works and 1080 subsidy replanting permit areas covering an extent of 1390 ac. (553 ha.) for planting holes. Further 211 subsidy replanting permit areas covering an extent of 353 ac. (143 ha.) and 219 subsidy replanting permit areas covering an extent of 372 ac. (150·5 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 10,733 trees in 220 holdings have been marked for tapping by Instructors for demonstration purposes. Random checks on planting material issued by subsidy replanting smallholders by the Rubber Controller, at various Commodity Purchase Depots were carried out by Rubber Instructors at their visits to these depots. A total of 7908 plants were checked at 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 requests from owners for special reasons such as sulphur dusting work *etc.*

Special inspections for Rubber Control Department :—

Visits for preliminary reports	..	153
Visits for final inspection reports	..	232
Visits for special reports (new planting)	..	1,223
Visits for special reports (replanting)	..	1,263
Visits for recommendation of subsidy payments by Divisional Advisory Officers and a few senior Rubber Instructors	..	1,230

Meetings and conferences

Village propaganda : The two Publicity Units of the Department operated in the field during the first and second quarters. The Propaganda Unit No. 1, did not operate during the third and fourth quarters. A total of 65 publicity meetings cum film shows were held during the year by the two Publicity Units of the Department. The films projected were the film produced by the R.R.I.C., " This is Rubber " and " Naturally its Rubber " along with other films of agricultural interest.

The 16 mm documentary colour film on rubber produced by the Rubber Control Department and the R.R.I.C. and directed by Mr. Lester James Peries has arrived in Ceylon and has been handed over to the Institute. This film was screened to the public during the third and the fourth quarters.

The following meetings and conferences attended by the Chief Advisory Officer and the field staff :

1. The Chief Advisory Officer Smallholdings attended a staff meeting at the Head Office, Dartonfield, Agalawatta on 21-3-72.

2. The Divisional Advisory Officer, Galle, and Rubber Instructor, Talgampola, attended a conference at the Galle Kachcheri. The conference was in connection with the planning of a programme for Pillgoda Valley Estate in Baddegama.

3. The Divisional Advisory Officer, Matugama, attended two Development Council meetings at Palindanuwara and Agalawatta.

4. Rubber Instructor, Welipenna, conducted three lessons on Rubber at the Welagedera Maha Vidyalaya.

5. Rubber Instructor, Pitigala, attended a District Development Council meeting at the Office of the District Revenue Officer, Pitigala on 15-1-72 and discussed the development of the area.

6. Divisional Advisory Officer, Matugama and Rubber Instructor, Matugama, attended the D.R.O's Office, Matugama on 3-5-72, and delivered a talk on rubber to Graduate trainees.

7. On 26-5-72, a conference of all Divisional Advisory Officers was held at Smallholdings Head Quarters. The Director R.R.I.C., Head Estates Advisory Department, Chief Administrative Officer and the Chief Advisory Officer Smallholdings, attended and recarving of ranges were discussed.

8. On 16-6-72, the Chief Advisory Officer Smallholdings and Deputy Chief Advisory Officer Smallholdings, attended the opening ceremony of the Nugedanda-Ihalagama Co-operative Society.

9. Rubber Instructor, Dehiowita, attended a conference of the Divisional Development Board, Dehiowita, on 1-7-72.

10. Rubber Instructor, Talangama and Homagama, attended a conference at the Office of the Assistant Commissioner, Co-operative Development, Colombo, to discuss about the Registration of Rubber Co-operative Societies in the ranges on 11-9-72.

11. Rubber Instructor, Yatiyantota, attended a conference at the D. R. O's Office, Yatiyantota to discuss about the rubber sheet production of the area on 11-9-72.

12. Rubber Instructor, Ruwanwella, attended a meeting of the Board of Directors, Multi-Purpose Co-operative Society, Ruwanwella on 15-9-72.

13. Rubber Instructor, Pitigala and Elpitiya, attended the Office of the Assistant Commissioner of Co-operative Development, Galle to discuss about the registration of Rubber Co-operative society in the respective ranges on 11-9-72.

14. Rubber Instructor, Imaduwa, attended the Weligama, Divisional Development Society meeting at the D. R. O's Office, Weligama Korale West, on 20-9-72 and 23-9-72.

15. The Chief Advisory Officer Smallholdings, gave a talk over the radio at the request of the Director, R.R.I.C. on the scope and functions of the Smallholdings Department on 28-9-72.

16. A full day conference of Smallholders in Panadura Division was held at Taksila Madya Maha Vidyalaya, Horana, on 8-11-72. The Hon. Minister of Plantation Industries, delivered the opening address, Scientific Officers of R.R.I.C., delivered useful talks on various ascepts of rubber *i.e.*, soils, ferlilizer, diseases and pests, clones, maintenance and manufacture. The Chief Advisory Officer Smallholdings, gave a talk on the progress made and shortcomings observed in smallholdings replanted under the Rubber Replanting Subsidy Scheme (1954 — 1971).

Publications

"Rubber Puwath" sinhala bulletin Vol. 2., December 1971, was printed and distributed among field staff and subscribers. No leaflets were published or reprinted.

Experiments

Sulphur dusting : This year as in 1971 the large scale dusting was curtailed and dusting was confined to holdings that were situated at elevations above 300 ft. (91·4 m) over mean sea level. A total of sixteen dusting groups comprising of 1600 ac. (647·5 ha.), were formed and fourteen groups comprising 1266 ac. (512·73 ha.) were successfully dusted during the year. The smallest holding to be dusted was 0·5 ac. (0·2 ha.) in extent. The total acreage dusted consisted of 1,109·5 ac. (449·4 ha.) of budded rubber and 156·8 ac. (63·2 ha.) of clonal seedling rubber.

Dusting operations commenced on 20-1-72 in Karawita, dusting group in Nivitigala Range and final round was given in 13-2-72. All dusting operations for the season were finally concluded on 5-3-72 when Aluthnuwara dusting group in Mawanella was given the final round of dusting. This year dusting was confined to Colombo, Kegalle, Ratnapura and Galle Districts. 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.

It is proposed to dust six groups, covering an extent of 572 ac. (231·7 ha.) during the 1973 dusting season.

Trial dusting groups to ascertain efficiency of control of Oidium *infection by leaf count :*

A survey was carried out by the Department of Plant Pathology, R.R.I.C., with the assistance of our field staff to ascertain the incidence of *Oidium* leaf diseases in PB 86 and Tjir 1 clonal seedlings.

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

Societies at Hataraliyadde, Kahagalle, Milleniya, Yatalamatta, Nugadanda-Ihalagama, Govinna, Dangampola and Kalupahana are in operation.

Societies at Galatura, Palugama, Kalalgoda/Talawatugoda, Rantotuwila and Etnawela have come to the final stages in building and are due to commence production soon. The following Group Processing Centres (GPCs) are constructing their smoke houses and curing sheds, Pinnawala, Homagama, Maliduwa, Haththella, Teppanawa, Walagedera, Olaboduwa, Opalla, Kandana, Yatagampitiya, Thambadiya, Iddamalgoda and Karapagoda.

The smoke house of Yatalamatta society was damaged by fire and arrangements are being made by the society to rebuild same very early.

Arrangements were made with the Commissioner of Commodity Purchase, to sell the sheets produced in these centres to the Government Rubber Purchasing Depots.

Initial arrangements are being made to form 50 Group Processing Centres (GPCs) in 1973.

A total of 3874 visits to Rubber Co-operative societies and 609 visits to Commodity Purchase Depots were made by the field staff to advice smallholders on the defects of their sheets. Altogether 1263 sheet making demonstrations were given by the Rubber Instructors to smallholders as an inducement to produce better quality sheets.

Twentynine ordinary smoke houses were started and twenty of these were completed by the smallholders through the inducement of the Instructors during the year. Instructors have paid 1154 visits to demonstration smoke houses and 5235 visits to ordinary smoke houses to advice smallholders on sheet making or improvement and on construction of smoke houses.

Hundred and fourteen strainers were sold to smallholders at subsidised rates to encourage them to produce better quality sheets.

Fertilizer demonstration Plots : At the request of the Fertilizer Corporation, the Director instructed the Smallholdings Department to select two suitable smallholdings $\frac{1}{2}$ 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 demonstrations plots commenced during May/June planting season and the Fertilizer Corporation supplied the fertilizer of 45 lb (20·4 kg) per holding for application at the filling of the planting holes and

subsequently during the October/November planting season, a further 24 demonstration plots were supplied with fertilizer for the same purpose. Further, the 52 plots, planted during the May/June planting season were supplied with manure of 67·5 lb (30·7 kg) for fertilizing plants during their first year after planting.

Exhibitions : The Department participated in a two day exhibition held at Mihindu Maha Vidyalaya, Agalawatta.

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

Sheet making	..	1,263
Tapping	..	724
Disease control	..	419
Miscellaneous	..	1,051

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

Fifteen reports on the suitability of locations for opening up of new Commodity Purchase Depots were submitted to the Department of Commodity Purchase for their attention.

Visitors

1. Dr. R. D. Elz and Mr. Richard de Heaulme of the World Bank, visited the Department. They visited several holdings in Ratnapura, Matugama, Kegalle and Pasyala Divisions. They also visited demonstration smoke houses and ordinary smoke houses and the Kahagalla Co-operative Production & Sales Society. All necessary information they required was complied with.

2. The Rubber Controller accompanied Deputy Chief Advisory Officer Smallholdings, to Milleniya and Nugadanda - Ihalagama Group Processing Centres.

3. On 24-6-72., The Deputy Commissioner Co-operative Development, accompanied Deputy Chief Advisory Officer Smallholdings, and inspected the work sites at Galatura Group Processing Centres and Group Processing Centre at Nugadanda - Ihalagama.

4. The Hon. Minister of Plantation Industries addressed the staff of the Smallholdings Department and Estates Advisory Department at the Tea Propaganda Board Hall on 29th August 1972.

5. The Director of the C.A.A. (Australia) Mr. Jim Web visited the Kalupahana Group Processing Centre, in November.

REVIEW OF THE ESTATE DEPARTMENT

By

S. DE S. DALUWATTA

SUMMARY

The Institute's group of estates, generally known 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.) at Hedigalla, is 1548 acres 0 roods and 30 perches (626·53 ha.). The planted acreage is 986¼ ac. (399·12 ha.), out of which 801 ac. (324·15 ha.) were tapped during the year. The immature areas and nurseries covered 151 ac. (61·11 ha.) and 34¼ ac. (13·86 ha.), respectively.

The weather conditions were not conducive to tapping and collection of crop. Heavy and uneven rainfall from April to June and again from September to November interrupted the collection of harvest. Further, a severe drought was experienced during the first two months of the year and thereby the intake per tapper was considerably reduced. The crop harvested was 452,777 lb (205,376 kg) representing an average yield of 559 lb/ac. (635 kg/ha.), this fell short of the estimate by 22·60%.

'Wintering' was very early, but uneven. Early symptoms of *Oidium heveae* were visible during mid February coinciding with occasional light showers occurring during the month. Though the attack was negligible, 'spot' dusting was carried out within the entire Group as a precautionary measure.

Phytophthora leaf-fall in mature areas and incidence of *Gloeosporium* in young clearings were not noticeable this year. The occurrence of Bark Rot and Brown Bast was greatly reduced, although a few scattered cases were treated at Hedigalla and Nivitigalakele Divisions. Applications of fungicides for Bark Rot control were discontinued especially in commercial areas.

The losses caused by wind damage was the highest recorded in recent years. The number of trees uprooted was 1,799, a loss of approximately 15 ac. (6 ha.), on the basis of 120 tree/ac. (300 tree/ha.).

Budwood of RRIC clones continued to be much in demand and issues were made to estates and smallholdings on request.

Routine weeding, manuring, disease control and other agricultural operations were carried out in both mature and immature areas of the Group.

Estimates for 1973, both capital and revenue, in connection with the working of the Group, were prepared and submitted to the Rubber Research Board for approval.

Workers' Councils were inaugurated as directed by the Ministry of Plantation Industries.

DETAILED REVIEW

Staff

The Estate Superintendent, Mr. S. de S. Daluwatta was on duty throughout the year. The Assistant Superintendent at Hedigalla Sub-station, Mr. M. R. T. Mendis resigned on 29th February 1972 and Mr. D. H. Ariyaratne was appointed in his place on 1st April 1972. He continued to look after the Sub-station during the rest of the year.

Mr. S. Abeywarna, K. P., at Hedigalla, resigned with effect from 4th October 1972.

The post of Accounts Clerk in the Estate Office, which remained vacant for a considerable period was filled by transferring Mr. B. H. Withanachchi of the Accounts Section to the Estate Department on 11th October 1972.

The Assistant Nursery Manager, Mr. L. Samaranayake, was under interdiction until the end of the year, pending the verdict of a court case.

The Estate Department cadre stood at 27 at the end of the year, made up as follows :—

Senior Staff	..	1
Intermediate Staff	..	1
Assistant Staff	..	16
Minor Staff	..	9
Total	..	27

In addition, Mr. B. D. Cyril, a Graduate trainee of the Government Graduate Trainee Scheme, was posted to the Department at the beginning of the year and was confirmed in his post with effect from 1st July.

Correspondence

Inward	..	412
Outward	..	1,028

Acreage Summary

	Dartonfield				Nivitigalakele				Hedigalla				Total			
	A.	R.	P.	Hectares	A.	R.	P.	Hectares	A.	R.	P.	Hectares	A.	R.	P.	Hectares
Mature ..	112	3	19	45·68	85	2	00	34·60	602	1	35	243·81	800	3	14	324·09
Immature ..	—	—	—	—	46	1	23	18·77	104	3	04	42·40	151	0	27	61·18
Nurseries ..	6	2	—	2·63	9	3	07	3·96	18	0	00	7·28	34	1	07	13·88
Total ..	119	1	19	48·31	141	2	30	57·34	725	0	39	293·50	986	1	08	399·14
Abandoned ..	11	2	—	4·65	13	2	36	5·55	61	3	08	25·01	87	0	04	35·22
Building sites *etc.* ..	40	2	36	16·39	15	1	33	6·25	8	1	18	3·38	64	2	07	26·12
Pinewood plantation ..	—	—	—	—	—	—	—	—	1	0	34	0·49	1	0	34	0·49
Roads ..	6	2	22	2·69	0	3	27	0·37	9	0	04	3·65	16	2	13	6·71
Swamp areas ..	—	—	—	—	0	2	08	0·22	0	2	20	0·25	1	0	28	0·48
Streams and reservations	0	0	29	0·07	—	—	—	—	13	0	29	5·33	13	1	18	5·41
Jungles *etc.* ..	—	—	—	—	1	3	38	0·80	376	0	00	152·16	377	3	38	152·97
	178	1	26	72·20	174	1	12	70·55	1195	1	32	483·73	1548	0	30	626·53

Visiting Agent

The Visiting Agent, Mr. M. W. Thompson paid one visit to Dartonfield Group on 25th and 26th April 1972.

Weather (estate gauge)

Comparative rainfall figures for 1972 and 1971 are given below :—

Month	Dartonfield				Nivitigalakele				Hedigalla			
	1972		1971		1972		1971		1972		1971	
	in.	mm/ha.	in.	mm/ha.	in.	mm/ha.	in.	mm/ha.	in.	mm/ha.	in.	mm/ha.
January ..	4·95	5·10	5·17	5·33	4·89	5·04	4·67	4·81	6·74	6·94	11·50	11·85
February ..	2·68	2·76	5·30	5·46	0·38	0·39	4·19	4·32	3·22	3·32	7·62	7·85
March ..	8·72	8·98	12·10	12·46	6·01	6·19	10·47	10·78	7·64	7·87	21·04	21·67
April ..	11·36	11·70	19·08	19·65	10·46	10·77	14·46	14·89	11·70	12·05	15·36	15·82
May ..	29·11	29·98	17·82	18·35	27·10	27·91	13·90	14·32	26·14	26·92	18·84	19·41
June ..	33·19	34·19	15·13	15·58	30·09	30·99	13·86	14·28	29·87	30·77	15·75	16·22
July ..	6·12	6·30	11·00	11·33	5·68	5·85	10·76	11·08	6·87	7·08	13·40	13·80
August ..	8·03	8·27	21·41	22·05	7·62	7·85	18·15	18·69	8·13	8·37	17·74	18·27
September ..	20·44	21·05	23·21	23·91	17·94	18·48	21·39	22·03	24·40	25·13	21·76	22·41
October ..	15·59	16·06	25·78	26·55	14·38	14·81	25·89	26·67	24·40	25·13	31·67	32·62
November ..	17·46	17·98	13·46	13·86	16·42	16·91	7·98	8·22	22·31	22·98	13·90	14·32
December ..	5·95	6·13	7·57	7·80	9·47	9·75	7·93	8·17	6·13	6·31	11·58	11·93
	163·60	168·51	177·03	182·34	150·44	154·95	153·65	158·26	177·55	182·88	200·16	206·16
Average (five-year period) ..	169·86 in.		174·96 mm/ha.		157·26 in.		161·98 mm/ha.		175·66 in.		180·93 mm/ha.	
Total No. of wet days ..	216		228		195		232		186		235	

The rainfall for the year at Dartonfield, Nivitigalakele and Hedigalla Divisions amounted to 163·60 in. 168·51 mm/ha., 150·44 in. 154·95 mm/ha. and 177·55 in. 182·88 mm/ha., and rain fell on 216, 195 and 186 days respectively. The second and fourth quarters of the year were wet while the first quarter was exceptionally dry. The highest rainfall recorded in the Group was in June. The rainfall at Dartonfield during this month was 33·19 in. 34·19 mm/ha. and was the highest recorded for the year.

Crop

The weather conditions were not at all favourable for tapping and collection of harvest. The main factors which contributed to the deficit in crop during the year were as follows :—

(a) Early defoliation and uneven wintering followed by a severe drought,

(b) heavy uneven distribution of rainfall especially during the cropping months of May, September, October and November,

(c) poor out-turn of village tappers, especially at Hedigalla, during paddy cultivation periods and on late tapping days.

(d) various tapping systems adopted in certain areas for experimental purposes.

	1972		1971	
	lb	kg	lb	kg
Estimated	585,000	265,351	615,000	278,959
Harvested	452,777	205,376	485,930	220,414
Deficit	132,223	59,975	129,070	58,545

The crop harvested for the year 1972 was 77·40% of the season's estimate.

Comparative yield records of individual fields

	Acreage in tapping		Total yield 1972		Total yield 1971		Yield 1972		Yield 1971	
	ac.	ha.	lb	kg	lb	kg	lb/ac.	kg/ha.	lb/ac.	kg/ha.
Dartonfield										
1950/51 replanted area ..	22¾	9·21	4,748	2,153	8,940	4,055	208·7	233·9	393·0	440·5
1952 ,, ,, ..	27	10·92	18,921	8,582	15,603	7,077	700·8	785·5	577·9	647·7
1953 ,, ,, ..	8	3·24	4,690	2,127	4,721	2,141	586·3	657·2	590·1	661·4
1954 ,, ,, ..	2½	1·01	1,788	811	1,659	753	715·2	801·6	663·1	743·2
1955 ,, ,, ..	5	2·02	2,807	1,273	2,925	1,327	561·4	629·2	585·0	655·7
1955/56 ,, ,, ..	4¾	1·92	3,084	1,399	2,581	1,171	649·3	727·8	543·4	609·1
1960/61 ,, ,, ..	31½	12·75	21,428	9,720	17,298	7,846	680·3	762·5	549·1	615·5
1965 ,, ,, ..	11½	4·65	1,435	651	370	168	124·8	139·9	123·3	138·2
	113	45·73	58,901	25,717	54,077	24,538	521·2	584·2	517·7	4580·3

	Acreage in tapping		Total yield 1972		Total yield 1971		Yield 1972		Yield 1971	
	ac.	ha.	lb	kg	lb	kg	lb/ac.	kg/ha.	lb/ac.	kg/ha.
Nivitigalakele										
1946 Clearing ..	11	4·45	2,581	1,171	13,763	6,243	234·6	263·0	1,376·3	1542·6
1953 ,, ..	10	4·05	6,119	2,776	7,282	3,303	611·9	685·8	728·2	816·2
1954 ,, ..	10	4·05	5,954	2,701	6,924	3,141	595·4	667·4	692·4	776·1
1962 replanted area ..	16¾	6·78	18,297	8,299	17,239	7,819	1,092·4	1,224·4	1029·2	1153·6
1963 ,, ,, ..	14	4·67	10,740	4,872	8,194	3,717	767·2	757·9	819·4	749·0
1964 ,, ,, ..	8	3·24	6,344	2,878	5,345	2,424	793·0	888·8	668·2	—
1965 ,, ,, ..	10	4·05	4,564	2,070	—	—	456·4	511·6	—	572·8
1966 ,, ,, ..	5¾	2·33	2,183	990	1,022	464	379·6	425·5	511·0	—
1967 ,, ,, (8¾) ..	—	—	550	249	—	—	62·8	70·4	—	—
	85½	34·60	57,332	26,005	59,769	27,111	670·5	—	895·4	1,003·6

	Acreage in tapping		Total yield 1972		Total yield 1971		Yield 1972		Yield 1971	
	ac.	ha.	lb	kg	lb	kg	lb/ac.	kg/ha.	lb/ac.	kg/ha.
Hedigalla										
1947 clearing ..	—	—	—	—	1,368	621	—	—	68·4	76·7
1949 ,, ..	34¾	14·06	26,635	12,081	27,069	12,181	766·5	859·1	779·0	873·1
1950/51 ,, ..	18	7·28	8,688	3,941	10,379	4,708	482·7	541·0	576·6	646·3
1952 ,, ..	79½	32·17	48,087	21,812	54,694	24,809	604·8	677·9	688·0	771·1
1953 ,, ..	132½	53·62	59,847	27,146	70,921	32,169	451·7	506·3	535·3	600·0
1954 ,, ..	171	69·20	89,283	40,498	96,444	43,746	522·1	585·2	564·0	632·2
1955 ,, ..	78	31·57	49,727	22,556	58,597	26,579	637·5	714·5	751·2	842·0
1956 ,, ..	60	24·28	39,418	17,880	39,426	17,883	657·0	736·4	657·1	736·5
1957 ,, ..	17¼	6·98	12,352	5,603	12,225	5,545	716·1	802·6	708·7	794·3
1965 replanted area ..	11½	4·65	2,507	1,173	941	427	218·0	244·3	81·8	91·7
	602½	243·82	336,544	136,195	372,064	168,765	558·6	626·1	708·6	794·2
Total for the Group ..	801	324·15	452,777	183,233	485,930	220,414	559·2	626·8	612·2	686·2
Other sources ..			82,121	37,249	128,036	58,076				
Total ..			534,898	242,625	613,966	278,490				

Tapping

Tapping was continued throughout the ' wintering ' period.

All tapping panels on experimental areas at Nivitigalakele and Hedigalla were treated with Antimucin, but commercial areas were not treated. Tapping cuts were also marked with appropriate guide lines for bark consumption in keeping with the systems of tapping adopted in various experimental areas. Tapping of three tapping blocks in 1950/51 replanted area at Dartonfield was discontinued, since July, owing to uneconomic intakes recorded. The tapping acreage at Hedigalla was re-blocked and as a result it was possible to reduce the number of 30 tapping tasks and thereby effect a reduction of 15 tappers.

Apart from the acreage estimated for tapping, 640 trees in 1967 replanted area at Nivitigalakele were brought under the S/2, d/3, 67% tapping system in September, as required by the Genetics & Plant Breeding Department.

Grooming of trees was done in a few experimental areas at Hedigalla Division.

Analysis of tapping rounds on Dartonfield Group for 1972 (1971 figures in brackets)

Dartonfield

	Early tapping		Late tapping		Winter rest		No tapping: Rain		No tapping: Holidays	
1st quarter	79	(63)	11	(25)	—	(—)	—	(1)	1	(1)
2nd ,,	43	(37)	17	(15)	—	(—)	26	(33)	5	(6)
3rd ,,	63	(52)	4	(6)	—	(—)	25	(34)	—	(—)
4th ,,	59	(60)	22	(18)	—	(—)	10	(13)	1	(1)
	244	(212)	54	(64)	—	(—)	61	(81)	7	(8)

Nivitigalakele

	Early tapping		Late tapping		Winter rest		No tapping: Rain		No tapping: Holidays	
1st quarter	76	(65)	14	(23)	—	(—)	1	(2)	—	(—)
2nd ,,	34	(28)	22	(23)	—	(—)	30	(34)	5	(6)
3rd ,,	51	(42)	19	(17)	—	(—)	22	(33)	—	(—)
4th ,,	52	(52)	27	(26)	—	(—)	13	(14)	—	(—)
	213	(187)	82	(89)	—	(—)	66	(83)	5	(6)

Hedigalla

	Early tapping		Late tapping		Winter rest		No tapping: Rain		No tapping: Holidays	
1st quarter	77	(63)	11	(16)	—	(—)	2	(11)	1	(—)
2nd ,,	33	(34)	19	(8)	—	(—)	32	(44)	7	(5)
3rd ,,	41	(52)	20	(5)	—	(—)	31	(35)	—	(—)
4th ,,	37	(47)	40	(27)	—	(—)	15	(18)	—	(—)
	188	(196)	90	(56)	—	(—)	80	(108)	8	(5)

Manufacture

A summary of the various forms of manufacture during the year is given below:—

Latex grades	Total		Percentage
	lb	kg	
Pale crepe No. 1 ..	288,540	130,879	63·72
Pale crepe No. 2 ..	26,129	11,852	5·77
Pale crepe No. 3 ..	74,602	33,839	16·48
Latex for experiments ..	4,017	1,822	0·89
	393,288	178,392	86·86
Scrap grades			
Scrap crepe No. 1 ..	12,569	5,701	2·78
Scrap crepe No. 2 ..	21,742	9,862	4·80
Scrap crepe No. 3 ..	25,178	11,421	5·56
Scrap for experiments ..	—	—	—
	59,489	26,984	13·14
Total ..	452,777	205,376	100·00
Outside sources ..	82,121	37,249	
	534,898	242,625	

Smallholders' latex, totalling 80,334 lb (36,439 kg) collected by Palinda Nuwara Multi-Purpose Co-operative Union Ltd., Badureliya, Lathpandura, was received at Dartonfield factory for pale crepe manufacture. A subsidised sum of -/15 cts. per lb was levied as manufacturing and transport charges.

Difficulties were encountered in the manufacture of No. 1 crepe, due to the multiplicity of clones under test, producing different types of latices planted in close proximity to one another. Frequent break-downs of factory machinery, adverse weather conditions, A.C. conversion programme of Mill motors and unsatisfactory transportation of latex and coagulum due to repairs to motor vehicles were some of the factors which aggravated the situation.

Factory Machinery

Mill No. 1 — 26″ × 14″ (*Brown's grooved mill*) : Re-grooved the rolls, re-bushed end bearing and converted to A.C.

Mill No. 2 — 26″ × 14″ (*Brown's grooved and shallow spiral mill*) : Converted to A.C.

Mill No. 5 — 26″ × 14″ (*C. C. C. axially and spirally grooved mill*) : Converted to A.C.

Mill No. 7 — 26″ × 14″ (*Brown's smooth mill*) : This mill was out of commission as the starter was reported to be irrepairable. The starter was not replaced till the end of the year.

Mill No. 8 — 26″ × 14″ (*Brown's smooth mill*) : A new pressure pad was supplied. The end pinions of the mill were bottomming and therefore required to be adjusted.

Scrap Washer — converted to A.C.

Factory Building

The old door of the factory main entrance was replaced with a new flexible steel door.

Field and technological experiments

The Rubber Chemistry, Botany, Genetics & Plant Breeding, Plant Pathology and Soils Chemistry Departments were given required labour and necessary assistance for carrying out their field and technological experiments.

Establishment and upkeep of experimental nurseries too were undertaken as required by Research Departments.

" Ethrel " latex stimulant was tested at Hedigalla, by application on 24 blocks in the 1954 clearing.

Two acres at Hedigalla were interplanted with Rubber and Kitul in July, to meet experimental requirements.

The Plant Pathology Department commenced bark inoculation trials at Dartonfield in October, against Black Stripe disease.

Estimates

Estimates for 1973, both capital and revenue, in respect of Dartonfield Group, were prepared and submitted to the Rubber Research Board for approval.

Roads

All motorable roads within the estate, including approach roads to outlying divisions, were well maintained, effecting surface repairs where necessary.

The tarring of the approach road leading to Nivitigalakele Division was completed by the Government contractors in October.

Pests and diseases

Oidium heveae

A mild attack of *Oidium* leaf disease was recorded throughout the Group, especially on late wintering clones, coinciding with light showers experienced during the middle part of February. Though the out-break was negligible, regular dusting operations were carried out, as a precautionary measure.

Gloeosporium alborubrum

The incidence was negligible.

Phytophthora palmivora

No noticeable attack was experienced.

Bark-Rot and Brown-Bast

The occurrence of Bark-rot and Brown-bast was greatly reduced, although a few trees at Hedigalla and Nivitigalakele were treated.

Root diseases

Some scattered cases of *Fomes lignosus* and *Ustulina zonata* were detected and treated in accordance with the Institute's recommendations.

Storm damage

The number of trees uprooted due to wind damage was rather high and totalled 102, 168 and 1529 trees, respectively, at Dartonfield, Nivitigalakele and Hedigalla Divisions.

Capital account — agriculture development

Dartonfield Division — immature areas

Nil

Nivitigalakele Division — immature areas

			ac.	ha.
1967	replanted area	..	8¾	3·54
1969	,, ,,	..	2½	1·01
1970	,, ,,	..	17½	7·08
1971	,, ,,	..	11½	4·65
1972	replanting	..	6	2·43
		Total	46¼	18·72

Hedigalla Division — immature areas

			ac.	ha.
1967	replanted area	..	10	4·05
1968	,, ,,	..	9¼	3·74
1969	,, ,,	..	22¼	9·00
1970	,, ,,	..	26¼	10·62
1971	,, ,,	..	17	6·88
1972	replanting	..	20	8·09
		Total	104¾	42·39

1967 replanted areas

(*a*) *8¾ ac. (3·54 ha.) at Nivitigalakele :* The plants in this area are growing satisfactorily and consist of clones Nos. 815, 1103, 1174 and RRIM 623. Some areas were brought under experimental tapping in 1972, and the balance would be ready for tapping in 1973.

(*b*) *10 ac. (4·05 ha.) at Hedigalla :* Plants of clones RRIC 41, 45, 86, 88, 89, 101, Nos. 451, 1004, 1010, 1108 and 1174 are planted in this area. Though the growth is good, it is not expected to bring it into tapping in 1973.

1968 replanted area 9¼ ac. (3·74 ha.) at Hedigalla

Growth is vigorous and ground covers are satisfactory. Clones of RRIC 45, 101, Nos. 135, 451, 1004, 1152, 1174 and 1305 are planted in this area.

1969 replanted areas

(*a*) *2½ ac. (1·01 ha.) at Nivitigalakele :* This area includes plants of clones RRIC 5, 41, 52, 89, RRIM 623 and Tjir 1. Growth is quite satisfactory.

(*b*) *22¼ ac. (9·00 ha.) at Hedigalla* : Clones of RRIC 45, 100, 101, Nos. 451 1103, 1173 and 1458 are planted in this area. The plants are growing well.

1970 replanted areas

(*a*) *17½ ac. (7·08 ha.) at Nivitigalakele :* Two acres (0·8 ha.) in this area are stump-budded with clone RRIC 45, while the balance acreage is planted with budded stumps of clones RRIC 13, 45, 100, 101, PR 252, IRCI 2, WR 101 and AVROS 1734. Growth is satisfactory.

(*b*) *26¾ ac. (10·62 ha.) at Hedigalla :* Eight acres (3·24 ha.) in this area are planted with stumped buddings of clone RRIC 45 and the balance is planted with budded stumps of clones RRIC 100 and 101. Ground covers are satisfactory and the plants are coming up well.

1971 replanted areas

(*a*) *11½ ac. (4·65 ha.) at Nivitigalakele :* This area is planted with experimental clones of RRIC series as required by the Botany Department. The growth is fairly satisfactory.

(*b*) *17 ac. (6·88 ha.) at Hedigalla :* Clones of RRIC 15, 48, 50, 101 and PR 252 are planted in this area and the growth is vigorous.

1972 replantings

(*a*) *6 ac. (2·43 ha.) at Nivitigalakele :* 916 budded stumps of clones RRIC 45 110, No. 506 and selected seedlings of experimental material were planted in this area during May in accordance with the requirements of the Genetics & Plant Breeding Department. Growth is quite good.

(*b*) *20 ac. (8·09 ha.) at Hedigalla* : A total of 3,300 budded stumps of clone RRIC 100 and 101 were planted in this area during June. Growth is satisfactory.

Nurseries

Budwood multiplication nurseries — 5½ ac. (2·23 ha.) at Dartonfield, 7¼ ac. (2·93 ha.) at Nivitigalakele and 14 ac. (5·67 ha.) at Hedigalla.

(a) Routine weeding, manuring, cleaning of drains, disease control work and other agricultural operations were carried out.

(b) All over-matured budwood points in Dartonfield and Nivitigalakele nurseries were lopped off for fresh budwood.

(c) 1,257 new budwood points of promising and high yielding experimental clones were established in Dartonfield nurseries after removing old uneconomical clones.

(d) It is intended to close down Hedigalla budwood nurseries, in due course, when plants come up to tappable girth.

Seedling stock nurseries — 1 ac. (0·405 ha.) at Dartonfield, 2½ ac. (1·01 ha.) at Nivitigalakele and 4 ac. (1·62 ha.) at Hedigalla.

(a) The seedling stock nurseries were satisfactorily maintained and routine agricultural operations were carried out.

(b) Vigorous stocks were budded to meet both experimental and commercial requirements.

(c) Approximately one-acre (0·405 ha.) was prepared for establishing a new nursery at Nivitigalakele.

Budwood issues

(a)	To outside estates	.. 2,025	yards
(b)	For Nivitigalakele budgraftings	.. 23	,,
(c)	For Botany Department experiments	.. 484	
(d)	For Genetics & Plant Breeding Dept. experiments	.. 9	
(e)	To Plant Breeding Section for despatching to India	.. 10	,,
		2,551	,,

Budded stumps issues

(a)	For Estate Department replantings including supply of vacancies	.. 5,428	budded	stumps
(b)	For planting Dartonfield budwood nurseries	.. 1,270	,,	,,
(c)	For Kitul/Rubber experimental planting at Hedigalla	.. 250	,,	,,
(d)	For Plant Pathology Department experiments	.. 300	,,	,,
		7,248	,,	,,

Labour and health

Labour force : The labour force was generally adequate for routine work, except during paddy cultivation periods, since the village labour was temporarily engaged in this work. To over-come this situation two new labourers were taken into the permanent cadre and 29 temporary/casual workers were offered work on a casual basis at Nivitigala and Hedigalla Divisions.

All daily paid workers employed at Nivitigalakele and Hedigalla divisions under Building and Engineering Trades were given monthly pay with effect from 1st April 1972, and transferred to the Works Section.

No strikes were reported during the year.

New applications for refund of E.P.F. dues, in respect of 28 individuals were made during the year. Including the previous year's outstanding cases 39 persons were settled in full.

No Labour Tribunal cases were reported, but, out of the cases filed during the previous year, six applications were dismissed, as the applicants were unable to explain their causes. The application made by Mr. G. A. Arlis Singho was amicably settled, after agreeing to pay gratuity, on medical grounds. The Estate Superintendent appeared on behalf of the Institute and no lawyers were retained.

Rivalry between the D.W.C. and the U.C.M.U. resulted in the members submitting enrolment applications frequently. Several inconveniences were experienced due to this haphazard system and therefore it was ruled that membership enrolment forms be submitted once in six months, adhering to the instructions given by the Ministry of Plantation Industries.

Four male and five female workers were retired upon reaching age limit, while eight permanent labourers left employment on their own accord on medical grounds. Gratuities due to these employees were paid in full.

Line rooms : Line-room accommodation was satisfactory. Repairs to lines and labour cottages where necessary were carried out. Five additional double-roomed latrines, two at Dartonfield, one at Nivitigalakele and two at Hedigalla were built for the convenience of labourers.

Wages : Wages were paid in accordance with the Wages Board's Ordinance in force. Besides the minimum wage, incentives were paid to supervisory kanganies and workers engaged in specified works. Temporary interim allowance, as declared by the Government, was added to the minimum wage with effect from November.

Dartonfield Group

Working Ceylonese		Resident	Non-resident	Total
Men	..	96	146	242
Women	..	90	115	205
Children	..	—	—	—
Working immigrants				
Men	..	34	—	34
Women	..	26	—	26
Children	..	—	—	—
		246	261	507

Annual holidays : Annual holidays with pay were given to all labourers who were entitled to them, in accordance with the labour ordinance.

Festival advances : Substantial festival advances were given to all labourers on an easy repayment basis to celebrate their main festivals.

Maternity benefits : In all 23 full and six alternative maternity benefit payments were made. No deaths were reported due to pregnancy or child birth.

Workmen's compensation : Seventeen accidents, sustained by workers during working hours, were reported, and compensation was paid in accordance with the regulations of the Ceylon Insurance Corporation.

Feeding children : Free rations, ¼ lb bread or wheat flour were issued to each resident non-working child over one year of age. Free milk foods were issued to infants under one year, who are resident on the estate, at the rate of 1 lb per fortnight, when their mothers were incapable of breast feeding. Due to non-availability of infants milk foods in the market, issues were temporarily suspended from mid June.

Co-operative stores

Two co-operative stores were opened at Dartonfield and Hedigalla Divisions for the convenience of labourers. Issues of rations to residents at Dartonfield and Hedigalla, through the Group's rice store were discontinued, since ration books were issued to them by the D.R.O., Agalawatta.

Workers' councils

Two workers' councils one at Hedigalla and the other at Dartonfield and Nivitigalakele, were inaugurated under the directions given by the Ministry of Plantation Industries.

Health : The health of the members of the Institute's staff and of the estate labourers was satisfactory. There was an epidemic of Infective Hepatitis during March/April. The Epidemiologist of the Institute of Hygene, Kalutara and Medical Officer, Agalawatta paid three visits to Dartonfield to take preventive measures.

Immunisations against polio and vaccination against small pox were carried out. The Anti-T.B. Unit of the Health Department carried out a round of B.C.G. vaccination for pre-school children.

Anti-mosquito measures : DDT spraying programme had to be abandoned due to non-availability of DDT powder in the open market. Further, the Superintendent of the Anti-malaria Campaign had indicated that there was no necessery to spray DDT as Agalawatta is non-malarial area.

Births : Twenty-five infants were born on the group during the year.

Deaths : There were seven deaths on the Group this year.

A list of diseases treated by the Institute's Estate Medical Assistants is given below :—

Influenza	..	746
Ulcers	..	607
Roundworm	..	556
Diarrhoea and enteritis	..	199
Eye and ear diseases	..	331
Other diseases	..	7,796
Total	..	10,235

The number of cases treated during the year was high as it included non-resident cases too. The Rubber Research Board as a social service had approved treatment of non-residents, who are relations of workers employed in the Institute.

From 1st May, treatment to non-residents was limited only to workers and their immediate family members. Cards were issued to each family for easy identification of personnel seeking treatment, in order to prevent abusing this service.

REVIEW OF THE KURUWITA SUB-STATION

By

S. M. Dias

Acreage Statement

MATURE RUBBER	A.	R.	P.	Hectares
1961 Replanting	83	0	0	33·59
1962 ,, ...	38	3	0	15·68
1963 ,, ...	22	2	0	9·11
1964 ,, ...	18	0	0	7·28
1965 ,, ...	19	2	0	7·89
1966 ,, ...	10	0	0	4·05
Total Acreage in tapping	191	3	0	77·60

IMMATURE RUBBER	A.	R.	P.	Hectares
1967 replanting	10	0	0	4·05
1968 ,, ...	10	0	0	4·05
1969 ,, ...	10	0	0	4·05
Total immature acreage	30	0	0	12·15

	A.	R.	P.	Hectares
Total Rubber Acreage	221	3	0	98·74
Nurseries	2	0	20	0·86
Paddy	5	2	0	2·23
Roads, buildings etc.	17	1	10	7·01
Grand total	246	2	30	99·84

Weather

	Rainfall		*Wet days*
1971	184·93 in.	190·48 mm/ha.	210
1972	160·22 in.	165·03 mm/ha.	173

The year under review commenced with unprecedented drought conditions which continued into mid-March, resulting in crop intakes being considerably reduced. Even with the advent of fair weather conditions, the improvement in crop intakes was slow and this has been attributed to the damage caused to feeder roots, as a result of the severe drought conditions that prevailed August/September, two good

cropping months were marved by unusual weather, where early morning rain, or very late night rains interfered with normal tapping. The year under review was not altogether favourable for the harvesting of crop.

Crop

		1971		1972	
Estimate	..	133,975 lb	60,770 kg	165,000 lb	74,843 kg
Secured	..	130,264 lb	59·087 kg	142,709 lb	64,732 kg
Decrease	..	Nil	Nil	Nil	Nil
Increase	..	38,564 lb	17,492 kg	12,445 lb	5,645 kg

Inspite of the adverse weather conditions for crop intake, an increase of 12,445lb (5,645 kg) over the previous season was recorded. However, there was a shortfall of 22,291 lb (10,111 kg) over the increased estimate for the year 1972. With 29½ ac. (11·94 ha.) young clearings brought into bearing, the low intensity tapping, no recovery tapping and adverse weather conditions were factors which did not make it possible to gather the enhanced estimated crop for the year under review.

Machinery and power

Machinery has worked satisfactorily with only minor breakdowns to the water pumps. There has been some breakdown in Government power supply and were on occasions for extended periods, when the standby unit has been commissioned.

Buildings

All labour quarter latrines which were condemned, have been serviced and are functioning effectively. The kitchen fireplaces which were defective have been all replaced with more efficient and acceptable fire places.

The creche building which was an eyesore, has been attended to and now presents a better picture, though the building is not of a very permanent nature.

All pipe lines have been repaired and cleaned out. The wood work and staircase of the smoke house has been treated with wood preservative and the factory iron frame work painted with anti-corrosive paint.

The smoke house is inadequate during periods of rush crops and drying of sheets is to some extent effected, during such periods. Although approval has been granted for the construction of a temporary smoke house, no action has been taken, as proposals for the conversion of the manufacturing facilities to crepe, has been under consideration. If however, this project is likely to be delayed, action will be taken for the construction of a temporary smoke house. This would be wasteful expenditure.

Staff

Mr. M. C. Perera continues as the Senior Field Assistant on the property.

Labour

The estate successfully contested three applications to the Labour Tribunal. Five workers were laid off on retirement and two workers who had applied to the Labour Tribunal in respect of retiring gratuities, were awarded two weeks gross salary per each year of service at the Sub-Station.

There has been considerable Union activity, and one labour Conference was attended during the year. There is little cause for labour activity except for reason best known to the local leaders.

Absenteeism amongst the labour who are mainly non-resident is high and seasonally disorganises routine maintenance cultivation.

Cost of production

The cost of production for the year was -/85·36 cts.

General

Mr. M. W. Thompson paid one visit during the year prior to his relinquishing visiting work of the Institutes Estates. I wish to place on record a very big thank you to this gentleman for his valuable advices and assistance in reorganising the work at the Sub-Station. Towards the end of the season, the newly appointed Visiting Agent, Mr. M. R. C. Pieris visited the property and made some valuable suggestions which are being progressively implemented.

I also wish to record my thanks for the assistance and co-operation I have received from the Director, Administrative and Scientific Staff during the year under review.